A | B | C | D | E | F | G | H | I | J | K | L | M | N | O | P | Q | R | S | T | U | V | W | X | Y | Z

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Current Hazards
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Forecasts
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Aviation
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Fire Weather
Weather Planner
Climate
Local Climate
Climate Prediction

A

Ablation: Depletion of snow and ice by melting and evaporation.

Abutment: The part of a valley or canyon wall against which a dam is constructed. Right and left abutments are those on respective sides of an observer looking downstream.

Abutment Seepage: Reservoir water that moves through seams or pores in the natural abutment material and exits as seepage.

ACCAS: An acronym for Altocumulus Castellanus. See ***Altocumulus Castellanus.***

Accessory Cloud: A cloud which is dependent on a larger cloud system for development and continuance. Roll clouds, shelf clouds, and wall clouds are examples of accessory clouds.

Accuracy: Degree of conformity of a measure to a standard or true value.

Achluophobia: The fear of darkness.

Acre-foot: The amount of water required to cover one acre to a depth of one foot. An acre-foot equals 326,851 gallons, or 43,560 cubic feet.

Active Conservation Storage: The portion of water stored in a reservoir that can be released for all useful purposes such as municipal water supply, power, irrigation, recreation, fish, wildlife, etc. Conservation storage is the volume of water stored between the inactive pool elevation and flood control stage.

Active (Usable) Storage Capacity: The total amount of reservoir capacity normally available for release from a reservoir below the maximum storage level. It is total or reservoir capacity minus inactive storage capacity. More specifically, it is the volume of water between the outlet works and the spillway crest.

A/D Converter: Ananlog-to-digital converter. The electronic device which converts the radar receiver analog (voltage) signal into a number (or count or quanta)

Adirondack Type Snow Sampling Set: A snow sampler consisting of a 5-foot fiberglass tube, 3 inches in diameter, with a serrated-edge steel cutter at one end and a twisting handle at the other. This sampler has a 60-inch snow depth capacity.

Administrative and Forest Fire Information Retrieval and Management System (AFFIRMS): A United States Department of Agriculture (USDA) Forest Service interactive computer program used on a time-share computer to collect and disseminate fire weather observations and forecasts, and to compute fire danger indices of the National Fire Danger Rating System.

Administrative Messages (ADM): Meteorological Operations Division (MOD) is responsible for issuing routine and special administrative messages that provide information to the field and outside users. These messages contain the following information: 1) the current status of the model run cycles (e.g., any delays in model guidance); 2) upper-air sounding data that were edited or deleted before their use by the models; 3)

Weather Safety
Storm Ready
Education
NOAA Weather Radio
Skywarn
Miscellaneous
Weather Now
Wireless Forecasts
Computer Guidance
Weather Stories
News Archive
Weather Links
Weather Glossary
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Tornado
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w-dtx.webmaster
@noaa.gov

delays in the creation and/or distribution of MOD products; and 4) delays in the creation and/or distribution of data sets processed on the Hydrometeorological Prediction Center (HPC). At a minimum, this administrative message is issued once every model cycle at approximately 9:45 AM/PM EST (10:45 AM/PM EDT) by the Senior Duty Meteorologist. Additional messages are issued as required.

Advection: The horizontal movement of an air mass that causes changes in the physical properties of the air such as temperature and moisture.

Advection Fog: It is formed as warmer, moist air moves over a cold ground. The air is cooled to saturation by the loss of heat to the cold ground. Unlike radiation fog, advection fog may form under cloudy skies and with moderate to strong winds. Initial stability is relatively unimportant since low level cooling makes the air unstable near the ground.

ADVIS: A program which combines the Antecedent Precipitation Index (API) method of estimating runoff with unit hydrograph theory to estimate streamflow for a headwater basin.

Advisory: 1) Highlights special weather conditions that are less serious than a warning. They are for events that may cause significant inconvenience, and if caution is not exercised, it could lead to situations that may threaten life and/or property. 2) Official information issued by tropical cyclone warning centers describing all tropical cyclone watches and warnings in effect along with details concerning tropical cyclone locations, intensity and movement, and precautions that should be taken. Advisories are also issued to describe: (a) tropical cyclones prior to issuance of watches and warnings and (b) subtropical cyclones.

Aeration Zone: A portion of the lithosphere in which the functional interstices of permeable rock or earth are not filled with water under hydrostatic pressure. The interstices either are not filled with water or are filled with water that is no held by capillarity.

Aerophobia: The fear of drafts, air swallowing, or air bourne noxious substances.

AFOS: Automation of Field Operations and Services. This system was installed in the early to mid 1980s and it is being replaced by ***Advanced Weather Interactive Processing System*** (***AWIPS)***.

Afterbay: The tail race of a hydroelectric power plant at the outlet of the turbines. The term may be applied to a short stretch of stream or conduit, or to a pond or reservoir.

Agglomerate: An ice cover of floe formed by the freezing together of various forms of ice.

AHOS: Automatic Hydrologic Observing System

AHOS-S: Automatic Hydrologic Observing System - Satellite

AHOS-T: Automatic Hydrologic Observing System - Telephone

Airborne Snow Survey Program: Center (NOHRSC) program that makes airborne snow water equivalent and soil moisture measurements over large areas of the country that are subject to severe and chronic snowmelt flooding.

Airborne Snow Water Equivalent Measurement Theory: A theory based on the fact that natural terrestrial gamma radiation is emitted from the potassium, uranium, and thorium radioisotopes in the upper eight inches of the soil. The radiation is sensed from low flying aircraft 500 feet above the ground. Water mass in the snow cover attenuates the terrestrial radiation signal. The difference between airborne radiation measurements made over bare ground and snow-covered ground can be used to calculate a mean areal snow water equivalent value with a root mean square error of less than a half inch.

Air Mass: A large body of air that has nearly uniform conditions of temperature and humidity.

Air Mass Thunderstorm: Generally, a thunderstorm not associated with a front or other type of synoptic-scale forcing mechanism. Air mass thunderstorms typically are associated with warm, humid air in the summer months; they develop during the afternoon in response to insolation, and dissipate rather quickly after sunset. They generally are less likely to be severe than other types of thunderstorms, but they still are capable of producing downbursts, brief heavy rain, and (in extreme cases) hail over 3/4 inch in diameter. Since all thunderstorms are associated with some type of forcing mechanism, synoptic-scale or otherwise, the existence of true air-mass thunderstorms is debatable; therefore, the term is somewhat controversial and should be used with discretion. Also, see ***Popcorn Convection*** and ***Single Cell Thunderstorm.***

AIRMET (AIRman's METeorological Information): This NWS aviation product advises of weather that maybe hazardous, other than convective activity, to single engine, other light aircraft, and Visual Flight Rule (VFR) pilots. However, operators of large aircraft may also be concerned with these phenomena. The items covered are:

In the Airmet Sierra bulletin:
Ceilings less than 1000 feet and/or visibility less than 3 miles affecting over 50% of the area at one time.
Extensive mountain obscuration

In the Airmet Tango bulletin:
Moderate turbulence
Sustained surface winds of 30 knots or more at the surface

In the Airmet Zulu bulletin:
Moderate icing
Freezing levels

These AIRMET items are considered to be widespread because they must be affecting or be forecast to affect an area of at least 3000 square miles at any one time. However, if the total area to be affected during the forecast period is very large, it could be that only a small portion of this total area would be affected at any one time.

AIRMETs are routinely issued for 6 hour periods beginning at 0145 UTC during Central Daylight Time and at 0245 UTC during Central Standard Time. AIRMETS are also amended as necessary due to changing weather conditions or issuance/cancelation of a SIGMET .

Air Quality Statement(AQI): This National Weather Service product is issued to relay air pollution information and issue Ozone Action Days.

Air Stagnation: A meteorological situation in which there is a major buildup of air pollution in the atmosphere. This usually occurs when the same air mass is parked over the same area for several days. During this time, the light winds cannot "cleanse" the buildup of smoke, dust, gases, and other industrial air pollution.

Air Stagnation Advisory: This National Weather Service product is issued when major buildups of air pollution, smoke, dust, or industrial gases are expected near the ground for a period of time. This usually results from a stagnant high pressure system with weak winds being unable to bring in fresh air.

Air Transportatable Mobile Unit: A modularized transportable unit containing communications and observational equipment necessary to support a meteorologist preparing on-site forecasts at a wildfire or other incident.

Albedo: The portion of incoming radiation which is reflected by a surface.

ALERT Flood Warning System: A cooperative, community-operated flood warning system; the acronym stands for Automated Local Evaluation (in) Real Time.

Alberta Clipper: A fast moving low pressure system that moves southeast out of Canadian Province of Alberta (southwest Canada) through the Plains, Midwest, and Great Lakes region usually during the winter. This low pressure area is usually accompanied by light snow, strong winds, and colder temperatures. Another variation of the same system is called a "Saskatchewan Screamer".

Aleutian Low: A semi-permanent, subpolar area of low pressure located in the Gulf of Alaska near the Aleutian Islands. It is a generating area for storms and migratory lows often reach maximum instensity in this area. It is most active during the late fall to late spring. During the summer, it is weaker, retreating towards the North Pole and becoming almost nonexistent. During this time, the North Pacific High pressure system dominates.

Algorithm: A computer program (or set of programs) which is designed to systematically solve a certain kind of problem. WSR-88D radars (NEXRAD) employ algorithms to analyze radar data and automatically determine storm motion, probability of hail, VIL, accumulated rainfall, and several other parameters.

Aliasing: The process by which frequencies too high to be analyzed with the given sampling interval appear at a frequency less than the Nyquist frequency.

Altimeter: An instrument that indicates the altitude of an object above a fixed level. Pressure altimeters use an aneroid barometer with a scale graduated in altitude instead of pressure.

Altocumulus (Ac): These clouds are composed of mainly water. They appear as white or gray colored roll like elements or bands. The individual elements are large and darker than in cirrocumulus clouds. These clouds from between 6,500 and 23,000 feet.

Altocumulus Castellanus (ACCAS): They are middle level convective clouds and possibly they should be classified as clouds with extensive vertical development. They are composed of mainly water vapor. They are characterized by their billowing tops and comparatively high bases. These clouds from between 6,500 and

23,000 feet. These clouds are a sign of instability aloft, and may precede the rapid development of thunderstorms.

Altocumulus Standing Leticular (ACSL): These clouds are formed on the crests of waves crested by barriers in the wind flow. The clouds show little movement hence the name standing. Wind, however, can be quite strong blowing through the cloud. They are characterized by their smooth, polished edges. These may also form on wave crests. They are composed of mainly water vapor and they are generally duller than Cirrocumulus Standing Leticular (CCSL). These clouds from between 6,500 and 23,000 feet.

Altostratus (As): It is a bluish veil or layer of clouds having a fibrous appearance. The outline of the sun may show dimly as through frosted glass. It often merges gradually into cirrostratus. As with cirrostratus, it often is part of a cloud shield associated with a front. This type of cloud is composed of mainly water vapor and result from lifting a layer. These clouds form between 6,500 and 23,000 feet.

Alluvial: An adjective referring to alluvium.

Alluvium: Sediments deposited by erosional processes, usual by streams.

Amplitude: The maximum magnitude of a quantity.

Anabranch: A diverging branch of a river which re-enters the main stream.

Analog: Class of devices in which the output varies continuously as a function of the input.

Ancraophobia: The fear of the wind. See ***Anemophobia***.

Anchor Ice: Submerged Frazil ice attached or anchored to the river bottom, irrespective of its formation.

Anchor Ice Dam: An accumulation of anchor ice which acts as a dam and raises the water level.

Anemometer: An instrument used for measuring the speed of the wind.

Anemophobia: The fear of air drafts or wind. See ***Ancraophobia***.

Aneroid Barometer: An instrument designed to measure atmospheric pressure. It contains no mercury.

Angels: Radar echoes caused by birds, insects, and localized refractive index discontinuities.

Angular Area of Sphere: Equals 4*pi steradians.

Annual Flood: The maximum discharge peak during a given water year (October 1 - September 30).

Anomalous Propagation (AP): Radio wave propagation that occurs due to non-standard atmospheric conditions. Most common usage refers to ground returns detected by downward bending of the radar beam.

Antecedent Precipitation Index (API): A measure of how much moisture in the top layer of soil within a drainage basin. In other words, this is a soil moisture index.

Antecedent Precipitation Index (API) Method: A statistical method to estimate the amount of surface runoff which will occur from a basin from a given rainstorm based on the **Antecedent Precipitation Index**, physical characteristics of the basin, time of year, storm duration, rainfall amount, and rainfall intensity.

Antenna: A transducer between electromagnetic waves radiated through space and electromagnetic waves contained by a transmission line.

Antenna Gain: The measure of effectiveness of a directional antenna as compared to an isotropic radiator; maximum values called 'antenna gain' by convention. Gain can be defined as: (power at point with antenna) / (power at same point with isotropic antenna).

Antenna Reflector: The portion of an antenna system which reflects the energy from the radiating element into a focused beam; generally circular parabolas for weather radars.

Attenuation: Any process in which the flux density (power) of a beam of energy is dissipated.

Anticipated Convection (AC): The Day 1 and Day 2 Convective outlooks issued by the Storm Prediction Center in Norman, Oklahoma. The term originates from the header coding (ACUS1) of the transmitted product.

Anticyclone: An area of high pressure around which the wind blows clockwise in the Northern Hemisphere and counterclockwise in the Southern Hemisphere. At the center of the circulation, there is sinking air. Generally, this sinking air provides clear skies.

Anticyclonic Rotation: Rotation in the opposite sense as the Earth's rotation. In the Northern Hemisphere, this would be clockwise as would be seen from above.

Antlophobia: The fear of floods.

Anvil: The flat, spreading top of a Cumulonimbus Cloud (Cb). Thunderstorm anvils may spread hundreds of miles downwind from the thunderstorm itself, and sometimes may spread upwind (See ***Back-Sheared Anvil***).

Anvil Crawler: Slang for a lightning discharge occurring within the anvil of a thunderstorm, characterized by one or more channels that appear to crawl along the underside of the anvil. They typically appear during the weakening or dissipating stage of the parent thunderstorm, or during an active ***Mesoscale Convective System (MCS)***.

Anvil Dome: A large overshooting top or penetrating top on the top of a Cumulonimbus Cloud (Cb).

Anvil Rollover: Slang for a circular or semicircular lip of clouds along the underside of the upwind part of a back-sheared anvil, indicating rapid expansion of the anvil. See ***cumuliform anvil***, ***knuckles***, and ***mushroom***.

Anvil Zits: Slang for frequent (often continuous or nearly continuous), localized lightning discharges occurring from within a thunderstorm anvil.

AOA: An acronym for "At or Above".

AOB: An acronym for "At or Below".

Apparent Temperature: The apparent temperature is a measure of human discomfort due to combined heat and humidity. It was developed by Dr. R. G. Steadman in 1979 and is based on studies of human physiology and textile (clothing) science. The apparent temperature is designed so that apparent temperature exceeds the actual air temperature when the humidity is relatively high. The apparent temperature then measures the increased physiological heat stress and discomfort associated with higher than comfortable humidities. The apparent temperature is less than the actual air temperature when the humidity is relatively low and that the apparent temperature indicates the reduced stress and increased comfort associated with the higher rate of evaporative cooling of the skin.

Apparent temperatures greater than 80 degrees F (27 degrees C) are likely to produce some discomfort. Values in excess of 105 degrees F (41 degrees C) may be dangerous and even life-threatening, with severe heat exhaustion or heat stroke possible if the exposure is prolonged or physical activity is high. The degree of stress may vary with age, health, and body characteristics.

The apparent temperature does not consider the effects of air movement (wind speed) or exposure to sunshine on the degree of discomfort or stress. The apparent temperature is determined by the following Quasi-empirical equation: Apparent Temperature = 1.03T + T (exp((DP-59)/17)-1)/19-3 where T = Observed Temperature (degree F) DP = Dew Point (degree F)

General Heat Stress Index

Apparent Temperature	Danger Category	Heat Symptoms
80 to 90 degrees F	Caution	Fatigue possible with prolonged exposure and physical activity
90 to 105 degrees F	Extreme Caution	Sunstroke, Heat Cramps, and Heat Exhaustion possible with prolonged exposure and physical activity
105 to 130 degrees F	Danger	Sunstroke, Heat Cramps, and Heat Exhaustion likely. Heat Stroke possible with prolonged exposure and physical activity
greater than 130 degrees F	Extreme Danger	Heat Stroke or Sunstroke imminent

Approaching Severe Levels: A thunderstorm which contains winds of 35 to 49 knots (40 to 57 mph), or hail 1/2 inch or larger but less than 3/4 inch in diameter. See ***Severe Thunderstorm***.

Apogee: The farthest distance between the moon and earth or the earth and sun.

Aquiclude: A formation which contains water but cannot transmit it rapidly enough to furnish a significant supply to a well or spring.

Aquifer: Permeable layers of underground rock, or sand that hold or transmit groundwater below the water table that will yield water to a well in sufficient quantities to produce water for beneficial use.

Aquifuge: A geologic formation which has no interconnected openings and cannot hold or transmit water.

Arch Dam: A concrete arch dam is used in sites where the ratio of width between abutments to height is not great and where the foundation at the abutments is solid rock capable of resisting great forces. The arch provides resistance to movement. When combined with the weight of concrete (arch-gravity dam), both the weight and shape of the structure provide great resistance to the pressure of water.

Arcus (Arc Cloud): A dense, arched-shaped, menacing-looking accessory cloud to a cumulonimbus that can occur along the leading edge of a thunderstorm's gust front as the consequence of uplift of stable warm air. Same as a ***shelf cloud***.

Area Forecast Discussion (AFD): This National Weather Service product is almost identical to the ***State Forecast Discussion***; however, it deals with a much smaller area (just the county warning area of the NWFO), and it may or may not have the non-convective watches listed at the end of the product. Eventually, this product will replace the ***State Forecast Discussion***.

Area of Influence: The area covered by the drawdown curves of a given pumping well or combination of wells at a particular time.

Area-Capacity Curve: A graph showing the relation between the surface area of the water in a reservoir, the corresponding volume, and elevation.

Area Wide Hydrologic Prediction System (AWHPS): A computer system which automatically ingests areal flash flood guidance values and WSR-88D products and displays this data and other hydrologic information on a map background.

Arid: An adjunctive applied to regions where precipitation is so deficient in quantity, or occurs at such times, that agriculture is impracticable without irrigation.

Arroyo: A water-carved channel or gully in arid country, usually rather small with steep banks, dry most of the time, due to infrequent rainfall and the shallowness of the cut which does not penetrate below the level of permanent ground water.

Artesian Well: A well drilled into a confined aquifer with enough hydraulic pressure for the water to flow to the surface without pumping. Also called a flowing well.

Artificial Control: A weir or other man-made structure which serves as the control for a stream-gaging station.

ASAP: AHOS SHEF Automatic Processing System

ASAPTRAN: The software component of ***ASAP***.

Ascope: A deflection-modulated display in which the vertical deflection is proportional to target echo strength and the horizontal coordinate is proportional to range.

ASOS: An acronym for Automated Surface Observing System. See ***Automated Surface Observing System***.

Astraphobia: The fear of thunder and lightning. See ***Astrapophobia, Brontophobia, Ceraunophobia, Keraunophobia,*** and ***Tonitrophobia***

Astrapophobia: The fear of thunder and lightning. See ***Astraphobia, Brontophobia, Ceraunophobia, Keraunophobia,*** and ***Tonitrophobia***

ATAD: An acronym for Automated Telephone Answering Device. A recorded telephone message giving current and forecast weather information.

Atmospheric Pressure: The pressure exerted by the atmosphere at a given point.

Atmospheric Pressure (Air Pressure): The weight of air pushing down on a unit area of a planet's surface.

Attenuation: a) **Radar definition:** It refers to the reduction of the radar beam power due to the reflection or absorption of energy when it strikes a target. The greatest attenuation occurs when the radar beam goes through very heavy rain. b) **Hydrological definition:** The process where the flood crest is reduced as it progresses downstream.

ATTM: An acronym for "at this time".

Aurora: A glowing light display in the nighttime sky cause by excited gases in the upper atmosphere giving off light. In the Northern Hemisphere, it is called the *aurora borealis* (northern lights). In the Southern Hemisphere, it is called *aurora australis* (southern lights).

Auroraphobia: The fear of the ***Northern Lights***.

Autocorrelation: A measure of similarity between displaced and undisplaced (in time, space, etc.) versions of the same function.

Automated Event-Reporting Gage: River stage gages, IFLOWS pressure transducer type gages can be programmed to report if water surface rises or falls by a predetermined amount. See ***Tipping Bucket Rain Gage***.

Automated Local Evaluation in Real Time (ALERT): A local flood warning system where river and rainfall data area collected via radio signals in real-time at an ALERT base station.

Automatic Gain Control (AGC): Any method of automatically controlling the gain of a receiver, particularly one that holds the output level constant regardless of the input level.

Automatic Radio Theodolite Master Control Unit (ART): This unit is used to automatically track radiosondes.

Automatic Surface Observing System (ASOS): The ASOS program is a joint effort of the National Weather Service (NWS), the Federal Aviation Administration (FAA), and the Department of Defense (DOD). When installation is completed in the mid-1990s, the ASOS systems will serve as the nation's primary surface weather observing network. ASOS is designed to support weather forecast activities and aviation operations and, at the same time, support the needs of the meteorological, hydrological, and climatological research communities.

Automated Tone Dial Telephone Data Collection System (ATDTDCS): Data collection system where cooperative observers collect precipitation, stage, and temperature data then transmit the data to the NWS ATDTDCS computer through the telephone lines. The ATDTDCS computer transmits the data to AFOS.

Avalanche: A mass of snow, rock, and/or ice falling down a mountain or incline. In practice, it usually refers to the snow avalanche. In the United States, the term snow slide is commonly used to mean a snow avalanche.

Avalanche Advisory: A preliminary notification that conditions may be favorable for the development of avalanches in mountain regions.

Average Power: Pulsed radars transmit over a very low duty cycle; i.e., many intense but short and widely separated pulses. The average power is a radar's peak power "its PRF" its pulse length (duration).

Aviation Area Forecast (FA): This NWS aviation product is a forecast of Visual Flight Rules (VFR) clouds and weather conditions over an area as large as the size of several states. It must be used in conjunction with the Airmet Sierra bulletin for the same area in order to get a complete picture of the weather. The area forecast together with the Airmet Sierra bulletin are used to determine forecast enroute weather and to interpolate conditions at airports which do not have terminal forecasts (FT's) issued. A map displaying the domestic FA areas is available by clicking here (approx. 50k file). FAs are issued 3 times a day by the Aviation Weather Center in Kansas City for each of 6 areas in the contiguous 48 states. In Alaska, FAs are issued by the Weather Service Forecast Office (WSFO's) in Anchorage, Fairbanks, and Juneau for their respective areas (Alaska map ~50k). The WSFO in Honolulu issues FAs for Hawaii (Hawaii map ~50k).

Each FA consists of a 12 hour forecast plus a 6 hour outlook. All times are Coordinated Universal Time (UTC). All distances except visibility are in nautical miles. Visibility is in statute miles.

The FA consists of a:

1) synopsis section which is a brief summary of the location and movement of fronts, pressure system, and circulation patterns for an 18 hour period.

2) VFR clouds and weather section which is a 12 hour forecast, in broad terms, of clouds and weather significant to flight operations plus a 6 hour categorical outlook. This section is usually several paragraphs. Airmet Sierra supplies information regarding Instrument Flight Rule (IFR) conditions. The breakdown may be by states, by well known geographical areas, or in reference to location and movement of a pressure system or front. A categorical outlook, identified by OTLK, is included for each area breakdown.

Amendments to the FA are issued as needed. An amended FA is identified by: AMD

a Corrected FA by: COR

and a delayed FA is identified by: RTD

Aviation Low Level Significant Weather Forecasts: A low-level graphics product is a forecast of aviation weather hazards, primarily intended to be used as a guidance product for briefing the VFR pilot. The forecast domain covers the 48 contiguous states, southern Canada and the coastal waters for flight levels below 24,000 ft. Each chart is a four panel product. The upper two panels depict freezing levels, turbulence, and a depiction of low cloud ceilings and/or restrictions to visibility (shown as contoured areas of MVFR and IFR conditions). The lower two panels, provided by NCEP/HPC, consist of graphical displays of the fronts and precipitation areas. Low altitude Significant Weather charts are issued four times daily and are valid at specific fixed times: 0000, 0600, 1200, and 1800 UTC. Each chart is divided on the left an right into 12 and 24 hour forecast intervals (based on the current ETA model available).

Aviation High Altitude Significant Weather Forecasts: In accordance with the World Meteorological Organization (WMO) and the World Area Forecast System (WAFS) of the International Civil Aviation Organization (ICAO) high altitude Significant Weather (SIGWX) forecasts are provided for the en-route portion of international civil aeronautical operations. The AWC fulfills the role of the Washington Regional Area Forecast Center (RAFC) by providing a suite of SIGWX forecast products. These products are used directly by airline dispatchers for flight planning and weather briefing before departure, and by flight crew members during the flight.

High altitude SIGWX charts are valid at specific fixed times: 0000, 0600, 1200, and 1800 UTC. They show significant en-route weather phenomena over a range of flight levels from 250 to 600, and associated surface weather features. The significant weather elements are defined by WMO and ICAO, and include:

thunderstorms and cumulonimbus clouds
tropical cyclones
severe squall lines
moderate or severe turbulence
moderate or severe icing
widespread sand storms and dust storms
well-defined surface convergence zones
surface fronts with speed and direction of movement
tropopause heights
jetstreams
volcanic eruptions

AViatioN model (AVN): One of the operational forecast models run at NCEP. The AVN is run four times daily, at 0000, 0600, 1200, and 1800 GMT. As of fall 1996, forecast output was available operationally out to 72 hours only from the 0000 and 1200 runs. At 0600 and 1800, the model is run only out to 54 hours. It is one of the oldest operational models used by forecasters. The AVN model was developed primarily to aid in forecasting for aviation. The AVN gives short range forecasts like the NGM and ETA models do, but it also forecasts well into the medium range with forecasts up to 72 hours into the future. The resolution of the AVN model is about 100 km, which is not as good as the NGM or ETA models, but it still provides valuable insight into the future state of the atmosphere. The AVN also has its own set of statistical equations that use the AVN model output. The output from the AVN statistical equations is known as AVN MOS or FAN Guidance.

Aviation Weather Center (AWC): One of the National Centers for Environmental Prediction. The Aviation Weather Center (AWC), located in Kansas City, Mo., enhances aviation safety by issuing accurate warnings, forecasts and analyses of hazardous weather for aviation interests. The Center identifies existing or imminent weather hazards to aircraft in flight and creates warnings for transmission to the aviation community. The Center also orginates operational forecasts of weather conditions that will affect domestic and international aviation interests out to two days. The Center collaborates with universities, governmental research laboratories, Federal Aviation Administration facilities, international meteorological watch offices and other National Weather Service components to maintain a leading edge in aviation meteorology hazards training, operations and forecast techniques development. These functions were formerly handled by three collaborating National Weather Service offices.

Warnings of flight hazards, such as turbulence, icing, low clouds and reduced visibility remain most critical for the protection of life and property over the United States from the earth's surface up to 24,000 feet. Above 24,000 feet, the AWC provides warnings of dangerous wind shear, thunderstorms, turbulence, icing and volcanic ash for the Northern Hemisphere from the middle of the Pacific Ocean eastward to the middle of the Atlantic Ocean. Additionally, above 24,000 feet, the AWC forecasts jet stream cores, thunderstorms, turbulence and fronts for the Northern Hemisphere from the east coast of Asia eastward to the west coast of Europe and Africa. Through international agreement, the Center also has responsibility to back up other World Area Forecast Centers with aviation products distributed through the World Area Forecast System.

The AWC supports requirements for products and services established by national and international

agreements. The Center coordinates closely with the aviation community to identify new standards which support national requirements of the Federal Aviation Administration and international requirements of the International Civil Aviation Organization. An Experimental Forecast Facility funded by the Federal Aviation Administration and located at the AWC brings new techniques for identifying aviation hazards into operational forefront.

The Center trains forecasters in the latest meteorological theories, develops and improves forecast techniques and evaluates data source and technology. Operational support within the AWC includes 24-hour on-call problem identification and resolution services and electronic and workstation support. This internal support is in part an extension of the NCEP Central Operations.

AWIPS: An acronym for Advanced Weather Interactive Processing System. This system is replacing Automation of Field Operations and Services (AFOS). This system allows the operator to overlay meteorological data from a variety of sources.

AWOS: An acronym for Automated Weather Observation System.

Azimuth: A direction in terms of a 360º compass. North is at 0º. East is at 90º. South is at 180º. West is at 270º.

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National Weather Service

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City, St | Go

NOAA Issues Draft Policy to Foster "Fair Weather" Partnerships

The National Oceanic and Atmospheric Administration (NOAA) is requesting public comment on a newly drafted policy governing NOAA's National Weather Service interactions and cooperation with the greater consortium of public, private and academic weather and climate institutions. Details...

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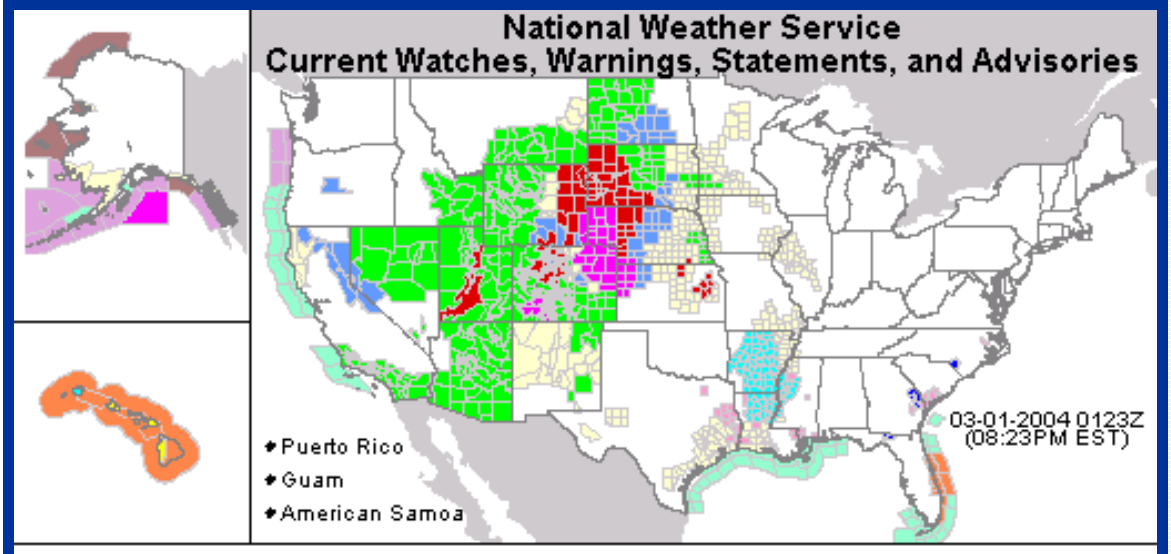
Warnings By State

Click On Map Below To Zoom In.



Blizzard Warning	Special Weather Statement
Severe Thunderstorm Warning	Hazardous Weather Outlook
Heavy Snow Warning	Gale Warning
Winter Storm Warning	High Surf Advisory
Flood Warning	Small Craft Advisory
Avalanche Warning	Short Term Forecast
Winter Storm Watch	
Snow Advisory	
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Flood Statement	

24 Hour Loop | 12 hour Loop

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National Weather Service
1325 East West Highway
Silver Spring, MD 20910

Page last modified: 23 Feb 2004 07:00 EST (News/maps updated more often)

Page Author: NWS Internet Services Team

National Oceanic and Atmospheric Administration

Site Index

Home Page Menu

Site Map

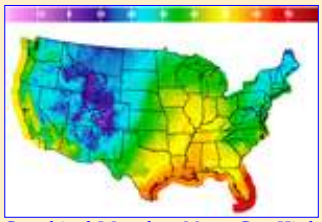
(includes pull-down menu text)

Today's Weather

Your Local Forecast by City, State

Go

Current Watches/Warnings



Graphical Weather Map: Get High and Low Temperatures and More

STORM WATCH

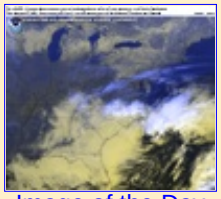


Image of the Day

About NOAA

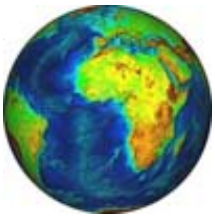
Top Story

NOAA RELEASES NEW MANUAL ON COASTAL HABITAT RESTORATION MONITORING

For the first time, NOAA compiled key restoration monitoring information applicable to coastal habitats nationwide. "Science-Based Restoration Monitoring of Coastal Habitats, Volume One: A Framework for Monitoring Plans Under the Estuaries and Clean Waters Act of 2000 (Public Law 160-457)" offers technical assistance, outlines steps, and provides useful tools for developing and carrying out monitoring of coastal restoration efforts. Prepared by the NOAA National Centers for Coastal Ocean Science, the manual offers coastal resource managers, practitioners and the public a consolidated set of science-based tools for planning and conducting monitoring associated with restoration in habitats throughout U.S. coastal waters habitats.

Full Story Inside

Other News



EARTH OBSERVATION SYSTEM MOVES FORWARD WITH WORKING GROUP MEETING IN SOUTH AFRICA The intergovernmental Group on Earth Observations (GEO) will hold its working meeting this week in Cape Town, South Africa, to continue development of a ten-year plan for an Earth Observation System. Retired Navy Vice Adm. Conrad C. Lautenbacher, Ph.D., undersecretary of commerce for oceans and atmosphere and NOAA administrator, will lead the U.S. delegation.

NOAA SEEKS COMMENT ON PROPOSAL TO LESSEN FISHING IMPACTS ON SEA TURTLES & REOPEN GRAND BANKS TO U.S. PELAGIC LONGLINE FLEET The conclusion of a three-year experiment in the Grand Banks and recent estimates of sea turtle bycatch (unintentional catch) in the Atlantic pelagic longline fishery have prompted NOAA Fisheries to propose mandatory changes in fishing practice for the fleet.

NOAA WEB SITE LETS YOU EXPLORE UNDERSEA VENTS ON SUBMARINE RING OF FIRE; Interactive Site Combines Discovery, Science and Computer Animation Ocean science researchers and explorers have been on NOAA s voyage of discovery to the deep-ocean hydrothermal vents of Magic Mountain, and now you can join them virtually with just a few clicks on your computer.

News Story Archive - Home page stories 1999 - Present

NOAA Magazine - The stories behind the headlines.

AccessNOAA - NOAA Employees Make a Difference

Media Advisories

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"NOAA Administrator's Speeches

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"NOAA Research
"NOAA Marine & Aviation Operations

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"Education and Sustainable Development
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"Science Advisory Board
"Employee Worklife Center

Public Affairs

NOAA Launches Redeveloped Web Site on U.S. Marine Protected Areas

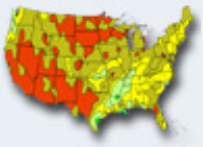
Science, Service, and Stewardship

Weather
Watches, warnings, floods, hurricanes, Weather Radio...

Ocean
Coral reefs, tides, currents, buoys, marine sanctuaries, estuaries, diving, spills

Satellites
Real-time imagery, environmental, geostationary and polar satellites

Fisheries
Protecting marine mammals, sea turtles, habitats, statistics, economics, enforcement



Climate
El Niño & La Niña, global warming, drought, climate prediction, archived weather data, paleoclimatology

Research
Environmental labs, air quality, atmospheric processes, climate and human interactions

Coasts
Coastal services, products, Great Lakes, coastal zone management

Charting & Navigation
Nautical & navigational charts, mapping, remote sensing, safe navigation

Question of the Month
What are coastal wetlands and where are they Located?

NOAA Answers Your Questions
A new Web site to help you find NOAA information.

In the Spotlight

- **Name NOAA s New Ship Contest Closed, Entries Being Evaluated**
- **NOAA Issues Draft Policy to Update Fair Weather Partnerships Public Comments Requested**
- **Economic Statistics for NOAA (PDF)**
- **NOAA 2005 Budget Request "Blue Book" Online**
- **Coastal Zone Management Act Consistency Appeals**
- **NOAA Climate Data at a Glance** - Find 108 years of weather data for the U.S.
- **NOAA Ocean Explorer** - Ocean exploration without getting wet!

Visit the World's only undersea laboratory - NOAA's AQUARIUS habitat.

Anchored off the coast of Florida, AQUARIUS provides divers with a place to work and live.

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"NOAA Background Info
"Public Affairs
"External Affairs
"Story Ideas for Reporters
"Webcasts

Drifting Iceberg

Visit the NOAA Photo Library and view more than 30,000 images.

- **Search & Rescue Satellite-aided Tracking/Emergency Beacon registration** - See how NOAA's SARSAT helps to save mariners, aviators and other people in distress.
- **NOAA Posts Images Online of Northeast Blackout**
- **NOAA Aircraft Takes Dramatic Photos of North Carolina Coast after Hurricane Isabel Unleashed Her Fury**
- **Dept. Of Commerce Millennium Pipeline Company Decision (40-page PDF File)**

FIRSTGOV
The U.S. Government's Official Web Portal

Now Playing

Want to Know About NOAA? You'll need *RealPlayer* to view this streaming video clip. Click here for video text.

NOAA Launches the First of Four Planned NOAA Fisheries Survey Vessels You'll need *RealPlayer* to view this streaming video clip. Read the story.

Publication of the National Oceanic & Atmospheric Administration (NOAA), U.S. Department of Commerce.
Last Updated: February 26, 2004 11:01 AM
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National Weather Service Forecast Office
Detroit/Pontiac

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Recent News

Spotter Schedule

The first class will be held on Monday in Port Huron at 7 PM.
The **2004** schedule for spotter training is available.

Snowfall totals from the February 23rd-24th, 2004, winter storm

Snowfall totals through 7 am February 24th, 2004, are available in graphic and text formats.

Customer Satisfaction Survey

Your National Weather Service office in White Lake is looking for feedback about our website. Please consider taking a quick survey. This survey will provide us with valuable information on how we can improve our site.

Click on the map below for the latest forecast.

Read watches, warnings & advisories

Zoom Out

Hazardous Weather Outlook

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Fire Weather
Weather Planner
Climate
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Education
NOAA Weather Radio
Skywarn
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Weather Now
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Computer Guidance
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Tornado
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@noaa.gov

Last map update: Sun, Feb 29th 2004 at 8:28:06 pm EST

New experimental graphical and digital forecasts: (click on image to enlarge; feedback)

Temperatures:

Temperatures for Tonight	Temperatures for Monday	Temperatures for Monday Night	Temperatures for Tuesday	Temperatures for Tuesday Night
Tonight	Monday	Monday Night	Tuesday	Tuesday Night

Probability of Precipitation:

Probability of Precipitation for Tonight	Probability of Precipitation for Monday	Probability of Precipitation for Monday Night	Probability of Precipitation for Tuesday	Probability of Precipitation for Tuesday Night
Tonight	Monday	Monday Night	Tuesday	Tuesday Night

The following menus will give you quick access to the Weather Now pages and also the latest forecasts for the counties in Southeast Michigan.

Weather Now

Select a page

Go!

Southeast Michigan County Forecasts

Select a county

Go!

National Weather Service
Detroit/Pontiac Forecast Office
9200 White Lake Road

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National Weather Service, Detroit/Pontiac

Welcome to the National Weather Detroit/Pontiac HomePage
One Stop Weather Links for the Great Lakes Region
Current Local Warnings and Severe Weather Statements
Special Weather Statements for the Great Lakes Region
Current Severe Weather Watches
Current Special Marine Warnings and Marine Weather Statements
Current Current Winter Weather Watches/Warnings and Advisories plus Public Information Statements
Current Flood Potential and Flood Watches
Current River Flood Warnings and Statements
Current Local Flash Flood Warnings and Statements
Current River Stages
Current Local Area Forecast Discussions
Current Revised Digital Forecasts (RDF)
State Forecasts, Zone Forecast, and Short-Term Forecasts
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Current Non-Precipitation Weather Products (NPW)
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Revised Digital Forecast Page for Southeast Michigan
Explaination of the Revised Digitial Forecast
Miscellaneous Maps and Summaries
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Climate Summaries Across Michigan
Tables and Record Reports
ANNUAL CLIMATOLOGICAL SUMMARY FOR DETROIT for 2001
Annual Climate Summary for Flint for 2001
Climate Summary Detroit for the year 2000
Climate Summary for Flint for the year 2000
1999fnt
Detroit Annual Summary for 1998
Yearly Summary for Flint for 1998
intranet\climate
climate\dtwtemp1980-2000
climate\dtwtemp1980-2000
dtwsnow1980-2000
fntsnow1980-2000
climate\junetemp
novtemp
yeartemp
janpcpn
aprpcpn

- Detroit Annual Summary for 1998
- Yearly Summary for Flint for 1998
- How To Read Climate Forms
- One of the snowiest Januarys ever in Southeast Lower Michigan
- Record Warmth across Southeast Lower Michigan in 1998

AHPS Data

- Current River Stages
- Text Products
- NWS Detroit/Pontiac Precipitation Page
- AHPS Feedback

Aviations Products and Information

Marine Forecasts and General Information

- Great Lakes Forecasts and Nearshore Forecasts

NOAA Weather Radio

- NOAA Weather Radio Warning Dissemination
- NOAA Weather Radio FAQ

NWS White Lake Skywarn Page

- Tornado Statistics for Southeast Michigan
  - Bay County Tornado Statistics
  - Genesee County Tornado Statistics
  - Huron County Tornado Statistics
  - Lapeer County Tornado Statistics
  - Lenawee County Tornado Statistics
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  - Shiawassee County Tornado Statistics
  - Tuscola County Tornado Statistics
  - Washtenaw County Tornado Statistics
  - Wayne County Tornado Statistics

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THE LEAD STORY

NOAA REPORTS ABOVE-NORMAL ATLANTIC HURRICANE SEASON

Miami, Dec. 1 -- With the 2003 Atlantic hurricane season having officially ended Nov. 30, NOAA hurricane specialists said the above-normal 2003 Atlantic hurricane season produced 14 tropical storms, of which 7 became hurricanes and 3 became major hurricanes (Fabian, Isabel and Kate). Six of the named systems affected the United States, bringing high wind, storm surge or rain.

-- FULL STORY --

WEATHER NEWS IN PICTURES

A lightning bolt slices the night skies above Kuhio Beach in O'ahu, Hawaii. *(Photo courtesy of Bill Stookey.)*

REGIONAL WEATHER NEWS ROUND-UP

Eastern Region

- NWS Scientist From Maryland Receives Award From Governor

Central Region

- Rain, Snow Dominate Central United States

Southern Region

- NEW MARINE-BASED NOAA WEATHER RADIO TRANSMITTER SERVES TAMPA BAY AREA

Western Region

- Olympia Weather Radio Transmitter Shifts To Capitol Peak

Alaska Region

- Alaska Meteorologist Receives Award

Pacific Region

- NWS Dedicates New Building In America Samoa

TODAY'S WEATHER MAP

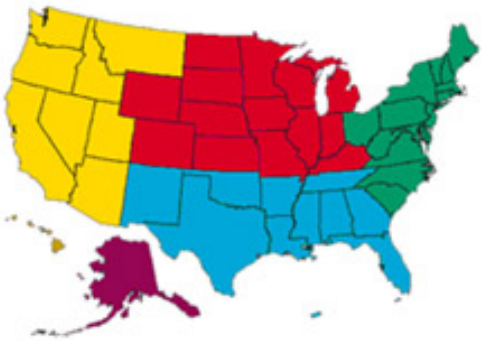
Current Forecast

-- View Full Size Version --

KEY WEB SITE TO WATCH

It's hurricane season and that means NOAA's National Hurricane Center in Miami is once again the focal point for monitoring tropical cyclones that develop in the Atlantic Ocean, Gulf of Mexico and the Pacific Ocean. Keep tabs on all the storms this season.

WEATHER FORECAST OFFICES AROUND THE COUNTRY



View NWS Offices
in your State

For administrative purposes, the NWS divides the United States and its territories into regions. Each region has a headquarters office that oversees the NWS field offices within that region.

Q & A CLOSE-UP

Q&A Close-Up is a series of one-on-one interviews with National Weather Service forecasters about weather events that impact your region and the nation.

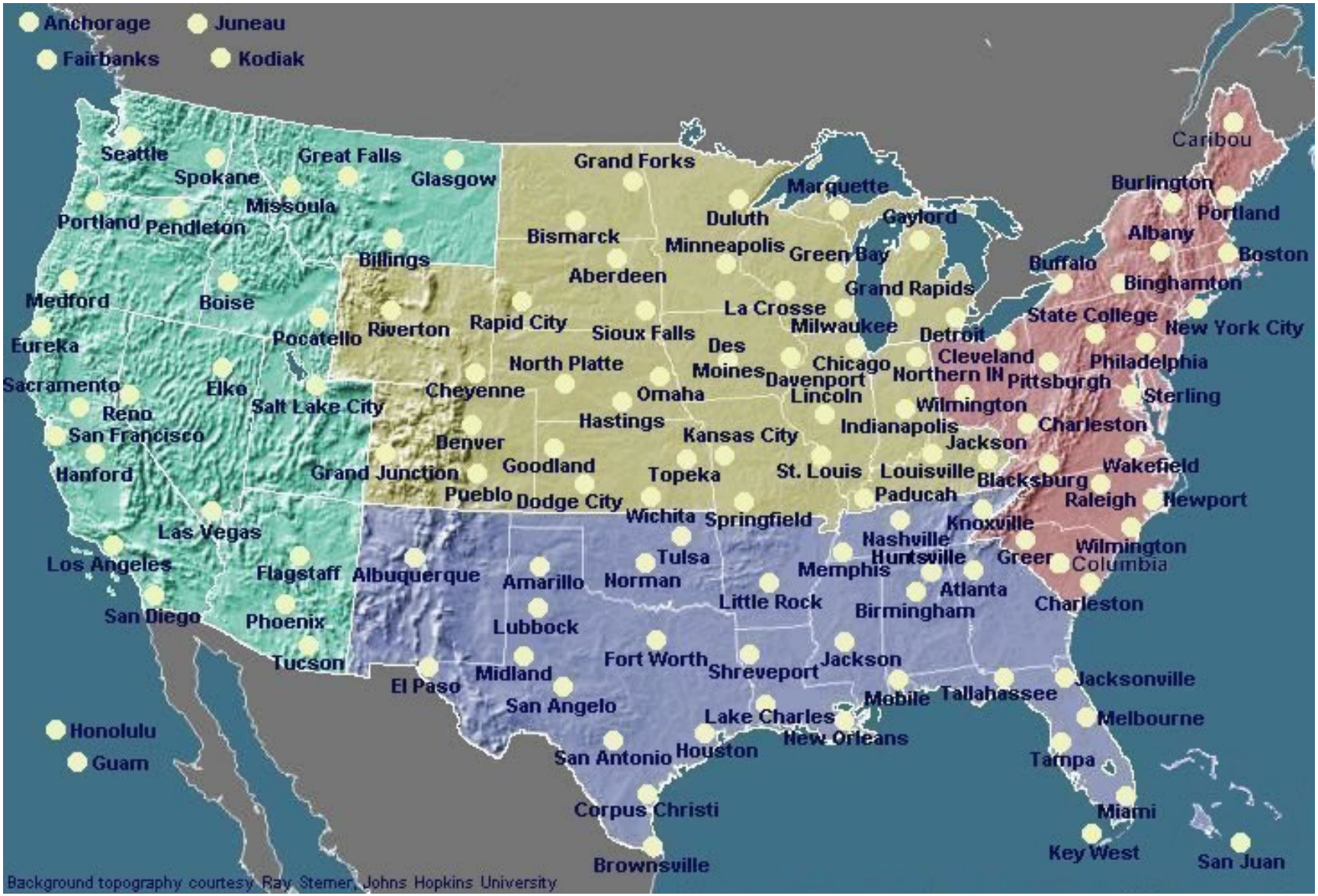
From the unusual to the severe, *Q&A Close-Up* helps explain the weather phenomena that impact the United States.

Our latest Q&A Close-Up segment features an interview with Scott Kiser, the Tropical Cyclone Program Manager at NOAA's National Weather Service headquarters, about the new five-day hurricane forecast for the 2003 hurricane season.

NWS Offices and Forecast Offices

Select appropriate city for forecasts and past weather information

For a summary of current watches, warnings and advisories across the western US,
visit the NWS Western Region Interactive Forecast Map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Newport
Knoxville
Nashville
Huntsville
Greer
Columbia
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Charleston
San Juan
Background topography courtesy Ray Sterner, Johns Hopkins University

Regional Support Centers

Regional Headquarters	Administrative Support Centers
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Central Region Headquarters	Eastern Administrative Support Center
Eastern Region Headquarters	Mountain Administrative Support Center
Pacific Region Headquarters	Western Administrative Support Center
Southern Region Headquarters	
Western Region Headquarters	

River Forecast Centers	Regional Climate Centers
Alaska RFC	Alaska Climate Research Center
Arkansas-Red Basin RFC	High Plains Regional Climate Center
California-Nevada RFC	Midwestern Climate Center
Colorado Basin RFC	Northeast Regional Climate Center
Lower Mississippi RFC	Southeast Regional Climate Center
Middle Atlantic RFC	Southern Regional Climate Center
Missouri River Basin RFC	Western Regional Climate Center
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National Support Centers

NOAA/NWS	National Centers
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NOAA Public Affairs	Climate Diagnostics Center (CDC)
	Climate Prediction Center (CPC)
NWS Headquarters	Environmental Modeling Center (EMC)

NWS Public Affairs

Hydrologic Research Laboratory (HRL)
Hydrometeorological Prediction Center (HPC)
Marine Prediction Center (MPC)
National Climatic Data Center (NCDC)
National Hurricane Center (NHC)
National Severe Storms Laboratory (NSSL)
Space Environment Center (SEC)
Storm Prediction Center (SPC)
Great Lakes Environmental Research Laboratory (GLERL)

NWS Centralized Facilities	NWS Headquarters Offices
Hydrologic Information Center (HIC)	Office of Hydrologic Development (OHD)
National Center for Environmental Prediction (NCEP)	Office of Climate, Water, and Weather Services
National Data Buoy Center (NDBC)	Office of Systems Development (OSD)
National Weather Service Training Center (W/TC)	Office of Operational Systems (OOS)
	Office of Science and Technology (OST)

Other Useful Links

University Corporation for Atmospheric Reasearch (UCAR)
Cooperative Program for Operational Meteorology, Education and Training (COMET)
National Weather Service Employees Organization (NWSEO)
SOO/SAC Homepage
Emergency Managers Weather Information Network (EMWIN)

Severe Weather Information

Watches/warnings | Statements | Convective Outlooks | Severe Weather Summaries

Source one

These are from Weather Now. Severe weather watches and warnings for the Great Lakes region.

Source two (from IWIN)

- All Watches/Warnings for Michigan. *(this includes Winter Storm Watches)*
- Severe Thunderstorm Warnings for the state of Michigan.
- Tornado Warnings for the state of Michigan.
- Special Marine Warnings issued by NWS Offices in Michigan.
- Flash Flood Warnings/Statements for the state of Michigan.
- Flood Warnings/Statements for the state of Michigan.
- Non Precipitation Warnings/Advisories for the state of Michigan. This may include... Frost/Freeze Advisories, Dense Fog Advisories, Excessive Heat Advisories, and High Wind Advisories.

Special Weather Statements issued by the Detroit/Pontiac, Grand Rapids, Gaylord, and Marquette NWS Offices for the state of Michigan. This includes the SEVERE WEATHER POTENTIAL Statements whenever thunderstorms are in the forecast between April 1st and September 15th.

- Latest Day 1 Convective Outlook
- Latest Day 2 Convective Outlook
- Latest Day 3 Convective Outlook
- Mesoscale Discussions
- Tornado and Severe Thunderstorm Watches from SPC.

Severe weather statistics for southeast Michigan (1995-2001)

Southeast Michigan Storm Data (all files in PDF format)

1997 1998 1999 2000

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- Storm Ready
- Education
- NOAA Weather Radio
- Skywarn

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Tornado

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Severe Weather Outlook

Severe Weather Potential graphic

Experimental graphic
Image last updated:
3:55 pm Sun Feb 29, 2004

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Weather Planner
Climate
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Climate Prediction

HAZARDOUS WEATHER OUTLOOK

NATIONAL WEATHER SERVICE DETROIT/PONTIAC MI

335 PM EST SUN FEB 29 2004

MIZ047>049-053>055-060>063-068>070-075-076-082-083-011200-
BAY-GENESEE-HURON-LAPEER-LENAWEE-LIVINGSTON-MACOMB-MIDLAND-MONROE-
OAKLAND-SAGINAW-SANILAC-SHIAWASSEE-ST. CLAIR-TUSCOLA-WASHTENAW-WAYNE-
335 PM EST SUN FEB 29 2004

THIS HAZARDOUS WEATHER OUTLOOK IS FOR SOUTHEAST LOWER MICHIGAN

.DAY ONE...TODAY AND TONIGHT

NO HAZARDOUS WEATHER IS EXPECTED AT THIS TIME.

.DAYS TWO THROUGH SEVEN...MONDAY THROUGH SATURDAY

THERE IS A CHANCE OF THUNDERSTORMS MONDAY AFTERNOON AND EVENING.
HOWEVER...THESE THUNDERSTORMS ARE NOT EXPECTED TO BE SEVERE AT THIS
TIME. LOW PRESSURE WILL TRACK NORTHEAST FROM THE CENTRAL PLAINS TO
THE WESTERN GREAT LAKES ON MONDAY...BRINGING SOMEWHAT UNSTABLE AIR
INTO THE REGION.

RAIN WILL RETURN TO THE AREA ON THURSDAY...AS ANOTHER STRONG STORM
SYSTEM TRACKS INTO THE REGION...THIS TIME FROM THE SOUTHERN PLAINS.
AT THIS TIME...IT APPEARS THAT HEAVY RAIN WILL BE POSSIBLE WITH THIS

Weather Safety
Storm Ready
Education
NOAA Weather Radio
Skywarn
Miscellaneous
Weather Now
Wireless Forecasts
Computer Guidance
Weather Stories
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Weather Links
Weather Glossary
Our Office
1953 Beecher
Tornado
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STORM...BRINGING AT LEAST THE POTENTIAL FOR SOME MINOR FLOODING TO THE AREA. SNOW MELT WILL CONTRIBUTE TO THIS POTENTIAL...ESPECIALLY TO THE NORTH OF I 69...WHERE THE GREATEST SNOW PACK REMAINS.

THERE IS ALSO THE POTENTIAL FOR SOME ACCUMULATING SNOW LATE THURSDAY NIGHT INTO FRIDAY BEFORE THE PRECIPITATION ENDS. HOWEVER...AT THIS TIME...IT IS TOO EARLY TO SAY WITH ANY CONFIDENCE WHETHER ENOUGH COLD AIR WILL BE IN PLACE TO CHANGE THE RAIN TO SNOW FAST ENOUGH FOR THIS ACCUMULATION TO OCCUR. THOSE WITH PLANS FOR FRIDAY SHOULD KEEP UP TO DATE ON THE LATEST FORECASTS CONCERNING THIS STORM SYSTEM.

.SPOTTER INFORMATION STATEMENT...

SPOTTER ACTIVATION IS NOT ANTICIPATED.

$$

GURNEY

National Weather Service
Detroit/Pontiac Forecast Office
9200 White Lake Road
White Lake, MI 48386
Email: w-dtx.webmaster@noaa.gov
Page last modified: December 04, 2003

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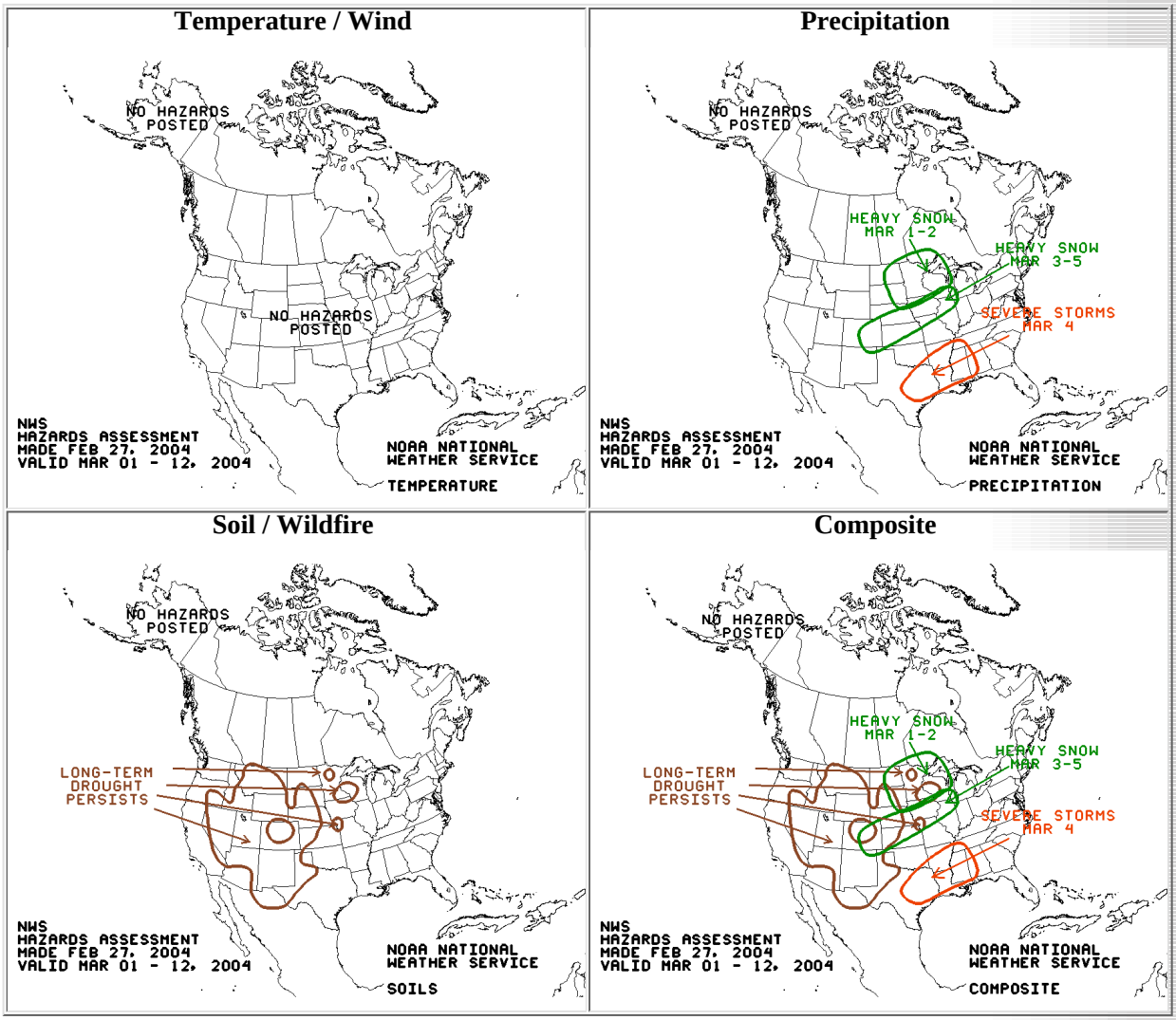
U.S. Hazards Assessment



Valid Monday, Mar 1 - Friday, Mar 12, 2004

Summary of Forecasts & Hazards

Click below for discussions of forecasts			
LONG-RANGE	11-14 DAYS	6-10 DAYS	3-5 DAYS

SYNOPSIS: The weather for the Lower 48 during this Assessment period is to be dominated by two strong upper-level troughs in the southern stream moving across the country from west to east. The first one will be in the southern Plains at the beginning of the Assessment period and bring with it unsettled weather from the Gulf Coast to the Great Lakes. As this trough weakens and moves northeast into Canada, another piece of energy is expected to dig down along the West Coast and amplify in the Southwest. Depending upon the amplitude of this trough, another round of unsettled weather could be in store for parts of the central and southern Plains, as well as the Mississippi Valley. With the troughs amplified the most in the Southwest, below normal temperatures can be expected for the Rockies, Intermountain West, and the Southwest, while the rest of the country experiences near or slightly above normal temperatures.

HAZARDS

- Heavy snow is expected to develop from the central Great Plains to the upper Midwest Mar 1-2.

- Heavy snow is again expected to develop from parts of the Southwest into the central Great Plains and Great Lakes from Mar 3-5.

- Severe storms are expected for parts of the southern Plains into the Lower and Middle Mississippi Valley on Mar 4.

- Most of the long-term drought areas depicted on the main graphic are expected to persist, although several areas, Arizona and the central Plains in particular, are expected to receive significant precipitation during this period.

DETAILED SUMMARY

For Monday Mar 1 - Wednesday Mar 3, 2004: A surface low is expected to be located over the central Plains at the beginning of this forecast period and move northeast towards the western Great Lakes. Moist flow ascending over this low's warm front will produce heavy overrunning precipitation in parts of the northern Plains and Upper Midwest. This precipitation might start out as a period of rain in some places, but is expectesd to quickly change over to snow as colder air is ushered in as heights lower and winds shift to a northerly direction. In the warm sector of this system, some isolated severe storms might occur along the Gulf Coast, however, no widespread severe weather outbreak is expected.

For Thursday Mar 4 - Friday Mar 12, 2004: As this low moves into southeastern Canada, another one is expected to form in southern Texas in association with a new upper-level trough. The chance for severe storms is renewed in parts of the southern Plains, and the Lower and Middle Mississippi Valley with strong, moist flow out ahead of the system. In addition, more heavy snow is possible along the northern edge of the storm's precipitation shield from the Southwest, to the Plains and eventually the Great Lakes. There are some models that are predicting this low to be more progressive and move to the east quicker than in previous model runs. If this more progressive track occurs, there will not be as much snow, as significant cold air will not be able to move southward. In addition, severe weather potential would be limited as the amount of low-level inflow and upper-level divergence would not be sufficent for severe storm generation. At this time, however, current thinking is to favor a more amplified upper-level trough. The rest of the forecast period is expected to remain active with the possibility of more storms affecting the Plains and eastern states.

Please consult local NWS Forecast Offices for short range forecasts and region-specific information.

NOAA/ National Weather Service
National Centers for Environmental Prediction
Climate Prediction Center
5200 Auth Road
Camp Springs, Maryland 20746
Climate Prediction Center Web Team
Page last modified: December 18, 2003

Severe Weather Reporting Form

Local forecast by "City, St" or Zip Code
Search by city or zip code. Press enter or select the go button to submit request | Go

Current Hazards
- Watches / Warnings / Advisories
- Local Outlook
- National Outlook
- Submit a Report

Current Conditions
- Observations
- Satellite Images
- Rivers & Lakes AHPS

Radar Imagery
- Detroit Radar
- Nationwide

Forecasts
- Text Forecasts
- Graphical
- Aviation
- Marine
- Fire Weather
- Weather Planner

Climate
- Local Climate
- Climate Prediction

We welcome reports of severe weather if they occur in our **County Warning Area (CWA)**. Our CWA includes the following counties in Southeast Lower Michigan...

Midland, Bay, Huron, Saginaw, Tuscola, Sanilac, Shiawassee, Genesee, Lapeer, St. Clair, Livingston, Oakland, Macomb, Washtenaw, Wayne, Lenawee, and Monroe

In addition, please do not submit a report unless it meets at least one of the following criteria:

- **Total snowfall of 2 inches or more per 12 hours**
- **Ice accumulation due to freezing rain or freezing drizzle**
- **Total rainfall of 1/2 inch or more for an event**
- **Hail 3/4 of an inch or greater (*Dime size or greater*)**
- **Wind gusts of 40 mph or greater (*please indicate whether winds were measured or estimated*)**
- **Tornado**
- **Waterspout**
- **Ice jams and flooding of rivers or streams**
- **Weather related damage to buildings, trees, or vehicles**

From (*your name*):

From (*your e-mail address*):

Subject: Southeast Lower Michigan Spotter Report

Only submit reports for events which occurred within our county warning area of *Southeast Lower Michigan*.

Please provide us with the following information:

- **The date and time of the event**
- **The location of the event** (*including the county, city/town, and street if possible*)
- **Your phone number** (*this will be helpful in case we need to contact you to verify the report or obtain additional information*)
- **A complete description of the event**

Date of the event:

Weather Safety
Storm Ready
Education
NOAA Weather Radio
Skywarn
Miscellaneous
Weather Now
Wireless Forecasts
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Weather Stories
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Weather Glossary
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@noaa.gov

Time of the event:

Location (town & county):

Phone number:

Please enter your description of the event in the box below.
When finished, click on **Submit Report**.

Submit Report | Reset Form

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Miscellaneous Maps and Summaries

Current Conditions | Snow Data |

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The latest Ultraviolet Index Forecast
- Text
- Graphic

Hourly State Weather Roundup

Michigan | Ohio | Indiana | Illinois | Wisconsin | Minnesota | Alaskan Regional Weather Roundup

Current Weather Around Southeast Lower Michigan

Saginaw	Bad Axe	Flint
Port Huron	Howell	Pontiac
Mt Clemens	Ann Arbor	Ypsilanti
Adrian	Detroit City Airport	Monroe
Detroit Metro	Grosse Ile	Lambertville

Latest snowfall and snow depth charts available by state (snowfall available in 1, 2, 3, and 7 day time periods)

Wind Chill Chart

Miscellaneous Maps and Summaries
- Drought Severity Index. This is called the Palmer Index.
- Crop Moisture
- Temperature and Precipitation Maps. These maps shows values for the past 7 and 30 days and departure from normal.

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- Climate Summaries for numerous stations in Michigan. These tables give means and extremes of temperatures and precipitation, plus heating and cooling degree days.

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Satellite Images

The Global Hydrology and Climate Center has a nice Satellite page. It allows you to zoom in to areas of interest and also add county outlines to the picture.

The following satellite images are courtesy of NOAA's Geostationary Satellite Browse Server (GSBS)

GOES 8 satellite images centered on the Great Lakes

Infrared Visible

GOES 8 Eastern U.S. Sector	GOES 10 Western U.S. Sector	GOES 8 and 10 Hemisphere Composite	GOES 8 Hurricane Tracking Sector
Infrared	Infrared	Infrared	Infrared
Visible	Visible	Visible	Visible
Water Vapor	Water Vapor	Water Vapor	Water Vapor

The Forecast Products Development Team from the Office of Research and Application (ORA) of NESDIS is producing some experimental Satellite products. Among these are images for:

- Microbursts
- Fog/Low Clouds
- Aircraft Icing

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Note: The NWS provides links to certain external Web pages because they may contain related information of interest to you. These links do not constitute an endorsement by the NWS of any information, products or services on those external Web sites.

www.nws.noaa.gov

Search Enter Search Here Go

Weather Forecast Office Detroit/Pontiac, MI

Local weather forecast by "City, ST"

Search by city or zip code. Press enter or select the go button to submit request

City, ST Go

National Conditions
- Rivers
- Satellite
- Climate

Local Conditions
- Warnings
- Weather Forecast
- Radar

What is AHPS?
- Facts
- Our Partners

Click on a point or river on the map **or** select from the menus below.

-- Tittabawassee River --
-- Pine River --
-- Saginaw River --
-- Salt River --
-- Chippewa River --
-- Cass River --
-- Shiawassee River --
-- Flint River --
-- S. Br. Flint River --
-- Kearsley Creek --
-- Thread Creek --
-- Swartz Creek --
-- N. Br. Clinton River --
-- Clinton River --

How are we doing?
Feedback

-- Rouge River --
-- Upper Rouge --
-- Middle Rouge --
-- Lower Rouge --
-- Huron River --
-- Saline River --
-- River Raisin --

Map Legend

- or **at or above Flood Stage**
- or **high water, below Flood Stage**
- or **below Flood Stage**
- or **observation more than 12 hours old**
- or **neighboring area point**

A square indicates that hydrograph information is available

A circle indicates that both probability and hydrograph information are available

Current Flood Status (tabular listing)

Hydrologic Resources

- Text Products
- Past Precipitation
- Forecast Precipitation
- River Forecast Centers
- About AHPS
- AHPS Feedback

Additional Resources

- National Significant River Flood Outlook

The National Weather Service prepares its forecasts and other services in collaboration with agencies like the US Geological Survey, US Bureau of Reclamation, US Army Corps of Engineers, Natural Resource Conservation Service, National Park Service, ALERT Users Group, Bureau of Indian Affairs, and many state and local emergency managers across the country. For details, please click here.

National Weather Service
Detroit/Pontiac Forecast Office
9200 White Lake Road
White Lake, MI 48386
w-dtx.webmaster@noaa.gov

This page dynamically generated at 01:29 GMT March 1, 2004.

National Weather Service Radar Image

Detroit, MI Radar.

Short Range Base Reflectivity Local forecast by "City, St" or zip code

Search by city or zip code. Press enter or select the go button to submit request

City, St Go

Adjacent Radars

DTX

Base Reflectivity
- Short Range Loop
- Long Range Loop

Composite Reflectivity
- Short Range Loop
- Long Range Loop

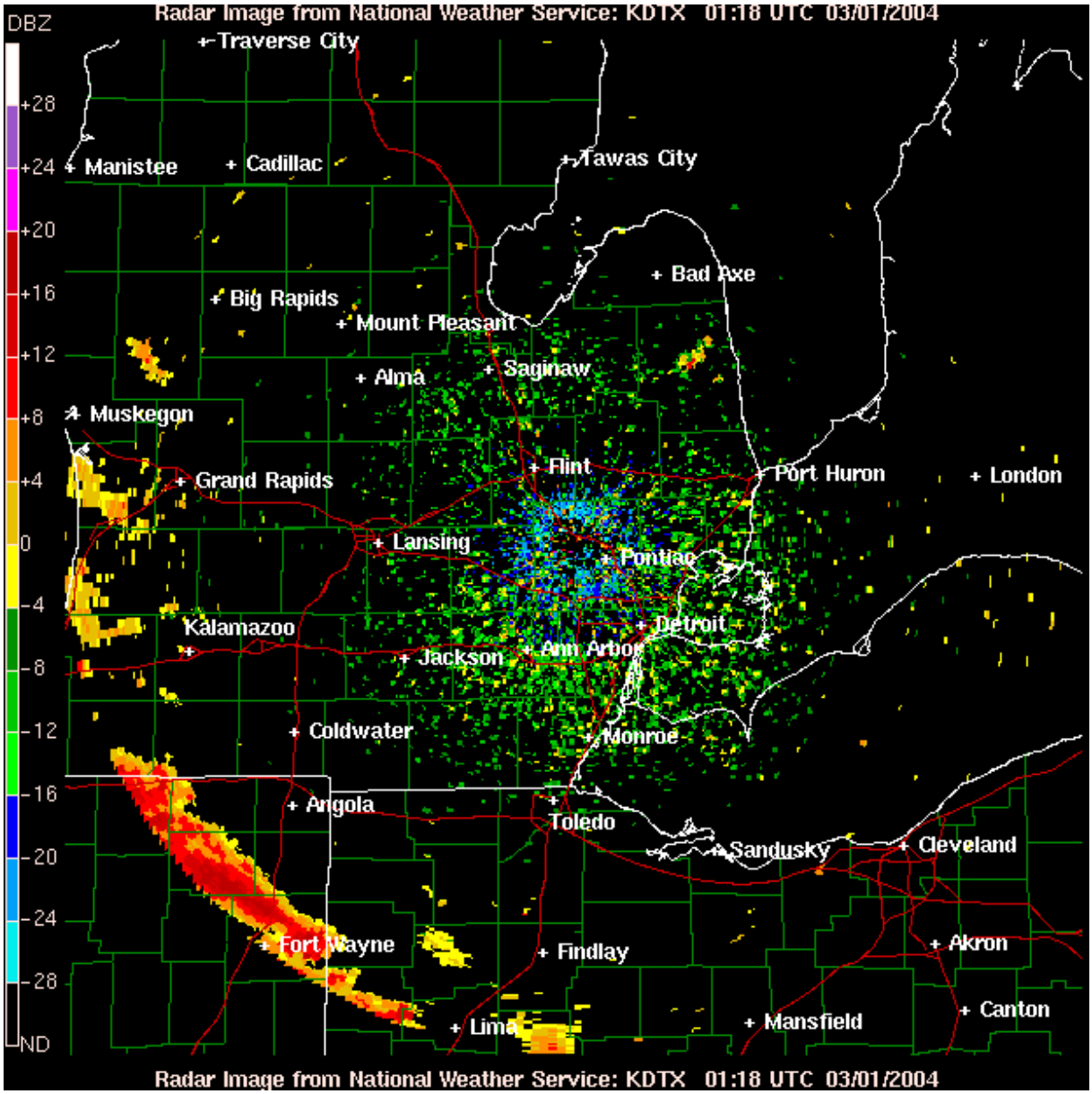
Rainfall
- 1-Hour Total Loop
- Storm Total Loop

U.S. Views
- National Loop
- Alaska Loop
- Hawaii Loop
- Guam Loop
- Puerto Rico Loop
- Radars by State

Additional Links
- Radar Information
- Credits
- Disclaimer

Detroit, MI Homepage

08:18 PM EST Sun Feb 29th 2004



Time and date in red indicates image is at least one hour old.
Java and Javascript must be enabled for looping.

National Weather Service, NOAA
1325 East-West Highway
Silver Spring, MD 20910

Page Authors: Dennis R. Cain and Paul D. Kirkwood
Last Modified: January 21, 2003
Southern Region Headquarters

National Weather Service Radar Image

National Doppler Radar.

To view a local radar, select area of interest and click on the image below.

Local forecast by "City, St"or zip code

Search by city or zip code. Press enter or select the go button to submit request

City, St Go

Additional Views

National	Loop
Alaska	Loop
Hawaii	Loop
Guam	Loop
Puerto Rico	Loop

Additional Links

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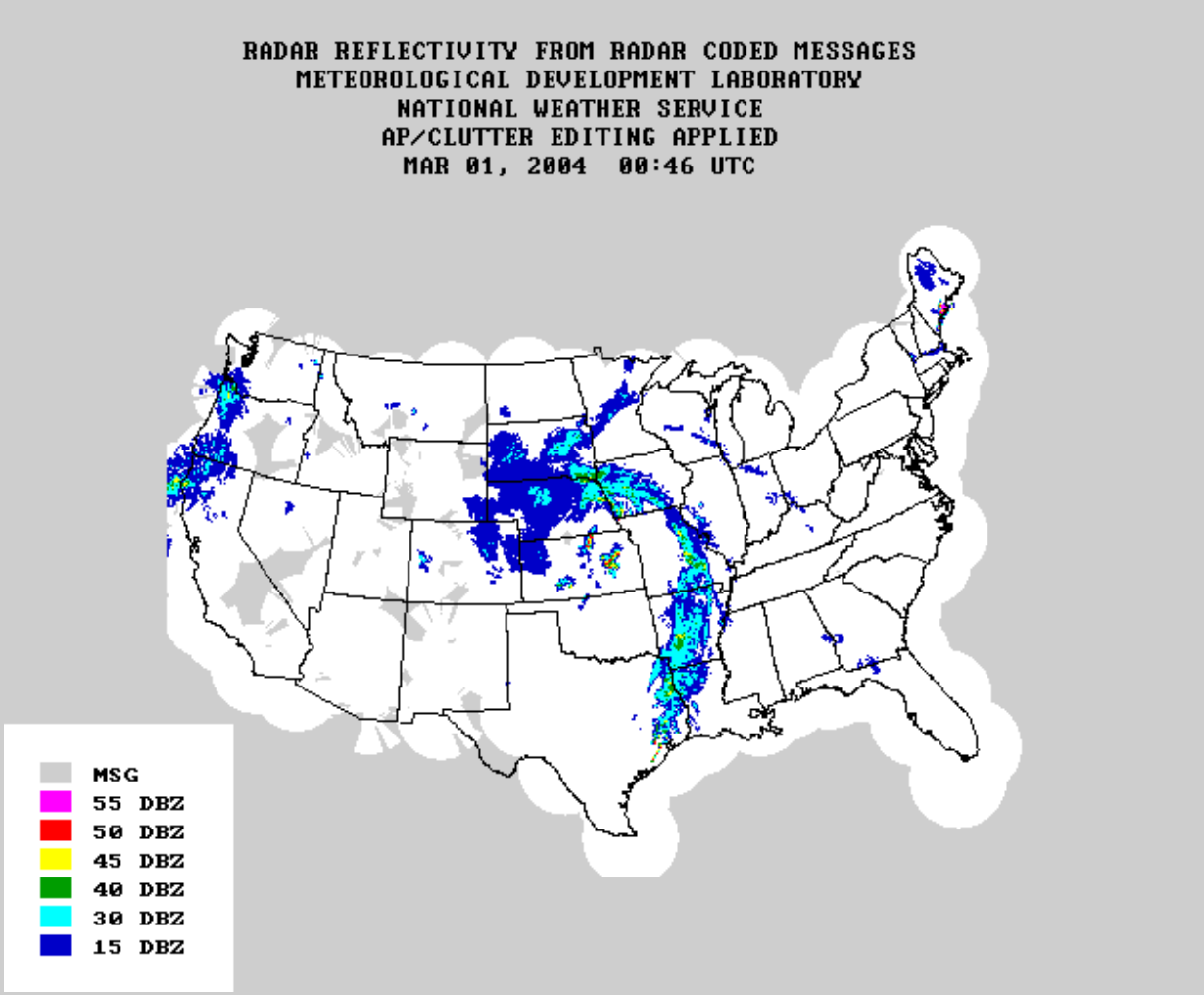
- About this Mosaic
- Credits
- Disclaimer

--Wyoming Go



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Silver Spring, MD 20910

Page Authors: Dennis R. Cain and Paul Kirkwood
Last Modified: January 13, 2003

Forecasts For the Great Lakes Area

Zone Forecasts | State Forecasts | Short Term Forecasts | Forecasts for Numerous cities in Michigan | Fire Weather Forecasts and Maps | Forecast Discussions | Coded City Forecasts | State Weather Roundups (these have weather and temperatures for numerous cities across Michigan and surrounding states)

Zone, State, and Short Term Forecasts

Zone and Short-Term Forecasts for Michigan (text) (map showing the county zone numbers)

The National Weather Service Office in Grand Rapids has developed an image map of Michigan that gives you one click access to the Short-term forecast and Zone forecast all on one page. The following table will help to get the forecast for counties in Southeast Lower Michigan...

Midland	Bay	Huron
Saginaw	Tuscola	Sanilac
Shiawassee	Genesee	Lapeer
St. Clair	Livingston	Oakland
Macomb	Washtenaw	Wayne
Lenawee	Monroe	

Forecast for Isle Royale National Park (*this forecast is issued twice a day from Memorial Day to Labor Day*)

Fire Weather Forecasts and Maps

- Fire Weather Forecast for the Upper Peninsula
- Fire Weather Forecast for Northern Lower Michigan.

The Storm Prediction Center (SPC) Fire Weather Forecast Page

Palmer Drought Index

The following graphics show selected fire weather and fire danger components of the National Fire Danger Rating System (NFDRS) and are based on once-daily observations. These observations are taken at 2 pm LST.

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- Haines Index Lower Atmosphere Stability Index
- Keetch-Byram Drought Index
- Fire Danger Class
- Wind
- Precipitation This is a 24 hour total
- Temperature at observation time
- Relative Humidity at observation time
- Dew Point at observation time
- Next Day Fire Danger Class
- Next Day wind Speed
- Next Day Rain Duration
- Next Day Temperature Forecast
- Next Day Relative Humidity
- Visual Greenness Most recent weekly composite
- Relative Greenness Most recent weekly composite
- Departure from Average Greenness Most recent weekly composite
- Experimental Live Moisture Most recent weekly composite
- 10 hour Fuel Moisture Weighed or Computed Fuel Moisture of 1/2 inch diameter fuels
- 1000 Hour Fuel Moisture Computed Fuel Moisture of 3-6 inch diameter fuels

Forecast Discussions for the Great Lakes region

NCEP Discussions

Short Range Public Forecast Discussions
Quantitative Precipitation Forecast (QPF) Discussion
Excessive Rainfall Discussion
Heavy Snow Discussion
Extended Forecast Discussion

Hourly State Weather Roundup

Michigan Ohio Indiana Illinois Wisconsin Minnesota Alaskan Regional Weather Roundup

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This map shows forecast temperatures for the Central Great Lakes, normally updated every hour. This is an **experimental** product of the National Digital Forecast Database, produced by the National Weather Service. Public comments and suggestions are encouraged.

Experimental Graphical Forecasts Central Great Lakes

Tonight	-12Hrs	+12Hrs
Max/Min Temperature	Low	
Probability of Precip.	12 hr. probability	
Weather	7pm	10pm	1am	4am
Temperature & Wind	7pm	10pm	1am	4am
Dewpoint	7pm	10pm	1am	4am
Sky Cover	7pm	10pm	1am	4am
Amount of Precip.	QPF	QPF
Snow Amount	Snow Amount	Snow Amount
Wave Height	Wave Height	
Step Image	◀	▶

Table MouseOver Effect On

Overview

conus Overview Image

| Product Description Document | Survey/Comments | Details |

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National Oceanic and Atmospheric Administration
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1325 East West Highway
Silver Spring, MD 20910
Page Author: NWS Internet Services Team

Aviation Forecasts

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- Weather Planner

Climate
- Local Climate
- Climate Prediction

---------- Go!
---------- Go!
---------- Go!
---------- Go!
---------- Go!

Explanation of Terminal Aerodrome Forecasts (TAFs) and how to decode them

Additional Information

- Aviation Digital Data Service
  For additional forecast and conditions including airmets, sigmets, pireps, TAFs, and observations, see the Aviation Digital Data Service

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- Aviation Weather Center
- Michigan D.O.T. Bureau of Aeronautics
- Canadian Forecasts from Environment Canada

The Front - A National Weather Service newsletter serving the aviation community

---

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NWS Detroit/Pontiac Marine Forecasts

Experimental Graphical Forecasts of Wind and Wave Heights
(click on image to enlarge; feedback)

Wind and wave forecast for Tonight
Tonight

Wind and wave forecast for Monday
Monday

Wind and wave forecast for Monday Night
Monday Night

Wind and wave forecast for Tuesday
Tuesday

Wind and wave forecast for Wednesday
Wednesday

Wind and wave forecast for Thursday
Thursday

Wind and wave forecast for Friday
Friday

Click on the map below for the latest marine forecasts

Local forecast by "City, St" or Zip Code
Search by city or zip code. Press enter or select the go button to submit request Go

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- Weather Glossary
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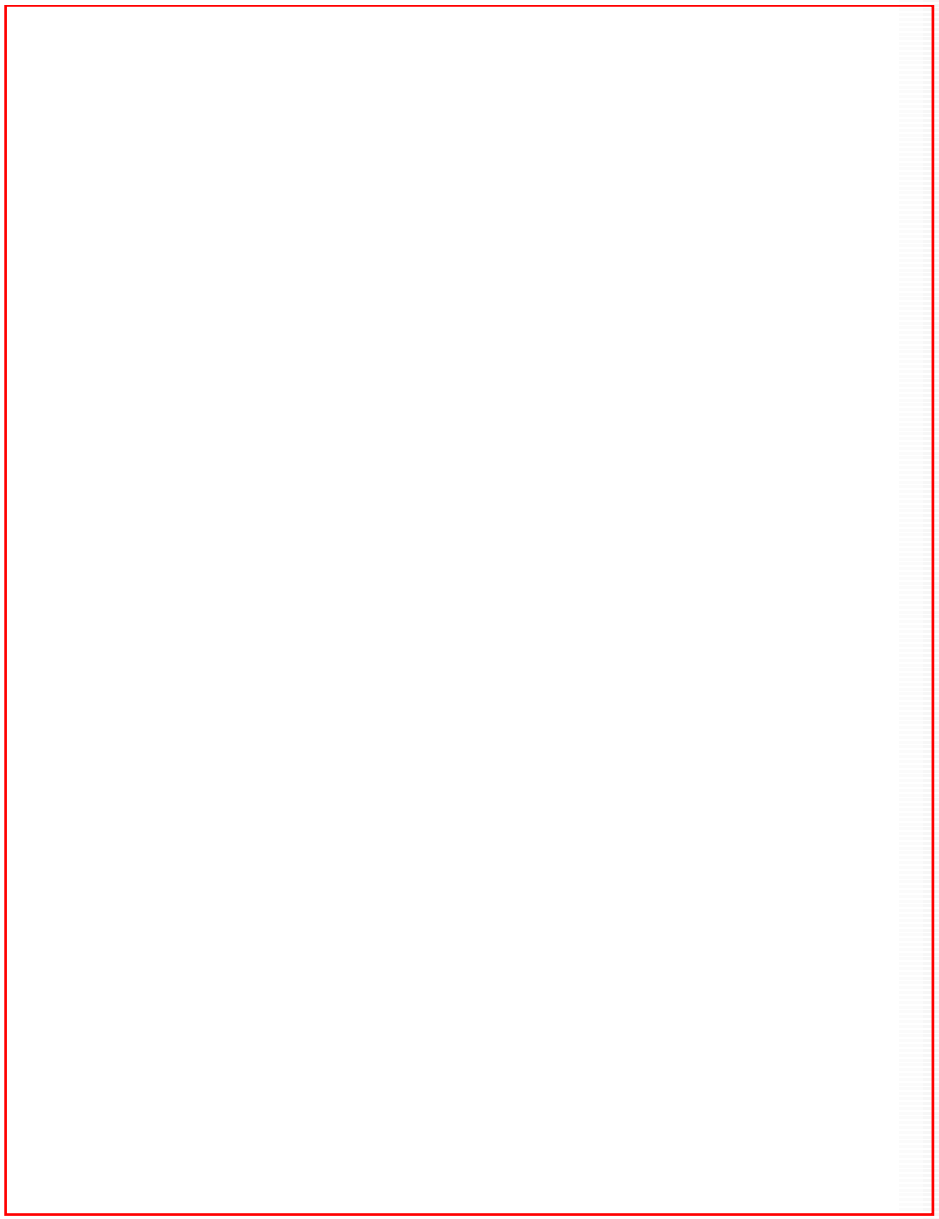

Experimental Graphical Marine Forecasts for Lake Huron and Lake St. Clair

Marine Text Forecasts for the Entire Great Lakes Region

Contact Us
w-dtx.webmaster
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Additional Marine Information

National Weather Service
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White Lake, MI 48386
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Page last modified: June 18, 2003

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Fire Weather

www.crh.noaa.gov/apx

area of responsibility
The National Weather Service in Gaylord is responsible for issuing fire weather forecasts for Northern Lower Michigan in support of forest fire and rangeland fire control and management. Fire weather season normally extends from mid-March through mid-November.

forecasts		
Northern Lower MI	Upper MI	
Boise NWS Fire Weather page		
Digital forecast for Northern Lower	Digital forecast for Southwest Lower	Digital forecast for Southeast Lower

watches/warnings
for all watches and warnings, see the Boise NWS Fire Weather page

guidance
storm prediction center

observations	
12hr RAWS	24hr RAWS

Official Use Only: Submit a Spot Forecast Request Official Use Only:		
Northern Lower MI	Southwest Lower	Southeast Lower

Climate
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- Climate Prediction

Weather Safety
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- Preparedness
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- Spotters
- EMWIN

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- Forecasting Tools
- Photo Gallery
- Science
- All Products
- GLOMW

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Local Climate Water & Weather Topics:
Home, Current Hazards,Current Wx, Radar, Satellite, Climate, Weather Safety, Contact Us

---

National Weather Service
Gaylord, MI
8800 Passenheim Rd, Gaylord, MI 49735
w-apx.webmaster@noaa.gov
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National Weather Service Forecast Office
Detroit/Pontiac

Experimental Weather Activity Planner

Comments/Feedback - Product Description

Welcome to the **Weather Activity Planner**. Please enter the range of weather parameters required for your activity. Then, either click the approximate location on the map below, or enter the specific latitude and longitude and hit submit. This will query the 5km resolution forecast grids to find when your weather requirements will be met at the nearest grid point over the next 7 days.

	Min		Max
Temperature (°F)		to	
Rel. Humidity (%)		to	
Prob. Pcpn (%)		to	

	Min		Max
Wind Speed (mph)		to	
Wind Direction (clockwise-compass)		to	
Sky Cover (%)		to	

Latitude Longitude Submit

Click Map for Forecast or Enter Lat/Lon Above

Click on the map below for the latest forecast.

Last map update: Sun, Feb 29th 2004 at 8:29:06 pm EST

Read watches, warnings & advisories

Zoom Out

Hazardous Weather Outlook

Local forecast by "City, St" or Zip Code

Search by city or zip code. Press enter or select the go button to submit request

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Climatology

Daily Climate Summaries | Monthly Climate Summaries | Monthly Summary... Gif Images | EL Niño/La Niña Information | NCDC Products | Long Range Forecasts | Record Reports | Daily Temperature and Precipitation Tables

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Nationwide

Forecasts
Text Forecasts
Graphical
Aviation
Marine
Fire Weather
Weather Planner

Climate
Local Climate
Climate Prediction

Yearly Climate Summaries

- Detroit and Flint for 2003
- Detroit and Flint for 2002
- Detroit and Flint for 2001
- Detroit and Flint for 2000
- Detroit and Flint for 1999
- Detroit and Flint for 1998
- 1997 Across all of Southeast lower

Daily and monthly Climate Summaries and summaries for various cities in Michigan.

Climate Records by Month

Here are daily climate records by month for Detroit and Flint. In additional, there is limited record information available for Saginaw (MBS).

Disclaimer: These are preliminary data listings and should be used with caution. For official climate records, please refer to the National Climatic Data Center (NCDC).

Detroit	Flint	Saginaw (MBS)
----------	----------	----------
Go!	Go!	Go!

Climate Records/Information across Southeast Lower Michigan

Preliminary Local Climatological Data (WS Form: F-6)
These are unofficial and subject to change, especially the precipitation data. Certified copies of this data can be bought on the National Climatic Data Center webpage. NCDC is the official source of climate data. The following page shows how to interpret the Preliminary F6.

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Detroit Preliminary F6

1999	2000	2001
January (not available) Go!	---------- Go!	---------- Go!
2002	2003	2004
---------- Go!	---------- Go!	---------- Go!

Flint Preliminary F6

1999	2000	2001
January (not available) Go!	---------- Go!	---------- Go!
2002*	2003	2004
Go!	---------- Go!	---------- Go!

The following monthly climate summaries are for information only. They are produced each day and come directly from the Automated Surface Observing System (ASOS). If you need official certified data, you should order that through the National Climatic Data Center (NCDC)

Saginaw (MBS)

2001	2002	2003	2004
---------- Go!	---------- Go!	---------- Go!	---------- Go!

Additional Daily Climatological Data

These are subject to change, especially the precipitation data. These tables are similar to the preliminary F6 data above, but include additional information from the daily climate summary (i.e. daily/monthly/seasonal departures from normal).

Detroit Daily Climate

2002	2003	2004
---------- Go!	---------- Go!	---------- Go!

Flint Daily Climate

2002	2003	2004
---------- Go!	---------- Go!	---------- Go!

Saginaw Daily Climate

2002 2003 2004

---------- Go! ---------- Go! ---------- Go!

Pontiac/White Lake Daily Climate

2002 2003 2004

---------- Go! ---------- Go! ---------- Go!

- Daily Climate Summaries from WFO Grand Rapids, WFO Gaylord, and WFO Marquette can be found here

Preliminary F6 data from other Michigan NWS Offices

- Grand Rapids
- Gaylord
- Marquette

Climate Articles from Bill Deedler

- January 1999... one of the snowiest Januarys on record across Southeast Lower Michigan.
- Record warmth across Southeast Lower Michigan during 1998.

Monthly Climate Summaries

Latest Summary: Detroit | Flint

Previous summaries from the past year:
(also available here)

Year	2004	2003	2003	2003	2003	2003	2003	2003	2003	2003	2003	2003
Detroit	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sep.	Oct.	Nov.	Dec.
Flint	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug	Sep	Oct.	Nov.	Dec.

The following images show the Monthly climate summaries for stations in Southeast Lower Michigan. . .

At the bottom of the image are the average high so far for the month (or for the entire month if all days have been plotted), the monthly normal high temperature if available, and also the average and normal lows. Also the average monthly temperature and normal monthly temperature as well as Heating and Cooling degree days are shown.

Year	2004	2004	2003	2003	2003	2003	2003	2003	2003	2003	2003	2003
Detroit	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sep.	Oct.	Nov.	Dec.
Flint	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sep.	Oct.	Nov.	Dec.
White Lake	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sep.	Oct.	Nov.	Dec.
Saginaw	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sep.	Oct.	Nov.	Dec.

Record Reports

EL Niño/La Niña Information

- The EL Niño page from the Climate Prediction Center (CPC).
- The EL Niño page from the Pacific Marine Environmental Laboratory (PMEL).
- The Midwest Climate Center has put together some information on how past EL Niño events have affected Midwest Weather.
- NOAA La Niña Page
- What is La Niña? This is from The PMEL site.
- Seasonal Mean Temperatures and Precipitation for the United Sates during Strong La Niña Years and a listing of the warm and cold episode years. The products are from CPC
- Latest Sea Surface Temperatures Charts from the National Environmental Satellite, Data and Information Service (NESDIS).

National Climatic Data Center (NCDC) Products

- Interactive Snowfall maps and data
- NCDC has produced over 40 maps and tables of Severe and Extreme Weather showing information on hurricanes, tornadoes, temperature extremes, and heavy rainfall.
- NCDC What's New Page. This is a listing of new products that the National Climatic Data Center is putting on the World Wide Web.

Climate Prediction Center (CPC) Products

- Hazards Assessment and Heat
- Drought
- 6-10 day outlook
- Experimental 8-14 day forecast
- Latest 30 day outlook
- Seasonal outlooks

State Temperature and Precipitation Tables

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Partnerships
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- JAWF
- Others

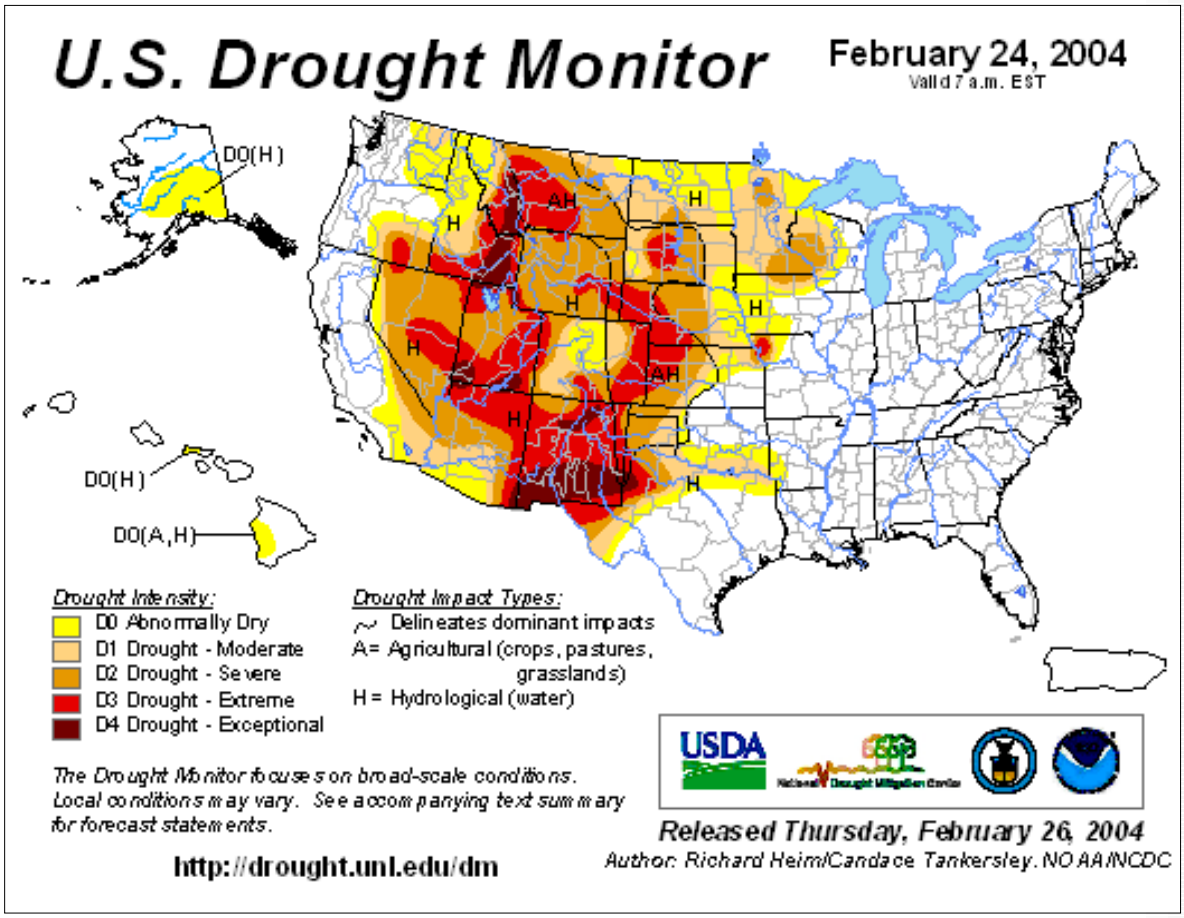
Outreach
- Educational
- Climate Glossary
- Meetings
- Publications
- Press Releases

Top News of the Day

• NOAA Issues Draft Policy to Foster "Fair Weather" Partnerships
The National Oceanic and Atmospheric Administration (NOAA) is requesting public comment on a newly drafted policy governing NOAA's National Weather Service interactions and cooperation with the greater consortium of public, private and academic weather and climate institutions. Details...

New Schedule for 2004 U.S. Monthly and Seasonal Outlooks

New Experimental Two-Class Monthly & Seasonal Climate Outlooks



Related Products

United States Drought Monitoring

United States Soil Moisture Monitoring

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Climate Prediction Center Web Team

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B

B-44 Form, Cooperative Station Report: A Weather Service form documenting station management, exposure, topography, driving instructions, payment information, hydrometeorlogic equipment, and observing information.

B Scope: An intensity-modulated rectangular display with azimuth angle as the horizontal coordinate and range as the vertical coordinate

Back-Building Thunderstorm: A thunderstorm in which new development takes place on the upwind side (usually the west or southwest side), such that the storm seems to remain stationary or propagate in a backward direction.

Back Door Cold Front: A cold front moving south or southwest along the Atlantic seaboard and Great Lakes.

Backflow: The backing up of water through a conduit or channel in the direction opposite to normal flow.

Backing: It is the counterclockwise turning of the wind direction as we move up through the atmosphere. For example, the wind direction would change from the north at the ground to the northwest. This is indicative of the airmass cooling.

Backing Winds: Winds which shift in a counterclockwise direction with time at a given location (e.g. from southerly to southeasterly), or change direction in a counterclockwise sense with height (example westerly at the surface but becoming more southerly aloft). The opposite of veering winds. In storm spotting, a backing wind usually refers to the turning of a south or southwest surface wind with time to a more east or southeasterly direction. Backing of the surface wind can increase the potential for tornado development by increasing the directional shear at low levels.

Back Scatter: It refers to the portion of the radar beam energy that returns back towards the radar after striking a target.

Back-Sheared Anvil: Slang for a thunderstorm anvil which spreads upwind, against the flow aloft. A back-sheared anvil often implies a very strong updraft and a high severe weather potential.

Backsight: A rod reading taken on a point of known elevation, a benchmark or a turning point. Backsights are added to the known elevation to arrive at the height of the instrument. With a known height of the instrument, the telescope can be used to determine the elevation of other points in the vicinity.

Backwater Curve: The longitudinal profile of the surface of a liquid in a non-uniform flow in an open channel, when the water surface is not parallel to the invert owing to the depth of water having been increased by the interposition of an obstruction such as a dam or weir. The term is sometimes used in a generic sense to denote all water surface profiles; or for profiles where the water is flowing at depths greater

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NOAA Weather Radio
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Weather Now
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than the critical.

Backwater Effect: The effect which a dam or other obstruction has in raising the surface of the water upstream from it.

Backwater Flooding: Upstream flooding caused by downstream conditions such as channel restriction and/or high flow in a downstream confluence stream.

Ball Lightning: A relatively rare form of lightning consisting of a luminous ball, often reddish in color, which moves rapidly along solid objects or remains floating in mid-air. Also known as ***globe lightning***.

Band: See ***frequency band***.

Bandpass Filter: A filter whose frequencies are between given upper and lower cutoff values, while substantially attenuating all frequencies outside these values (this band).

Band Width: The number of cycles per second between the limits of a frequency band.

Bank: The margins of a channel. Banks are called right or left as viewed facing in the direction of the flow.

Bank Storage: Water absorbed and stored in the void in the soil cover in the bed and banks of a stream, lake, or reservoir, and returned in whole or in part as the level of water body surface falls.

Bankfull Stage/Elevation: An established river stage/water surface elevation at a given location along a river which is intended to represent the maximum water level that will not overflow the river banks or cause any significant damages from flooding.

Bankfull Stage: An established river stage at a certain point along a river which is intended to represent the maximum safe water level which will not overflow the river banks or cause any significant damage within the reach of the river.

Bar: An obstacle formed at the shallow entrance to the mouth of a river or bay which empties into the ocean.

Barber Pole: Slang for a thunderstorm updraft with a visual appearance including cloud striations that are curved in a manner similar to the stripes of a barber pole. The structure typically is most pronounced on the leading edge of the updraft, while drier air from the rear flank downdraft often erodes the clouds on the trailing side of the updraft.

Baroclinic Zone: A region in which a temperature gradient exists on a constant pressure surface. Baroclinic zones are favored areas for strengthening and weakening systems; barotropic systems, on the other hand, do not exhibit significant changes in intensity. Also, wind shear is characteristic of a baroclinic zone.

Barogram: A graphic record of air pressure produced by a barograph.

Barograph: A recording barometer.

Barometer: An instrument used for measuring air pressure. The two most common types are the *mercury barometer* and the *aneroid barometer*.

Barometric Pressure: The actual pressure value indicated by a pressure sensor.

Barotropic System: A weather system in which temperature and pressure surfaces are coincident, i.e., temperature is uniform (no temperature gradient) on a constant pressure surface. Barotropic systems are characterized by a lack of wind shear, and thus are generally unfavorable areas for severe thunderstorm development. See ***Baroclinic Zone***. Usually, in operational meteorology, references to barotropic systems refer to equivalent barotropic systems - systems in which temperature gradients exist, but are parallel to height gradients on a constant pressure surface. In such systems, height contours and isotherms are parallel everywhere, and winds do not change direction with height. As a rule, a true equivalent barotropic system can never be achieved in the real atmosphere. While some systems (such as closed lows or cutoff lows) may reach a state that is close to equivalent barotropic, the term barotropic system usually is used in a relative sense to describe systems that are really only close to being equivalent barotropic, i.e., isotherms and height contours are nearly parallel everywhere and directional wind shear is weak.

Barrage: Any artificial obstruction placed in water to increase water level or divert it. Usually the idea is to control peak flow for later release.

Base Data: Those digital fields of **reflectivity**, mean **radial velocity**, and **spectrum width** data in spherical coordinates provided at the finest resolution available from the radar.

Base Flood: The national standard for floodplain management is the base, or one percent chance flood. This flood has at least one chance in 100 of occurring in any given year. It is also called a 100 year flood.

Baseflow: Streamflow which results from precipitation that infiltrates into the soil and it eventually moves through the soil to the stream channel.

Base Products: Those radar products that present some representation of the data base. This representation may not necessarily be in either full resolution or depict full area of coverage. Base products can be used to generate graphic display or used for further processing.

Base Reflectivity (R): This WSR-88D radar product depicts a full 360 degree sweep of echo intensity data. It is available for every elevation angle that is sampled in a volume scan. It is used to observe precipitation intensity and movement; determine storm structure; estimate hail potential; locate boundaries (cold front, outflow, lake breeze, etc.); identify cloud layers; and detect light snow, drizzle, birds, insects, and smoke plumes.

Base Station: A computer which accepts radio signals from ALERT gaging sites, decodes the data, places the data in a database, and makes the data available to other users.

Base Velocity (V): This WSR-88D radar product depicts a full 360 degree sweep of radial velocity data. It is available for every elevation angle that is sampled in a volume scan. It is used to estimate wind speed and direction; determine regions of significant shear (convergence, etc.); locate boundaries (cold front, outflow, lake breeze, etc.); identify areas of circulation; and determine storm structure.

Base Width: The time duration of a unit hydrograph.

Basic Fire Weather Services: Routine daily forecasts; spot forecasts; prescribed burn forecasts; smoke management forecasts and information, advisories, observations, summaries, and briefings produced in and by a National Weather Service office during normal working hours, plus warnings of critical weather conditions. Generally, these basic services are tailored to meet the specific needs of user agaencies.

Basin: A surface area having drainage system consisting of a surface stream and its tributaries and impounded bodies of water. It is also called a "Drainage Basin".

Basin Boundary: The topographic dividing line around the perimeter of a basin, beyond which overland flow (i.e.; runoff) drains away into another basin.

Basin Lag: The time it takes from the centroid of rainfall for the hydrograph to peak.

Basin Recharge: Rainfall that adds to the residual moisture of the basin in order to help recharge the water deficit. i.e; water absorbed into the soil that does not take the form of direct runoff.

Bathymetric Chart: A map delineating the form of the bottom of a body of water, usually by means of depth contours (***see Isobaths***).

Bathythermograph (BT): A device for obtaining a record of temperature against depth (strictly speaking pressure) in the upper 300 meters of the ocean from a ship underway. Some of these devices are expendable and designated as ***XBT***.

Beach Erosion: The carrying away of beach materials by wave action, currents, tides, or wind.

Beam Filling: The measure of variation of hydrometeor density throughout the radar sampling volume. If there is no variation in density, the beam is considered to be filled. The fraction of the radar sample volume filled.

Beam Width: The angular width of the radar beam. Usually that width where the power density is one-half that on the axis of the beam ("half-power" or "3 dB" point).

Bear's Cage: Slang for a region of storm-scale rotation, in a thunderstorm, which is wrapped in heavy precipitation. This area often coincides with a radar hook echo and/or mesocyclone, especially one associated with an High Precipitation (HP) storm. The term reflects the danger involved in observing such an area visually, which must be done at close range in low visibility.

Beaver('s) Tail: Slang for a particular type of inflow band with a relatively broad, flat appearance suggestive of a beaver's tail. It is attached to a supercell's general updraft and is oriented roughly parallel to the pseudo-warm front, i.e., usually east to west or southeast to northwest. As with any inflow band, cloud elements move toward the updraft, i.e., toward the west or northwest. Its size and shape change as the strength of the inflow changes. See also ***inflow stinger***. Spotters should note the distinction between a beaver tail and a tail cloud. A "true" tail cloud typically is attached to the wall cloud and has a cloud base at about the same level as the wall cloud itself. A beaver tail, on the other hand, is not attached to the wall cloud and has a cloud base at about the same height as the updraft base (which by definition is higher than the wall cloud). Unlike the beaver tail, the tail cloud forms from air that is flowing from the storm's main precipitation cascade region (or outflow region). Thus, it can be oriented at a large angle to the pseudo-warm front.

Bed Load: Sand, silt, gravel, or soil and rock detritus carried by a stream on or immediately above its bed. The particles of this material have a density or grain size such as to preclude movement far above or for a long distance out of contact with the stream bed under natural conditions of flow.

Beginning of the Breakup: Date of definite breaking, movement, or melting of ice cover or significant rise of water level.

Beginning of Freezup: Date on which ice forming a stable winter ice cover is first observed on the water surface.

Benchmark (BM): A permanent point whose known elevation is tied to a national network. These points are created to serve as a point of reference. Benchmarks have generally been established by the USGS, but may have been established by other Federal or local agencies. Benchmarks can be found on USGS maps.

Bermuda High: A semi-permanent, subtropical area of high pressure in the North Atlantic Ocean off the East Coast of North America that migrates east and west with varying central pressure. Depending on the season, it has different names. When it is displaced westward, during the Northern Hemispheric summer and fall, the center is located in the western North Atlantic, near Bermuda. In the winter and early spring, it is primarily centered near the Azores in the eastern part of the North Atlantic. Then it may be referred to as the Azores High.

Best Track: A subjectively smoothed path, versus a precise and very erratic fix-to-fix path, used to represent tropical cyclone movement. It is based on an assessment of all available data.

Bias: A systematic difference between an estimate of and the true value of the parameter.

Bimetallic Thermometer: A temperature measuring devise usually consisting of two dissimilar metals that expand and contract differentially as the temperature changes.

Bistatic Radar: A radar which uses separate antennas for transmission and reception; usually the transmitter and receiver are at different locations. Bistatic radars depend upon forward scattering of the signal from transmitter to receiver.

Black Blizzard: A local term for a violent duststorm on the south-central Great Plains that darkens the sky and casts a pall over the land. Also called a black roller.

Black Ice: Thin, new ice on fresh- or saltwater, appearing dark in color because of its transparency; also popularly applied to thin hazardous ice coverings on roads.

Blizzard: A winter storm which produces the following conditions for at least 3 hours: 1) sustained winds or frequent gusts to 35 miles per hour or greater 2) considerable falling and/or blowing snow reducing visibility to less than 1/4 mile.

Blizzard Warning: This product is issued by the National Weather Service when blizzard conditions are life threatening. The criteria for this warning varies from state to state. In Michigan, the criteria is a sustained wind or frequent wind gusts to 35 mph or more and considerable falling and/or blowing slow reducing visibility frequently to less than 1/4 mile for a duration of 3 hours or longer.

Blocking High: The development of a warm ridge or cutoff high aloft at high latitudes which becomes associated with a cold high at the surface, causing a split in the westerly winds. Such a high will move very slowly, tending to move westward during intensification and eastward during dissipation. It prevents the movement of migratory cyclones across its latitudes. Two examples are a cut-off high and an Omega block.

Blowing: A descriptor used to amplify observed weather phenomena (dust, sand, snow, and spray) whenever the phenomena are raised to a height of 6 feet or more above the ground and reduces horizontal visibility to less than 7 statue miles.

Blowing Dust (BLDU): Wind-driven dust that significantly reduces surface visibility to less than 7 miles.

Blowing Snow (BLSA): Wind-driven sand that significantly reduces surface visibility to less than 7 miles.

Blowing Snow (BLSN): Wind-driven snow that significantly reduces surface visibility to less than 7 miles.

Blue Watch (or Blue Box): Slang for a severe thunderstorm watch.

Blustery: 15 to 25 mph winds

Border Ice: An ice sheet in the form of a long border attached to the bank or shore.; shore ice.

Boundary Layer: - In general, a layer of air adjacent to a bounding surface. Specifically, the term most often refers to the planetary boundary layer, which is the layer within which the effects of friction are

significant. For the earth, this layer is considered to be roughly the lowest one or two kilometers of the atmosphere. It is within this layer that temperatures are most strongly affected by daytime insolation and nighttime radiational cooling, and winds are affected by friction with the earth's surface. The effects of friction die out gradually with height, so the "top" of this layer cannot be defined exactly. There is a thin layer immediately above the earth's surface known as the surface boundary layer (or simply the surface layer). This layer is only a part of the planetary boundary layer, and represents the layer within which friction effects are more or less constant throughout (as opposed to decreasing with height, as they do above it). The surface boundary layer is roughly 10 meters thick, but again the exact depth is indeterminate. Like friction, the effects of insolation and radiational cooling are strongest within this layer.

Bounded Weak Echo Region (BWER): A radar feature that identifies where the strongest updraft is located in a supercell thunderstorm. This updraft is so strong that large particles do not have time to form in the lower and mid levels of the thunderstorm and they are prevented from falling back into the updraft core from updraft. The weak echo region is bounded when, in a horizontal section, the weak echo region is completely surrounded or bounded by higher reflectivity values.

Bow Echo: A rapidly moving crescent shaped echo on a radar which is convex in the direction of motion. It is associated with strong, straight-line winds. Areas of circulation also can develop at either end of a bow echo, which sometimes can lead to tornado formation - especially in the left (usually northern) end, where the circulation exhibits cyclonic rotation. See also ***Line Echo Wave Pattern (LEWP)***.

Box (or Watch Box): Slang for a severe thunderstorm or tornado watch. See ***blue box*** and ***red box***.

Brackish Ice: Ice formed from Brackish water.

Bragg Scattering: Scatter from small-scale fluctuations (i.e., turbulence) in the refractive index of the atmosphere. Bragg scatter comes from fluctuations which are small compared to the radar's wavelength.

Braided Stream: Characterized by successive division and rejoining of streamflow with accompanying islands. A braided stream is composed of anabranches.

Brash Ice: Accumulation of floating ice made up of fragments not more than 2 meters across; the wreckage of other forms of ice.

Breach: The failed opening in a dam.

Breakup: The time when a river whose surface has been frozen from bank to bank for a significant portion of its length begins to change to an open water flow condition. Breakup is signaled by the breaking of the ice and often associated with ice jams and flooding.

Breakup Date: Date on which a body of water is first observed to be entirely clear of ice and remains clear thereafter.

Breakup Jam: Ice jam that occurs as a result of the accumulation of broken ice pieces.

Breakup Period: The period of disintegration of an ice cover.

Breezy: 15 to 25 mph winds

Bright Band: The enhanced layer of radar echo caused by the difference in radar reflectivity of ice and water particles. This echo is interpreted as the delineation on a radar display between frozen and liquid precipitation. It shows where the snow is melting and becoming rain.

Brisk: 15 to 25 mph winds

BRN: An acronym for Bulk Richardson Number. See ***Bulk Richardson Number***.

Broken (BKN): An official sky cover classification for aviation weather observations, descriptive of a sky cover of 5/8 to 7/8. This is applied only when obscuring phenomenon aloft are present--that is, not when obscuring phenomenon are surface-based, such as fog.

Brontophobia: The fear of thunder and lightning. See ***Astraphobia, Astrapophobia, Ceraunophobia, Keraunophobia,*** and ***Tonitrophobia***

Brown Snow: Snow intermixed with dust particles. A not uncommon phenomenon in many parts of the world. Snows of other colors, such as ***yellow snow***, are similarly explainable.

Bubble High: A mesoscale area of high pressure, typically associated with cooler air from the rainy downdraft area of a thunderstorm or a complex of thunderstorms. A gust front or outflow boundary separates a bubble high from the surrounding air.

Bubbler Gage: A water stage recording device that is capable of attaching to a LARC for data automation purposes.

Bulk Richardson Number (BRN): It is the ratio of the buoyancy (*CAPE*) of a lifted parcel to the vertical wind shear of the environment in which the parcel is lifted. It correlates well with observed storm type (single, multicell, supercell), especially for *CAPEs* between 1500 and 3000 J/kg. BRN's less than 45 tend to support supercell structures, but multicellular convection is favored over 45. While the BRN has shown some value as a predictor of storm type, it is a poor predictor of storm rotation because BRN Shear is a "bulk" measure. For example, it does not take in account the specific effects of directional and speed shear components. High values indicate unstable and/or weakly-sheared environments; low values indicate weak instability and/or strong vertical shear.

Burn Index: A fire control management system that integrates the effects of selected fire danger factors into one or more qualitative or numerical indices from which ease of ignition and probable fire behavior may be estimated. This is also called a ***Fire Danger Rating***.

Bust: - Slang for an inaccurate forecast or an unsuccessful storm chase; usually a situation in which thunderstorms or severe weather are expected, but do not occur.

Buttress Dam: Buttress dams are comprised of reinforced masonry or stonework built against concrete. They are usually in the form of flat decks or multiple arches. They require about 60 percent less concrete than gravity dams, but the increased form work and reinforcement steel required usually offset the savings in concrete. Many were built in the 1930's when the ratio of labor cost to materials was comparatively low. However, this type of construction is not competitive with other types of dams when labor costs are high.

BWER: An acronym for Bounded Weak Echo Region. See ***Bounded Weak Echo Region***.

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C

CAA: An acronym for Cold Air Advection. See ***Cold Air Advection***.

C-Band Radar: A radar operating in the 3900 to 6200 megahertz range whose wavelength is generally accepted as 5 centimeters. The National Weather Service still operates a few of these radars around the country, but within the next year or so, they should be all shut down.

Cache Site: A secure storage area for equipment. Normally a location owned and operated by user agencies where fire fighting equipment is stored and dispatched when needed. Single agency and multiagency cache site securely store and, upon proper request, dispatch the National Weather Service (NWS) ***Air Transportable Mobile Unit (ATMU)*** when needed at the site of an incident.

CADAS (Centralized Automated Data Acquisition System): A system of two minicomputers in NWSH that interrogates LARCs and DARDCs by telephone every 6 hours and transmits the data to AFOS via HADS.

Calibration: The process of using historical data to estimate parameters in a hydrologic forecast technique such as Sacramento Soil Moisture Accounting Model (SACSMA), routings, and unit hydrographs.

Calm: A condition when **no** air motion is detected.

Cap or Cap Strength: It measures the ability of stable air aloft (a layer of relatively warm air) to inhibit low-level parcel ascent. Empirical studies show that a cap greater than 2ºC often precludes thunderstorms in the absence of a strong dynamical or forced lift. This occurs even when the instability is excessive. A strong cap prevents widespread convection from occurring; thus, it allows low level heat and moisture to increase over a period of time. This in turn increases the amount of potential instability. Also, the air above it can cool, which also increases potential instability. This delay in the onset of convection increases the severe potential for a limited number of cells that manage to punch through the cap or reach the boundary separating capped from uncapped region. The cap is an important ingredient in most severe thunderstorm episodes, as it serves to separate warm, moist air below and cooler, drier air above. Meanwhile, when there is no cap, either process (warming/moistening at low levels or cooling aloft) results in a faster release of available instability - often before instability levels become large enough to support severe weather development. As a result, convection tends to be widespread, but less intense. This is a result of developing thunderstorms competing for a limited amount of available moisture. Therefore, severe storms often form along these lid boundaries, where the release of potential instability is favored. As a result, thunderstorms showing rapid growth within or very near a strongly capped region become severe. This is also called a ***lid***.

CAPE: An acronym for Convective Available Potential Energy. See ***Convective Available Potential Energy***.

Capillarity: (1) The degree to which a material or object containing minute openings or passages, when immersed in a liquid, will draw the surface of the liquid above the hydrostatic level. Unless otherwise defined, the liquid is generally assumed to be water. (2) The phenomenon by which water is held in interstices above the normal hydrostatic level, due to attraction between water molecules.

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Capillary Fringe: The soil area just above the water table where water can rise up slightly through the cohesive force of capillary action. This layer ranges in depth from a couple of inches, to a few feet, and it depends on the pore sizes of the materials. The capillary zone is also called the ***capillary zone***.

Capillary Potential: The work required to move a unit mass of water from the reference plane to any point in the soil column.

Capillary Zone: The soil area just above the water table where water can rise up slightly through the cohesive force of capillary action. This layer ranges in depth from a couple of inches, to a few feet, and it depends on the pore sizes of the materials. The capillary zone is also called the capillary fringe.

CAPPI: An acronym for Constant Altitude PPI. A data product providing radar data at a fixed height or altitude, rather than at a fixed elevation angle.

Cartesian Coordinates: The familiar "x-y" coordinate system, in which the axes are at right angles to each other. Raw radar data, often in polar coordinates, can always be converted to Cartesian coordinates.

Catchment Area: An area having a common outlet for its surface runoff (also see Drainage Area or Basin, Watershed).

Categorical: A National Weather Service precipitation descriptor for a 80, 90, or 100 percent chance of measurable precipitation (0.01 inch). See ***Precipitation Probability (PoP)***.

Caution Stage: Same as ***alert stage***.

CB: An acronym for Cumulonimbus. See ***Cumulonimbus***.

CCL: An acronym for Convective Condensation Level. See ***Convective Condensation Level***.

Ceiling: The height of the lowest layer of broken or overcast clouds.

Ceiling Balloon: A small balloon used to determine the height of the cloud base. The height is computed from the balloon's ascent rate and the time required for its disappearance into the cloud.

Ceiling Light: A type of cloud-height indicator that uses a focused light to project vertically a narrow beam of light onto a cloud base.

Ceilometer: A device used to evaluate the height of clouds or the vertical visibility into a surface-based obscuration.

Cell: Convection in the form of a single updraft, downdraft, or updraft/downdraft couplet, typically seen as a vertical dome or tower as in a cumulus or towering cumulus cloud. A typical thunderstorm consists of several cells (see multi-cellular thunderstorm). The term "cell" also is used to describe the radar echo returned by an individual shower or thunderstorm. Such usage, although common, is technically incorrect.

Center: The vertical axis or core of a tropical cyclone. It is usually determined by cloud vorticity patterns, wind, and/or pressure distributions.

Center/Vortex Fix: The location of the center of a tropical or subtropical cyclone obtained by reconnaissance aircraft penetration, satellite, radar, or synoptic data.

Central North Pacific Basin: The region north of the Equator between 140W and the International Dateline. The Central Pacific Hurricane Center (CPHC) in Honolulu, HI is responsible for tracking tropical cyclones in this region.

Centroid: The center of mass of a convective cell (storm) or other precipitation system.

Cerunophobia: The fear of thunder. See ***Astraphobia, Astrapophobia, Brontophobia, Keraunophobia,*** and ***Tonitrophobia***

CFS (Cubic Feet per Second): The flow rate or discharge equal to one cubic foot (of water, usually) per second. This rate is equivalent to approximately 7.48 gallons per second. This is also referred to as a second-foot.

CFS (Cubic Feet per Second) Day: The volume of water discharged in twenty four hours, with a flow of one cubic foot per second is widely used; 1 cfs-day is 24 x 60 x 60 = 86,000 cubic feet, 1.983471 acre-feet, or 646,317 gallons. The average flow in cubic feet per second for any time period is the volume of flow in cfs-days.

Chaff: Small strips of metal foil, usually dropped in large quantities from aircraft or balloons. Chaff

typically produces a radar echo which closely resembles precipitation. Chaff drops once were conducted by the military in order to confuse enemy radar, but now are conducted mainly for radar testing and calibration purposes.

Chance: A National Weather Service precipitation descriptor for 30, 40, or 50 percent chance of measurable precipitation (0.01 inch). When the precipitation is convective in nature, the term scattered is used. See ***Precipitation Probability (PoP)***.

Channel (watercourse): An open conduit either naturally or artificially created which periodically, or continuously contains moving water, or forms a connecting link between two bodies of water. River, creek, run, branch, anabranch, and tributary are some of the terms used to describe natural channels. Natural channels may be single or braided. Canal and floodway are some of the terms used to describe artificial channels.

Channel Inflow: Water, which at any instant, is flowing into the channel system form surface flow, subsurface flow, base flow, and rainfall that has directly fallen onto the channel.

Channel Lead: An elongated opening in the ice cover caused by a water current.

Channelling: The tendency of the wind to follow the axis of a channel or be steered by sloping land, resulting in a change in its direction.

Channel Routing: The process of determining progressively timing and shape of the flood wave at successive points along a river.

Channelization: The modification of a natural river channel; may include deepening, widening, or straightening.

Chart Datum: A plane of reference, established by the National Ocean Survey (NOS), as a mean low water level for each of the Great Lakes. These are expressed in feet above mean water level at Point-au-Pere (Father Point), Quebec, which is considered the Mean Sea Level (MSL) datum for the Great Lakes. All depths and clearances shown on NOS charts refer to Chart Datum. Actual water levels are reported by the Coast Guard in inches above or below Chart Datum. The following table shows the Chart Datums for Great Lakes in feet above sea level.

Great Lakes Chart Datums			
Lake	**Feet Above Sea Level**	**Lake**	**Feet Above Sea Level**
Erie	569.2'	Ontario	243.3'
Huron	577.5'	St. Clair	572.3'
Michigan	577.5'	Superior	601.1'

Cheimaphobia: The fear of cold.

Cheimatophobia: The fear of cold.

Chionophobia: Fear of snow.

Chinook Wind: A warm, dry wind that descends the eastern slope of the Rocky Mountains. The warmth and dryness of this wind can quickly melt and evaporate snowcover. Another name for this type of wind is "foehn".

CIN: An acronym for Convective Inhibition. See ***Convective Inhibition***.

Circulation Cell: A "package" of air with a distinct circulation pattern, i.e., a ***lake breeze***.

Cirrocumulus(Cc): They are thin clouds, the individual elements which appear as small white flakes or patches of cotton, usually sowing brilliant and glittering quality suggestive of ice crystals. They form at altitudes between 16,500 to 45,000 feet above ground.

Cirrocumulus Standing Leticular (CCSL): These clouds are formed on the crests of waves crested by barriers in the wind flow. The clouds show little movement hence the name standing. Wind, however, can be quite strong blowing through the cloud. They are characterized by their smooth, polished edges. They may also form on wave crests. They are ice crystal clouds and generally are whiter than ACSL. These clouds from between 16,500 and 45,000 feet.

Cirrostratus (Cs): They are thin, whitish cloud layers appearing like a sheet or veil. They are diffuse

sometimes partially striated or fibrous. Due to their ice crystal makeup, these clouds are associated with halos--large, luminous circles or arcs of circles surrounding the sun or moon. The layer frequently is the edge of a frontal shield. They form at altitudes between 16,500 to 45,000 feet above ground.

Cirrus (Ci): They are thin, feather like clouds composed entirely of ice crystals. They form at altitudes between 16,500 to 45,000 feet above ground. Thunderstorm anvils are a form of cirrus cloud, but most cirrus clouds are not associated with thunderstorms.

CISK: An acronym for Conditional Instability of the Second Kind.

Civil Emergency Message (CEM): These National Weather Service statements are issued when a local or state official wants a warning disseminated regarding nuclear accidents, spills of toxic material, and other similar situations.

Classic Supercell: See ***supercell***.

Clear Ice: It is a glossy, clear or translucent ice formed by the relatively slow freezing of large supercooled droplets. The large droplets spread out over the airfoil of an airplane before complete freezing, forming a sheet of clear ice.

Clear Skies: Skies are clear when no clouds or obscurations are observed or detected from the point of observation.

Clear Slot: A local region of clearing skies or reduced cloud cover, indicating an intrusion of drier air; often seen as a bright area with higher cloud bases on the west or southwest side of a wall cloud. A clear slot is believed to be a visual indication of a rear flank downdraft.

Client Agency: As used in connection with reimbursable National Weather Service (NWS) fire weather services, a public fire service or wildlands management agency, Federal or non-Federal, which requires and uses NWS fire and forestry meteorological services

Cliff Effect: The dramatic alteration in direction of an onshore wind by a cliff face. The offshore equivalent is called the ***Lee Effect***.

Climatological Data (CD): This National Climatic Data Center (NCDC) publication, also produced monthly and annually, contains daily temperature and precipitation data for over 8,000 locations. Monthly editions contain station daily maximum and minimum temperatures and precipitation. Some stations provide daily snowfall, snow depth, evaporation, and soil temperature data. Each issue also contains monthly summaries for heating and cooling degree days (65 degrees F base). The July issue also contains monthly heating degree days and snow data for the preceding July through June. The Annual issue contains monthly and annual averages of temperature, precipitation, temperature extremes, freeze data, soil temperatures, evaporation, and a recap of monthly cooling degree days. The CD is published by state or region (New England), with a total of 45 issues produced each month.

Climate Diagnostics Center (CDC): This agency is part of the National Oceanic & Atmospheric Administration (NOAA). Their mission is to identify the nature and causes of climate variations on time scales ranging from a month to centuries. The goal of this work is to develop the ability to predict important climate variations on these time scales.

Climate Prediction Center (CPC): One of nine national centers that comprises the National Centers for Environmental Prediction (NCEP). Their mission is to maintain a continuous watch on short-term climate fluctuations and to diagnose and predict them. These efforts are designed to assist agencies both inside and outside the federal government in coping with such climate related problems as food supply, energy allocation, and water resources.

Closed Basin: A basin draining to some depression or pond within its area, from which water is lost only by evaporation or percolation. A basin without a surface outlet for precipitation falling precipitation.

Closed Basin Lake Flooding: Flooding that occurs on lakes with either no outlet or a relatively small one. Seasonal increases in rainfall cause the lake level to rise faster than it can drain. The water may stay at flood stage for weeks, months, or years.

Closed Low: A low pressure area with a distinct center of cyclonic circulation which can be completely encircled by one or more isobars or height contour lines. The term usually is used to distinguish a low pressure area aloft from a low-pressure trough. Closed lows aloft typically are partially or completely detached from the main westerly current, and thus move relatively slowly (see ***cutoff low***).

Cloud: A visible aggregate of minute water droplets or ice particles in the atmosphere above the Earth's surface.

Cloud-Air Lightning (CA): Streaks of lightning which pass from a cloud to the air, but do **not** strike the

ground.

Cloud-Cloud Lightning (CC): Streaks of lightning reaching from one cloud to another.

Cloud-Ground Lightning (CG): Lightning occurring between cloud and ground.

Cloud Height: The height of the base of a cloud or cloud layer above the surface of the earth.

Cloud Layer: An array of clouds whose bases are at approximately the same level.

Cloud Seeding: An experimental process used to weaken hurricanes or make rain in dry areas.

Cloud Streets: Rows of cumulus or cumulus-type clouds aligned parallel to the low-level flow. Cloud streets sometimes can be seen from the ground, but are seen best on satellite photographs.

Cloud Tags: Ragged, detached cloud fragments; fractus or scud.

Cloud-Water Lightning (CW): Lightning occurring between cloud and water.

Cloudy: When the predominant/average sky condition is covered completely by opaque (not transparent) clouds. In other words, 8 octants of the sky is covered by opaque clouds.

Clutter: Radar echoes that interfere with observation of desired signals on the radar display.

CNIF: Calibration Network Information Files

Coalescence: The process by which water droplets in a cloud collide and come together to form raindrops.

Coastal Convergence: The convergence or running together of land and se winds, creating a stronger band of windnear the shore. Factors such as the shape of the shoreline and the angle between the wind and the shore determine the severity of this effect.

Coastal Flood Statement: This National Weather Service product keeps the public and cooperating agencies informed of the status of existing coastal flood watches and warnings as well as provides an update on local conditions. It is also used to cancel a ***Coastal Flood Watch*** or a ***Coastal Flood Warning***.

Coastal Flood Warning: This National Weather Service product alerts residents along the Atlantic, Pacific, and Gulf Coasts that coastal flooding is either imminent or occurring.

Coastal Flood Watch: This National Weather Service product alerts residents along the Atlantic, Pacific, and Gulf Coasts to the possibility of coastal flooding.

Coastal Marine Forecasts (CWF): This National Weather Service marine product is designed to serve the needs of the widest variety of maritime activities in the ***coastal waters*** of Atlantic Ocean, Pacific Ocean, and Gulf of Mexico. Coastal water traffic ranges from numerous small and weather-sensitive craft, many of which do not venture far from land, to the largest ocean-going vessels. Another important activity is the offshore energy vessels that includes mobile drill ships and fixed platforms.

Coastal Waters: The marine area, including bays, harbors, and sounds, from a line approximating the mean high water mark (average height over a 19-year period) along the mainland or near-shore islands out to as much as 100 nautical miles offshore.

Coastal Flooding: Flooding that occurs from storms where water is driven onto land from an adjacent body of water. These can be hurricanes, "nor'easters," or tropical storms, but even a severe winter storm or thunderstorm can cause this type of flooding.

COE: An acronym for Corps of Engineers

Coherent Radar: A radar that utilizes both signal phase and amplitude to determine target characteristics (e.g., velocity, spectrum width).

Cokriging: A technique for estimating values of a spatial process (e.g., a precipitation field) given point observations of the process (e.g., rain gage observations) and possibly auxiliary observations (e.g., radar and satellite observations).

Cold Air Advection: Transport of cold air into a region by horizontal winds.

Cold Air Funnel: A funnel cloud or (rarely) a small, relatively weak tornado that can develop from a small shower or thunderstorm when the air aloft is unusually cold (hence the name). They are much less violent than other types of tornadoes.

Cold Core Low: A low pressure area which is colder at its center than at its periphery. Mid-latitude cyclones exhibit this temperature pattern. They usually produce much of their cloud cover and precipitation during the

daytime when the instability is the greatest. At night, the clouds and precipitation usually diminishes significantly.

Cold Front: The leading edge of a relatively colder airmass which separates two air masses in which the gradients of temperature and moisture are maximized. In the northern hemisphere winds ahead of the front will be typically southwest and shift into the northwest with frontal passage.

Cold Pool: A region of relatively cold air, represented on a weather map analysis as a relative minimum in temperature surrounded by closed isotherms. Cold pools aloft represent regions of relatively low stability, while surface-based cold pools are regions of relatively stable air.

Collar Cloud: A generally circular ring of cloud that may be observed on rare occasions surrounding the upper part of a wall cloud. This term sometimes is used (incorrectly) as a synonym for wall cloud.

Columnar Ice: Ice consisting of columnar shaped grain. The ordinary black ice is usually columnar-grained.

Combined Seas: Generally referred to as "SEAS". It is used to describe the combination or interaction of wind waves and swells. In some prediction techniques, its height is the square root of the sum of the squares of the wind wave and swell heights. It is generally equal to the height of the swell plus 1/3 the height of the wind waves.

Combined Shear (CS): This WSR-88D radar product displays a combined radial and azimuthal shear of the mean radial velocity. It is available for all elevation angles; however, its high computational load on the system may result in load shedding of other radar products. It is used to identify low-level wind shear associated with gust fronts, downbursts, and mesoscale rotational phenomena. Aviation interests and operational researchers primarily use this radar product.

Combined Shear Contour (CSC): This WSR-88D radar product is a contoured version of ***Combined Shear (CS)*** that is displayable alone or as an overlay on reflectivity or velocity products. It is generated upon radar operator request for the same elevation angle selected as the ***Combined Shear (CS)*** product. It is used: 1) as an overlay to highlight shear zones on velocity products; and 2) to identify low-level wind shear associated with gust fronts, downbursts, and mesoscale rotational phenomena. Aviation interests and operational researchers primarily use this radar product.

Complex Index of Refraction: m = n + i*k, where n is the normal index of refraction, i is sqrt(-1), and k is the absorption coefficient.

Complex Signal: A signal containing both amplitude and phase information.

Comma Cloud: A synoptic scale cloud pattern with a characteristic comma-like shape, often seen on satellite photographs associated with large and intense low-pressure systems.

Comma Echo: - A thunderstorm radar echo which has a comma-like shape. It often appears during latter stages in the life cycle of a bow echo.

Complex Gale/Storm: In the National Weather Service High Seas Forecast, an area for which gale/storm force winds are forecast or are occurring, but for which no single center is the principle generator of these winds.

Composite Hydrograph: A stream discharge hydrograph which includes base flow, or one which corresponds to a net rain storm of duration longer than one unit period.

Composite Reflectivity(CR): This WSR-88D radar product displays the maximum reflectivities for each resolution grid box for all elevation angles in a volume scan. Available with combined attribute table which provides valuable information concerning storm characteristics, such as storm tops, maximum radial velocity and reflectivity, and possible existence of hail and mesocyclones. It is used to observe the highest reflectivities in a storm from any scanned elevation angle; determine intensity trends; and generate cross section through maximum reflectivity.

Composite Reflectivity Contour (CRC): This WSR-88D radar product is a line contoured image of ***composite reflectivity (CR)***. Contour intervals and number of contours are changed at the User Control Processor. There is also a combined attribute table available for this product. It is used to view a contoured image of higher reflectivity values; examine storm structure features such as overhang, tilt, ***Weak Echo Regions (WER)***, and ***Bounded Weak Echo Regions (BWER)***; estimate height of higher dBZ's and echo tops; and locate the bright band (where snow is melting and becoming rain)

Concentric Rings: These are common in the most intense hurricanes. They usually mark the end the period of intensification. These hurricanes then maintain quasi-constant intensity or weaken. When the inner eye is completely dissipated, more intensification may occur.

Condensation: The process by which a gas or vapor changes into a liquid.

Condensation Funnel: A funnel-shaped cloud associated with rotation and consisting of condensed water droplets (as opposed to smoke, dust, debris, etc.). Compare with debris cloud.

Conductor: Any substance or object which carries electricity.

Conditional Symmetric Instability (CSI): Fundamentally, CSI results from a combination of forces acting simultaneously along different planes of the atmosphere. As is well known, an uneven distribution of gravitational forces in the vertical can give rise to convective instability. Similarly, horizontal inertial instability can develop in strongly anticyclonically-sheared regimes, due to an imbalance of centrifugal forces. CSI environments typically exhibit weak convective and inertial stability for strictly vertical or horizontal motions. However, air parcels displaced along certain sloped, or "slantwise" trajectories may attain positive buoyancy due to a unique combination of gravitational and centrifugal forces. While convective available potential energy (CAPE) values within these environments are typically much smaller than those associated with upright convection, sufficient energies are frequently present to support the formation and maintenance of thunderstorm cells. There is growing evidence supporting the role CSI plays in the development of some types of thunderstorms, particularly those occurring within strongly baroclinic regimes.

Cone of Depression: The depression, roughly conical in shape, produced in a water table, or other piezometric surface, by the extraction of water from a well at a given rate. The volume of the cone will vary with the rate of withdrawal of water. Also called the ***Cone of Influence***.

Cone of Influence: The depression, roughly conical in shape, produced in a water table, or other piezometric surface, by the extraction of water from a well at a given rate. The volume of the cone will vary with rate of withdrawal of water. Also called the ***Cone of Depression***.

Confined Ground Water: Ground water held under an aquiclude or an aquifuge called artesian if the pressure is positive.

Confluence: A pattern of wind flow in which air flows inward toward an axis oriented parallel to the general direction of flow. It is the opposite of difluence. Confluence is not the same as convergence. Winds often accelerate as they enter a confluent zone, resulting in speed divergence which offsets the (apparent) converging effect of the confluent flow.

Conjugate of a Complex Number: If c = a + i*b is a complex number, then c* = a - i*b is its complex conjugate.

Congressional Organic Act of 1890: The act that assigned the responsibility of river and floor forecasting for the benefit of the general welfare of the Nation's people and economy to the Weather Bureau, and subsequently the National Weather Service.

Conservation Storage: Storage of water for later release for usual purposes such as municipal water supply, power, or irrigation in contrast with storage capacity used for flood control..

Considerable Cloudiness: When the predominant/average sky condition is covered by more than half, but not completely covered by opaque (not transparent) clouds. In other words, 5/8 to 7/8 of the sky is covered by opaque clouds. Same as ***Considerable Cloudiness***.

Consolidated Ice Cover: Ice cover formed by the packing and freezing together of floes, brash ice and other forms of floating ice.

Contents: The volume of water in a reservoir. Unless otherwise indicated reservoir content is computed on the basis of a level pool and does not include bank storage.

Continental Shelf (CONSHELF): The zone bordering a continent and extending to a depth, usually around 100 fathoms (600 feet), from which there is a steep descent toward greater depth.

Continental Slope: The area of descent from the edge of the continental shelf into greater depth.

Control Points: Horizontal and Vertical: Small monuments securely embedded in the surface of the dam. Any movement of the monument indicates a movement in the dam itself. Movements in the dam are detected by comparing control points location to location of fixed monuments located off the dam using accurate survey techniques.

CONUS: An acroynm for Continental United States.

Convection: Generally, transport of heat and moisture by the movement of a fluid. In meteorology, the term is used specifically to describe vertical transport of heat and moisture, especially by updrafts and downdrafts in an unstable atmosphere. The terms "convection" and "thunderstorms" often are used interchangeably, although thunderstorms are only one form of convection. Cumulonibus (Cb), towering cumulus clouds, and Altocumulus Castellanus (ACCAS) clouds all are visible forms of convection. However, convection is not

always made visible by clouds. Convection which occurs without cloud formation is called dry convection, while the visible convection processes referred to above are forms of moist convection.

Convective Available Potential Energy (CAPE or B+): It defines the vertically integrated positive buoyancy of an adiabatically rising air parcel on a sounding. This is proportional to the amount kinetic energy that the air parcel gains while it is warmer that its surrounding environment. As a result, CAPE provides the best measure of the potential instability available in the atmosphere. Increasing values of CAPE generally lead to progressively vigorous convection. However, severe thunderstorms can form in environments showing weak to moderate CAPE, especially if the Storm Relative Helicity values are high.

Convective Clouds: The vertically developed family of clouds are cumulus and cumulonimbus. The height of their bases range from as low as 1,000 feet to a bit more than 10,000 feet. Clouds with extensive vertical development are positive indications of unstable air. Strong upward currents in vertically developed clouds can carry high concentrations of supercooled water to high levels where temperatures are quite cold. Upper portions of these clouds may be composed of water and ice.

Convective Condensation Level (CCL): It is the height to which a parcel of air, if heated sufficiently from below, will rise adiabatically until it is just saturated (condensation starts). It approximates the base height of cumuliform clouds which are, or would be, produced by surface heating.

Convective INhibition (CIN or B-): It represents the cumulative effect of atmospheric layers the are warmer than the parcel moving vertically along the adiabat. Low level parcel ascent is often inhibited by such stable layers near the surface. If natural processes fail to destabilize the lower levels, an input of energy from forced lift (a front, an upper level shortwave, etc.) will be required to move the negatively buoyant air parcels to the point where they will rise freely. Since CIN is proportional to the amount of kinetic energy that a parcel loses to buoyancy while it is colder than the surrounding environment, it contributes to the downward momentum.

Convective Outlook (SWO): A forecast containing the area(s) of expected thunderstorm occurrence and expected severity over the contiguous United States, issued several times daily by the SPC in Norman, Oklahoma. They are sent out as both a narrative and a graphic covering a period of up to 52 hours in advance. This product serves as guidance to the local National Weather Service Office for use in the preparation of forecast products issued; to advise the public, media, and other interests of the possibility of severe weather; and to assist with preliminary staffing should severe weather be anticipated. The terms ***approaching***, ***slight risk***, ***moderate risk***, and ***high risk*** are used to describe severe thunderstorm potential. Local versions sometimes are prepared by local NWS offices. It is sometimes called ***Anticipated Convection (AC) Outlook***.

Convective Rain: Rain associated with convective or cumuliform clouds characterized by vertical development in the form of rising mounds, domes, or towers.

Convective Rings and Bands: Like "Stratiform Rings and Bands" they occur outside the eye wall of the hurricane. They exhibit a *VIP* Level 2 or greater reflectivity and occasionally display the ″bright band″ aloft. When they pass over a location, the wind speed increases by as much as 50%, accompanied by a significant increases in the rainfall rate. When tornadoes and down bursts occur, they are likely to come from convective rings and bands.

Convective SIGMETs: These NWS aviation products are issued in the conterminous U.S. for any of the following:

Severe thunderstorm due to:
- surface winds greater than or equal to 50 knots
- hail at the surface greater than or equal to 3/4 inches in diameter
- tornadoes

Embedded thunderstorms
Line of thunderstorms
Thunderstorms greater than or equal to VIP level 4 affecting 40% or more of an area at least 3000 square miles.

Any Convective SIGMET implies severe or greater turbulence, severe icing, and low level wind shear. A Convective SIGMET may be issued for any convective situation which the forecaster feels is hazardous to all categories of aircraft.

Convective SIGMET bulletins are issued for the Eastern (E), Central (C), and Western (W) United States. The areas separate at 87 and 107 degrees west longitude with sufficent overlap to cover most cases when the phenomenon crosses the boundaries. Bulletins are issued hourly at Hour+55. The text of the bulletin consists of either an observation and a forecast or just a forecast. The forecast is valid for up to 2 hours.

Convective Temperature: It is the surface temperature that must be reached to start the formation of convective clouds by solar heating of surface-air layer. Calculation of the convective temperature involves many assumptions, such that thunderstorms sometimes develop well before or well after the convective

temperature is reached (or may not develop at all). However, in some cases the convective temperature is a useful parameter for forecasting the onset of convection.

Convergence: A contraction of a vector field; the opposite of divergence. Convergence in a horizontal wind field indicates that more air is entering a given area than is leaving at that level. To compensate for the resulting "excess," vertical motion may result: upward forcing if convergence is at low levels, or downward forcing (subsidence) if convergence is at high levels. Upward forcing from low-level convergence increases the potential for thunderstorm development (when other factors, such as instability, are favorable). Compare with confluence.

Convergence Line: A horizontal line along which horizontal convergence of the airflow is occurring. Common forms of convergence lines are sea-breeze fronts, cold-air outflow from thunderstorms, and synoptic fronts.

Conveyance Loss: The loss of water from a conduit due to leakage, seepage, evaporation, or evapo-transpiration.

Cooling Degree Day: see **Degree Day**

Cooperative Observer: An individual (or institution) who takes precipitation and temperature observations-and in some cases other observations such as river stage, soil temperature, and evaporation-at or near their home, or place of business. Many observers transmit their reports by touch-tone telephone to an NWS computer, and nearly all observers mail monthly reports to the National Climatic Data Center to be archived and published.

Coordinated Universal Time (UTC): The time in the zero degree meridian time zone. In order to convert to Eastern Standard Time, subtract 5 hours (Eastern Daylight Time subtract 4 hours). For example, 0900 UTC is 4:00 AM EST or 5:00 AM EDT.

Core Punch: Slang for a penetration by a vehicle into the heavy precipitation core of a thunderstorm. Core punching is not a recommended procedure for storm spotting.

Coriolis Effect: The effect caused by the Earth's rotation which deflects air moving between two places. It causes an object to move to the right in the Northern Hemisphere and to the left in the Southern Hemisphere.

Corn Snow Ice: Rotten granular ice.

Corner Effects: A small-scale convergence effect that can be quite severe. It occurs around steep islands and headlands.

Correlation: A measure of the similarity between variables or functions.

County Warning Area (CWA): All the counties or parishes assigned to a specific National Weather Service Office (NWSO) for the purpose of warnings issuance and hazard awareness responsibility.

Couplet: Adjacent maxima of radial velocities of opposite signs.

Covariance: A measure of the degree of association between two variables. In Doppler radars, the argument (or angle) of the covariance of the complex signal is a measure of the Doppler frequency.

Crack: A separation formed in an ice cover of floe that does not divide it into two or more pieces.

Creek: A small stream of water which serves as the natural drainage course for a drainage basin of nominal, or small size. The term is a relative one as to size, some creeks in the humid section would be called rivers if they occurred in the arid portion.

Crest: 1) The highest stage or level of a flood wave as it passes a point. 2) The top of a dam, dike, spillway, or weir, to which water must rise before passing over the structure.

Crest Gage: A gage used to obtain a record of flood crests at sites where recording gages are installed.

Crest (Top) of Dam: The elevation of the uppermost surface of a dam excluding any parapet walls, railings, etc.

Crest Width (Top thickness): The thickness or width of a dam at the level of the crest (top) of the dam. The term "thickness" is used for gravity and arch dams and "width" for other types of dams.

Critical Depth: The depth of water flowing in an open channel or conduit, partially filled, corresponding to one of the recognized critical velocities.

Critical Flow: A condition of flow where the mean velocity is at one of the critical values; ordinarily at

Belanger's critical depth and velocity. Another important usage is in reference to the Reynolds' critical velocities which define the point at which the flow changes from streamline or nonturbulent to turbulent flow.

Critical Rainfall Probability (CRP): The Probability that the actual precipitation during a rainfall event has exceeded or will exceed the flash flood guidance value.

Cross Seas: Steep waves with short, sharp wave crests. They form when two or more wave trains moving in different directions run together.

Cross Section: See ***radar cross section***.

Cross-Sectional Area: Area perpendicular to the direction of flow.

CRP (Critical Rainfall Probability): The Probability that a given rainfall will cause a river, or stream to rise above flood stage.

Cryology: The science of the physical aspects of snow, ice, hail, and sleet and other forms of water produced by temperatures below Zero degrees Celsius.

Cryophobia: Fear of extreme cold, ice, or frost.

CSI: An acronym for Conditional Symmetric Instability. See ***Conditional Symmetric Instability***.

CU: An acronym for Cumulus. See ***Cumulus***.

Cubic Feet Per Second (CFS): A unit expressing rates of discharge. One cubic foot per second is equal to the discharge through a rectangular cross section, 1 foot wide by 1 foot deep, flowing at an average velocity of 1 foot per second. It is also approximately 7.48 gallons per second.

Cumuliform: Descriptive of all clouds with vertical development in the form of rising mounds, domes, or towers.

Cumuliform Anvil: A thunderstorm anvil with visual characteristics resembling cumulus-type clouds (rather than the more typical fibrous appearance associated with cirrus). A cumuliform anvil arises from rapid spreading of a thunderstorm updraft, and thus implies a very strong updraft. See ***anvil rollover***, ***knuckles***, and ***mushroom***.

Cumulonimbus Cloud (Cb): They are the ultimate manifestation of instability. They are vertically developed clouds of large dimensions with dense "boiling" tops often crowned with thick veils of dense cirrus (anvil). This is also called a "thunderstorm cloud". It can produce very heavy precipitation, lightning, large hail (greater than 3/4 inch), damaging winds, and tornadoes.

Cumulonimbus Mammatus Cloud (CBMAM): It is associated with a cumulonimbus cloud. It indicates extreme instability. This cloud is characterized by hanging festoons or protuberances underneath the anvil of the Cumulonimbus Cloud (Cb). The festoons may be at any level of the cloud from the underside of the anvil to the base of the cloud.

Cumulus Cloud (Cu): These clouds form in convective currents and are characterized by relatively flat bases and dome-shaped tops. Fair weather cumulus do not show extensive "towers" or vertical development and do not produce precipitation. A cumulus may, however, be an early stage in the development of towering cumulus or cumulonimbus. More often fair weather cumulus indicate a relatively shallow layer of instability.

Cumulus Congestus: Same as towering cumulus. Sometimes referred to just as congestus.

Current Meter: Device used to measure the water velocity or current in a river.

Curtain Drain: A drain constructed at the upper end of the area to be drained, to intercept surface or ground water flowing toward the protected area from higher ground, and carry it away from the area. Also called an ***Intercepting Drain***.

Curvature: The reciprocal of the radius of a circle; the rate of change in the deviation of a given arc from any tangent to it.

Cutoff Low: A closed low which has become completely displaced (cut off) from basic westerly current, and moves independently of that current. Cutoff lows may remain nearly stationary for days, or on occasion may move westward opposite to the prevailing flow aloft (i.e., retrogression). "Cutoff low" and "closed low" often are used interchangeably to describe low pressure centers aloft. However, not all closed lows are completely removed from the influence of the basic westerlies. Therefore, the recommended usage of the terms is to reserve the use of "cutoff low" only to those closed lows which clearly are detached completely from the

westerlies.

Cuttoff: An impervious construction or material which reduces seepage or prevents it.

Cyclic Storm: A thunderstorm that undergoes cycles of intensification and weakening (pulses) while maintaining its individuality. Cyclic supercells are capable of producing multiple tornadoes (i.e., a tornado family) and/or several bursts of severe weather. A storm which undergoes only one cycle (pulse), and then dissipates, is known as a pulse storm.

Cyclogenesis: Development or intensification of a low-pressure center (cyclone).

Cyclone: An area of low atmospheric pressure that has a closed circulation. Cyclones (or more commonly called "low pressure areas") rotate counter-clockwise in the Northern Hemisphere and clockwise in the Southern Hemisphere. They usually bring about clouds and precipitation.

Cyclonic Circulation (or Cyclonic Rotation): Circulation (or rotation) which is in the same sense as the Earth's rotation, i.e., counterclockwise (in the Northern Hemisphere) as would be seen from above. Nearly all mesocyclones and strong or violent tornadoes exhibit cyclonic rotation, but some smaller vortices, such as gustnadoes, occasionally rotate anticyclonically (clockwise). Compare with ***anticyclonic rotation***.

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Weather Planner
Climate
Local Climate
Climate Prediction

D

Daily Climatological Report: As the name indicates, this climatological product is issued daily by each National Weather Service office. Most of the climatological data in this report are presented in a tabular form; however, some narrative statements may also be used in the product. The report is organized so that similar items are grouped together (i.e., temperature, precipitation, wind, sunrise and sunset times, etc.).

Daily Flood Peak: The maximum mean daily discharge occurring in a stream during a given flood event.

Dam: Any artificial barrier which impounds or diverts water. The dam is generally hydrologically significant if it is: 1) 25 feet or more in height from the natural bed of the stream and has a storage of at least 15 acre-feet. 2) Or has an impounding capacity of 50 acre-feet or more and is at least six feet above the natural bed of the stream.

DAMBRK: The Dam Break Forecasting Model.

Dam Failure: Catastrophic event characterized by the sudden, rapid, and uncontrolled release of impounded water.

DAPM: The Data Acquisition Program Manager.

DATACOL: The Software System that supports RFC gateway functions.

DATANET: Hydrologic Data Network Analysis Software.

Day-Second Feet: Often abbreviated as DSF. See Second-Day Feet.

dBm: A logarithmic expression for power, referenced to 1 milliwatt. dBm = 10 log (power / 1 mW). See ***decibel***.

dBZ: A logarithmic expression for reflectivity factor, referenced to (1 mm^6 / 1 m^3). dBZ = 10 log (z / 1 mm^6 m^3). See ***decibel***.

DCP (Data Collection Platform): An electronic device that connects to a river or rainfall gage that records data from the gage and at pre-determined times transmits that data through a satellite to a remote computer.

DDS: Data Distribution System.

Dead Fuel Moisture: Dead fuel moisture responds solely to ambient environmental conditions and is critical in determining fire potential. Dead fuel moistures are classed by time lag. A fuel's timbale is proportional to its diameter and is loosely defined as the time it takes a fuel particle to reach 2/3's of its way to equilibrium with its local environment. Dead fuels in NFDRS have four timbale classes:

1-hr: Fine flashy fuels, less than 1/4" diameter. Responds quickly to weather changes. Computed

Weather Safety
Storm Ready
Education
NOAA Weather Radio
Skywarn
Miscellaneous
Weather Now
Wireless Forecasts
Computer Guidance
Weather Stories
News Archive
Weather Links
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from observation time temperature, humidity and cloudiness.

10-hr: 1/4 to 1" diameters. Computed from observation time temperature, humidity, and cloudiness, or may be a standard set of "10-Hr Fuel Sticks" that are weighed as part of the fire weather observation.

100-hr: 1 to 3" diameter. Computed from 24 hour average boundary condition composed of day length, hours of rain, and daily temperature/humidity ranges.

1000-hr: 3 to 6 " diameter. Computed from a 7-day average boundary condition composed of day length, hours of rain, and daily temperature/humidity ranges.

Dead Storage: The volume in a reservoir below the lowest controllable level.

Dealiasing: Process of correcting for aliases in the velocity measurement. Also known as unfolding.

Debris Cloud: A rotating "cloud" of dust or debris, near or on the ground, often appearing beneath a condensation funnel and surrounding the base of a tornado. This term is similar to dust whirl, although the latter typically refers to a circulation which contains dust but not necessarily any debris. A dust plume, on the other hand, does not rotate. Note that a debris cloud appearing beneath a thunderstorm will confirm the presence of a tornado, even in the absence of a condensation funnel.

Decibel (dB): This is a logarithmic expression comparing the energy that the radar emits (Z_1) to the energy that radar receives back from a radar target (Z_2). It is expressed mathematically as
$Z\ (dBZ) = 10 \log (Z_1/Z_2)$ The solution to this equation lets the radar operator know the strength of a target. The value of Z is a function of the amount of radar beam energy that is back scattered by a target and detected as a signal (or echo). Higher values of Z (and dBZ) thus indicate more energy being back scattered by a target. The amount of back scattered energy generally is related to precipitation intensity, such that higher values of dBZ that are detected from precipitation areas generally indicate higher precipitation rates. However, other factors can affect reflectivity, such as width of the radar beam, precipitation type, drop size, or the presence of ground clutter or AP. WSR-88D radars can detect reflectivities as low as -32 dBZ near the radar site, but significant (measurable) precipitation generally is indicated by reflectivities of around 15 dBZ or more. Values of 50 dBZ or more normally are associated with heavy thunderstorms, perhaps with hail, but as with most other quantities, there are no reliable threshold values to confirm the presence of hail or severe weather in a given situation. See ***VIP*** for threshold dBZ values associated with each VIP level.

Deep Percolation Loss: Water that percolates downward through the soil beyond the reach of plant roots.

Deep Seepage: Infiltration which reaches the water table.

Deep Well: A well whose pumping head is too great to permit use of a suction pump.

Deformed Ice: A general term for ice which has been squeezed together and forced upwards and downwards in places. Subdivisions are rated ice, ridge ice, hummocked ice, and other similar deformations.

Degradation: The geologic process by means of which various parts of the surface of the earth are worn down and carried away and their general level lowered, by the action of wind and water.

Degree Day: It gauges the amount of heating or cooling needed for a building using 65 degrees as a baseline. To compute heating/cooling degree-days, take the average temperature for a day and subtract the reference temperature of 65 degrees. If the difference is positive, it is called a "**Cooling Degree Days**". If the difference is negative, it is called a "**Heating Degree Days**". The magnitude of the difference is the number of days. For example, if your average temperature is 50 degrees for a day in September, the difference of the average temperature for that day and the reference temperature of
65 degrees would yield a minus 15. Therefore, you know that you are going to have Heating Degree Days that day. Since the magnitude of the difference is 15, you know that you are going to have 15 Heating Degree Days. Electrical, natural gas, power, and heating, and air conditioning industries utilize heating and cooling degree information to calculate their needs.

DELMARVA: An acronym for Delaware/Maryland/Virginia.

Delta: An alluvial deposit, often in the shape of the Greek letter "delta", which is formed where a stream drops its debris load on entering a body of quieter water.

Delta T: 1) A simple representation of the mean lapse rate within a layer of the atmosphere, obtained by calculating the difference between observed temperatures at the bottom and top of the layer. Delta Ts often are computed operationally over the layer between pressure levels of 700 mb and 500 mb, in order to evaluate the amount of instability in mid-levels of the atmosphere. Generally, values greater than about 18 indicate sufficient instability for severe thunderstorm development. 2) A way of determining whether lake effect snow showers are likely to develop over the Great Lakes. Typically, this is done by taking the absolute

value of the difference in temperature between the 850 mb temperature and the lake water temperature. Typically, 13 degree C or more is needed for lake effect snow showers to develop over The Great Lakes. However, an 8 degree C difference can help enhance system snow.

Dendrites: Thin branch-like growth of ice on the water surface.

Dendritic: The form of the drainage pattern of a stream and it's tributaries when it follows a treelike shape, with the main trunk, branches, and twigs corresponding to the main stream, tributaries, and subtributaries, respectively, of the stream.

Dense Fog Advisory: This product is issued by the National Weather Service when widespread fog reduces visibility to less than or equal to 1/4 mile.

Density Current: A flow of water maintained by gravity through a large body of water, such as a reservoir or lake, and retaining its unmixed identity because of a difference in density.

Density of Snow: The ratio, expressed as a percentage, of the volume which a given quantity of snow would occupy if it were reduced to water, to the volume of the snow. When a snow sampler is used, it is the ratio expressed as percentage of the scale reading on the sampler to the length of the snow core or sample.

Depth of Runoff: The total runoff from a drainage basin, divided by its area. For convenience in comparing runoff with precipitation, the term is usually expressed in inches of depth during a given period of time over the drainage area or acre-feet per square mile.

Depletion Curve: That part of the hydrograph extending from the point of termination of the Recession Curve to the subsequent rise or alternation of inflow due to additional water becoming available for stream flow.

Depression Storage: The volume of water contained in natural depressions in the land surface, such as puddles.

Derecho: (Pronounced day-RAY-cho) A widespread and usually fast-moving windstorm associated with convection. Derechos include any family of downburst clusters produced by an extratropical mesoscale convective weather system (MCS), and can produce damaging straight-line winds over areas hundreds of miles long and more than 100 miles across. There are 2 types of derecho-producing convective systems. They are serial and progressive. See ***Progressive Derecho*** and ***Serial Derecho***.

Derived Products: Processed base data on the Doppler radar.

Design Criteria: The hypothetical flood used in the sizing of the dam and the associated structures to prevent dam failure by overtopping, especially for the spillway and outlet works.

Detection Efficiency: The percentage of the total number of cloud-to-ground flashes that the network locates and records and is a function of range.

Detention Basins: Structures which are built upstream from a populated area so that precipitation flows do not flood and cause the loss of life or property. They are normally dry, but are designed to detain surface water temporarily during, and immediately after a runoff event. Their primary function is to attenuate the storm flows by releasing flows at a lower flow rate. There are no gates or valves allowed on the outlet so that water can never be stored on a long-term basis. Typical detention times in such a basin would be on the order of 24 to 72 hours although some are as long as 5 to 10 days.

Detention Storage: The volume of water, other than depression storage, existing on the land surface as flowing water which has not yet reached the channel.

Detritus: 1) the heavier mineral debris moved by natural watercourses, usually in bed-load form. 2) the sand, grit, and other coarse material removed by differential sedimentation in a relatively short period of detention.

Developing Gale/Storm: In the National Weather Service High Seas Forecast, a headline used in the warnings section to indicate that gale/storm force winds are not now occurring, but they are expected before the end of the forecast period.

Developing Gale: Used in the National Weather Service High Seas Forecast. It refers to an extratropical low or an area in which gale force winds of 34 knots (39 mph) to 47 knots (54 mph) are "expected" by a certain time period. On surface analysis charts a developing gale indicates gale force winds within the next 36 hours. When the term developing gale is used on the 48 hour surface forecast and 96 hour surface forecast charts, gale force winds are expected to develop by 72 hours and 120 hours, respectively.

Developing Storm: Used in the National Weather Service High Seas Forecast. It refers to an extratropical low or an area in which storm force winds of 48 knots (55 mph) or greater are "expected" by a certain time period. On surface analysis charts a developing storm indicates storm force winds forecast within the next 36 hours. When the term developing storm is used on the 48 hour surface and 96 hour surface charts, storm force

winds are expected to develop by 72 hours and 120 hours, respectively.

Dew: Water droplets that form upon surfaces on or near the ground when air is cooled toward its dew point.

Dew Point (Dew-Point Temperature): A measure of atmospheric moisture. The temperature to which air must be cooled, at constant pressure and moisture content, in order for saturation to occur. The higher the dew point, the greater amount of water vapor in the air mass.

Dew Point Front: A narrow zone (mesoscale feature) of extremely sharp moisture gradient and little temperature gradient. It separates moist air from dry air. Severe weather can be associated with this front. It is also known as a "**dryline**" or "dry front".

Dielectric Constant: For a given substance, the ratio of the capacity of a condenser with that substance as dielectric to the capacity of that condenser with a vacuum as dielectric. The dielectric constant of precipitation partially determines its reflectivity; this is partially the reason the same rate of snow and water precipitation will have different reflectivities.

Differential Motion: Cloud motion that appears to differ relative to other nearby cloud elements, e.g. clouds moving from left to right relative to other clouds in the foreground or background. Cloud rotation is one example of differential motion, but not all differential motion indicates rotation. For example, horizontal wind shear along a gust front may result in differential cloud motion without the presence of rotation.

Difluence (or Diffluence): A pattern of wind flow in which air moves outward (in a "fan-out" pattern) away from a central axis that is oriented parallel to the general direction of the flow. It is the opposite of confluence. Difluence in an upper level wind field is considered a favorable condition for severe thunderstorm development (if other parameters are also favorable). But difluence is not the same as divergence. In a difluent flow, winds normally decelerate as they move through the region of difluence, resulting in speed convergence which offsets the apparent diverging effect of the difluent flow.

Differential Reflectivity (Z_dr): A measure of the difference in reflectivity of a target when the transmitted waves are polarized horizontally or vertically.

Diffraction: The bending of light around objects, such as clouds and fog droplets, producing fringes of light and dark colored bands.

Diffuse Ice: Poorly defined ice edge limiting an area of dispersed ice; usually on the leeward side of an area of floating ice.

Digital Marine Weather Dissemination System (D-MAWDS): A menu driven computer system which provides cooperating mariners with weather information such as observations, forecasts, charts, advisories, warnings, etc.

Dipole Pattern: The systematic polarity pattern or spatial distribution of concentrated + and - strike points of lightning flashes on the ground. The + and - centers may be a couple of hundred miles apart.

Dipolar Structure: The dominate accumulations of + and - charges in a thunderstorm cell (+ charge in the upper part of the cloud and - charge in the bottom part of the cloud).

Direct Flood Damage: The damage done to property, structures, goods, etc., by a flood as measured by the cost of replacement and repairs.

Direct Runoff: The runoff entering stream channels promptly after rainfall or snowmelt. Superposed on base runoff, it forms the bulk of the hydrograph of a flood.

Directional Shear: The component of wind shear which is due to a change in wind direction with height, e.g., southeasterly winds at the surface and southwesterly winds aloft. A veering wind with height in the lower part of the atmosphere is a type of directional shear often considered important for tornado development.

Disaster Awareness: All local National Weather Service Offices (NWSFO or NWFO) are responsible for public safety education, cooperation with outside agencies and organizations, and providing assistance to communities and counties in their county warning area (CWA) regarding the development of local warning systems and spotter networks.

Discharge: The rate at which water passes a given point. Discharge is expressed in a volume per time with units of L3/T. Discharge is often used interchangeably with streamflow.

Discharge Curve: A curve that expresses the relation between the discharge of a stream or open conduit at a given location and the stage or elevation of the liquid surface at or near that location. Also called ***Rating Curve*** and ***Discharge Rating Curve***.

Discharge Table: 1) A table showing the relation between two mutually dependent quantities or variable

over a given range of magnitude. 2) A table showing the relation between the gage height and the discharge of a stream or conduit at a given gaging station. Also called a ***Rating Table***.

Disdrometer: Equipment that measures and records the size distribution of raindrops.

Distortion: Change in a signal resulting in gross nonlinearities in signal processing or handling.

Distribution (Hydro)Graph: A unit hydrograph of direct runoff modified to show the proportions of the volume of runoff that occur during successive equal units of time.

Diurnal: Daily; related to actions which are completed in the course of a calendar day, and which typically recur every calendar day (e.g., diurnal temperature rises during the day, and diurnal falls at night).

Divergence: A measure of the the expansion or spreading out of a vector field; usually said of horizontal winds. It is the opposite of convergence. Divergence at upper levels of the atmosphere enhances upward motion, and hence the potential for thunderstorm development (if other factors also are favorable).

Diversion: The taking of water from a stream or other body of water into a canal, pipe, or other conduit.

Divide: The high ground that forms the boundary of a watershed. A divide is also called a ridge.

DNR: Department of Natural Resources.

DOH: Development and Operations Hydrologist.

Domestic Consumption: The quantity, or quantity per capita, of water consumed in a municipality or district for domestic uses or purposes during a given period, generally one day. It is usually taken to include all uses included within the term Municipal Use of Water and quantity wasted, lost, or otherwise unaccounted for.

Domestic SIGMET (SIGnificant METeorlogical Information): This NWS aviation product advises of weather potentially hazardous to all aircraft other than convective activity. In the conterminous U.S., items covered are:

Severe icing
Severe or extreme turbulence
Duststorms and sandstorms lowering visibilities to less that three (3) miles.
Volcanic Ash

In Alaska and Hawaii, SIGMETS are also issued for the following events:

Tornadoes
Lines of thunderstorms
Embedded thunderstorms
Hail greater than or equal to 3/4 inch in diameter

For the lower 48 states and adjacent coastal waters, Convective SIGMETS are issued hourly for Thunderstorm-related aviation hazards.

These SIGMET items are considered to be widespread because they must be affecting or be forecast to affect an area of at least 3000 square miles at any one time. However, if the total area to be affect during the forecast period is very large, it could be that only a small portion of this total area would be affected at any one time.

SIGMETs are issued for 6 hour periods for conditions associated with hurricanes and 4 hours for all other events. If conditions persist beyond the forecast period, the SIGMET is updated and reissued.

Domestic Use of Water: The use of water primarily for household purposes, the watering of livestock, the irrigation of gardens, lawns, shrubbery, etc., surrounding a house or domicile.

Doppler Dilemma: The interdependence of **maximum unambiguous range** and maximum unambiguous velocity on the **pulse repetition frequency, PRF**. As **PRF** is increased (decreased) , the range of unambiguous velocities increases (decreases), but the **unambiguous range** decrease (increases). Vmax * Rmax = c * l / 8, where Vmax is maximum unambiguous velocity, Rmax is maximum unambiguous range, c is speed of light, and l is wavelength.

Doppler Frequency Shift: f = 2 * V / l, where V is radial velocity of the target, l is the wavelength

Doppler Radar (National Weather Service Doppler Weather Radar): A new **W**eather **S**urveillance **R**adar (**WSR-88D)** system developed in 1988. About 120 systems were installed at Weather Forecast Offices. An additional 24 systems was installed at Department of Defense (Air Force Bases) sites. This powerful and sensitive Doppler system generates many useful products for meteorologists, among them: standard

reflectivity "echoes," wind "velocity" or atmospheric air motion pictures, and areal 1-hour, 3-hour, or storm-total precipitation images. This radar can also measure radial velocity, the instantaneous component of motion parallel to the radar beam (i.e., toward or away from the radar antenna).

Doppler Shift: The change in observed **frequency** of wave energy due to the relative motion of the observer and wave source. For example, as a train approaches your location, you hear a higher pitch sound. After the train has passed your location, you will hear a lower pitch sound. The Doppler radar uses this change in frequency to determine the velocity and direction of the wind.

Downburst: A strong down draft, initiated by a thunderstorm, that induces an outburst of damaging straight line winds on or near the ground. Downburst winds can produce damage similar to a strong tornado. The damage from aloft often looks like a star with debris spreading out from the center in straight lines. Although usually associated with thunderstorms, downbursts can occur with showers too weak to produce thunder. Down bursts come in the following to 2 categories: ***microburst*** and ***macroburst***. See ***Microburst*** and ***Macroburst***.

Downdraft: A small-scale column of air that rapidly sinks toward the ground, usually accompanied by precipitation as in a shower or thunderstorm. A downburst is the result of a strong downdraft.

Downslope/Upslope Flow: Air that descends down a mountain chain or over sloping terrain (pressurized air moving from high pressure to low pressure), resulting in subsequent drying, and in some cases, dramatic warming of air that can quickly melt a snowcover. Local names for Down slope winds or "foehn winds" in the western United States are Chinook Winds, East Winds, North Winds and Mono Winds. Usually associated with little or no clouds. On the other hand, the upslope flow is representative of air being lifted by rising terrain and is normally associated with extensive clouds and/or precipitation.

Downstream: In the same direction as a stream or other flow, or toward the direction in which the flow is moving.

Downstream Slope: The slope or face of the dam away from the reservoir water. This slope requires some kind of protection (e.g. grass) from the erosive effects of rain and surface flow.

Drainage Area: An area having a common outlet for its surface runoff (also see Watershed and Catchment Area).

Drainage Basin: A part of the surface of the earth that is occupied by a drainage system, which consists of a surface stream or a body of impounded surface water together with all tributary surface streams and bodies of impounded surface water. *See* ***Basin***.

Drainage Density: The relative density of natural drainage channels in a given area. It is usually expressed in terms of miles of natural drainage or stream channel per square mile of area, and obtained by dividing the total length of stream channels in the area in miles by the area in square miles.

Drainage Divide: The boundary line, along a topographic ridge or along a subsurface formation, separating two adjacent drainage basins.

Drains (Relief Wells): A vertical well or borehole, usually downstream of impervious cores, grout curtains or cutoffs, designed to collect and direct seepage through or under a dam to reduce uplift pressure under or within a dam. A line of such wells forms a "drainage curtain".

Drawdown: The lowering of the surface elevation of a body of water, the water surface of a well, the water table, or the piezometric surface adjacent to the well, resulting from the withdrawl of water therefrom.

Dredging: The scooping, or suction of underwater material from a harbor, or waterway. Dredging is one form of channel modification. It is often too expensive to be practical because the dredged material must be disposed of somewhere and the stream will usually fill back up with sediment in a few years. Dredging is usually undertaken only on large rivers to maintain a navigation channel.

Drifting Ice: Pieces of floating ice moving under the action of wind and/ or currents.

Drifting Snow: It is an uneven distribution of snowfall/snow depth caused by strong surface winds. Drifting snow may occur during or after a snowfall. Drifting snow is usually associated with blowing snow.

Drizzle (DZ): Fairly uniform precipitation composed exclusively of fine drops with diameters less than 0.02 inch (0.5 mm) which are very close together. Drizzle appears to float while following air currents, although unlike fog droplets, it falls to the ground. The intensity of drizzle is based solely on visibility. The following table shows drizzle intensity versus visibility:

Drizzle Intensity versus Visibility	
Drizzle Intensity	**Visibility**

Light	greater than ½ statue mile
Moderate	1/4 to ½ statue mile
Heavy	less 1/4 statue mile

Drought: A period of abnormally dry weather sufficiently prolonged from the lack of precipitation to cause a serious hydrologic imbalance.

Drought Index: Computed value which is related to some of the cumulative effects of a prolonged and abnormal moisture deficiency. (An index of hydrological drought corresponding to levels below the mean in streams, lakes, and reservoirs.)

Dry Adiabat: A line of constant potential temperature on a thermodynamic chart.

Dry Adiabatic Rate: The rate of change of temperature in rising or descending unsaturated air parcel. The rate of adiabatic cooling or warming is 5.5°F per 1,000 feet (10°C per 1,000 meters).

Dry Crack: Crack visible at the surface but not going right through the ice cover, and therefore it is dry.

Dry Floodproofing: A dry floodproofed building is sealed against floodwaters. All areas below the flood protection level are made watertight. Walls are coated with waterproofing compounds or plastic sheeting. Openings like doors windows, sewer lines and vents are closed, weather permanently, with removable shields, or with sandbags. The flood protection level should be no more than 2 or 3 feet above the top of the foundation because the buildings walls and floors cannot withstand the pressure of deeper water.

Dryline: A boundary separating moist and dry air masses and an important factor in severe weather frequency in the Great Plains. It typically lies north-south across the central and southern high Plains states during the spring and early summer, where it separates moist air from the Gulf of Mexico (to the east) and dry desert air from the southwestern states (to the west). The dry line typically advances eastward during the afternoon and retreats westward at night. However, a strong storm system can sweep the dry line eastward into the Mississippi Valley, or even further east, regardless of the time of day. A typical dry line passage results in a sharp drop in humidity (hence the name), clearing skies, and a wind shift from south or southeasterly to west or southwesterly. (Blowing dust and rising temperatures also may follow, especially if the dry line passes during the daytime; see dry punch). The dry line's eastward movement at the surface is often not as fast as it is aloft. Dry air at about 1000 feet can overrun the moist air, creating what is called a capping inversion. Hot air over warm air acts like a lid that keeps heated air from rising, On some days this lid is very thick preventing the blossoming of storms. But on other days, the lid holds the unstable air down for only so long before it breaks through the inversion and clouds explode into thunderstorms. Storms may grow to 50,000 feet or higher in minutes as moist air rockets skyward at 100 mph, creating large hail, torrential rain, deadly lightning and strong winds. And with low-level winds changing speed and direction with height, from south to southwest then to west, storms are likely to rotate, which can lead to powerful tornadoes. The thunderstorms most likely to produce tornadoes are called supercells and are often a product of the severe weather trigger known as the dry line. When the dry line retreats westward at night, the dew points will rise rapidly and the wind will shift from the west or southwest to the south or southeast. See Low Precipitation storm. It is also known as a "dewpoint front" or "dry front".

Dryline Bulge: A bulge in the dry line, representing the area where dry air is advancing most strongly at lower levels (i.e., a surface dry punch). Severe weather potential is increased near and ahead of a feature.

Dryline Storm: Generally, any thunderstorm that develops on or near a dry line. The term often is used synonymously with a Low Precipitation (LP) thunderstorm, since the latter almost always occurs near the dry line.

Dry Microburst: - A microburst with little or no precipitation reaching the ground; most common in semi-arid regions. They may or may not produce lightning. Dry microbursts may develop in an otherwise fair-weather pattern; visible signs may include a cumulus cloud or small Cb with a high base and high-level virga, or perhaps only an orphan anvil from a dying rain shower. At the ground, the only visible sign might be a dust plume or a ring of blowing dust beneath a local area of virga. Compare with wet microburst.

Dry Punch: Slang for a surge of drier air; normally a synoptic-scale or mesoscale process. A dry punch at the surface results in a dry line bulge. A dry punch aloft above an area of moist air at low levels often increases the potential for severe weather.

Dry Slot: A zone of dry (and relatively cloud-free) air which wraps east- or northeastward into the southern and eastern parts of a synoptic scale or mesoscale low pressure system. A dry slot generally is seen best on satellite photographs. Dry slot should not be confused with clear slot, which is a storm-scale phenomenon.

Dry Weather Flow: Streamflow which results from precipitation that infiltrates into the soil and eventually moves through the soil to the stream channel. This is also referred to as baseflow, or ground water flow.

Ducting: The phenomenon by which the radar signal propagates along the boundary of two dissimilar air masses. Ducting occurs when the upper air is exceptionally warm and dry in comparison with the air at the surface. When this occurs, the radar is able to detect targets at abnormally long ranges and it can cause holes in the radar coverage area.

Dual Doppler: The use of two Doppler radars to measure two different radial velocities; with some math, these two radial wind components can be synthesized to a spatial distribution of fully 2-D (horizontal) winds.

Ducting: The phenomenon by which the radar signal propagates along the boundary of two dissimilar air masses. The radar ranges with ducted propagation are greatly extended; holes can also appear in the coverage. Ducting occurs when the upper air is exceptionally warm and dry in comparison with the air at the surface. Ducting occurs when dN/dh <= - 157 N-units/km

Duplexer: A device in the waveguide which protects the sensitive receiver from the full power of the transmitter; usually contains one or more TR (transmit-receive) tubes.

Duration Curve: A cumulative frequency curve that shows the percent of time during which specified units of items (e.g. discharge, head, power,etc.) were equaled or exceeded in a given period. It is the integral of the frequency diagram.

Duration of Ice Cover: The time from freeze-up to break-up of an ice cover.

Dust Devil: A small, vigorous whirlwind, usually of short duration, rendered visible by dust, sand, and debris picked up from the ground. They range from 10 feet to greater than 100 feet in diameter, and can extend up to 1000 feet above the ground. They form are caused by intense surface heating. This heating causes the air to rapidly rise and thus, a mini low pressure system is formed. They are usually found in desert or dry climatic regions where dust and dirt can be easily lifted. Only rarely do they cause any damage. Wind speeds can reach 30 to 60 mph.

Dust Plume: A non-rotating "cloud" of dust raised by straight-line winds. Often seen in a microburst or behind a gust front. If rotation is observed, then the term dust whirl or debris cloud should be used.

Dust Storm (DS): Severe weather conditions marked by strong winds and dust filled air over an extensive area. Visibility is reduced to ½ mile or less.

Dust Whirl: A rotating column of air rendered visible by dust. Similar to debris cloud; see also dust devil, gustnado, tornado.

Dwell Time: Time over which a signal estimate is made. Usually, the time required for the antenna to traverse one degree.

Dynamical Model: In hydrology, a hydrological computer model that is mathematically and physically correct because it accounts for every molecule of moisture entering, stored in and leaving a basin or an area.

Dynamic Ice: Pressure due to a moving ice cover or drifting ice. Pressure occurring at movement of first contact termed Ice Impact Pressure

Dynamic Range: The ratio, usually expressed in decibels, of the maximum to the minimum signal that a system can handle. Used to describe the limits of receivers.

Dynamics: Generally, any forces that produce motion or affect change. In operational meteorology, dynamics usually refer specifically to those forces that produce vertical motion in the atmosphere.

Dynamic Wave Routing Model (DWOPER): A computerized hydraulic routing program whose algorithms incorporate the complete one-dimensional equations of unsteady flow originally developed by Barre' De Saint-Venant in 1871.

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E

E-3, Flood Stage Report: A form that a Service Hydrologist/Hydrology Focal Point completes to document the dates in which forecast points are above flood stage, as well as the crest dates and stages. Discussion of the flood event must also be included in the E-5, Monthly Report of River and Flood conditions. An E-3 report is sent to Regional Headquarters, the appropriate RFC, as well as the Office of Hydrology (OH).

E-5, Monthly Report of River and Flood conditions: A monthly narrative report covering flooding which occurred over the past month. Flood stage, flood crest and dates in which flooding occurred is covered within this report for each data point which was in flood. If the flooding involved a forecast point, an E-3 must be filled out as well. If no flooding has occurred within the past month, a climatic summary of the past month can be included as well as other interesting non-flood events, such as water supply, ice jams and the occurrence of drought. An E-5 report is sent to Regional Headquarters, the appropriate RFC, as well as the Office of Hydrology (OH).

E-7, Flood Damage Report: A report to be completed anytime there is reported flood damage or loss of life as a direct result of flooding. An E-7 report is sent to Regional Headquarters, as well as the Office of Hydrology (OH).

E-19, Report on River Gage Station: A report to be completed every 5 years providing a complete history of a river station and all gages that have been used for public forecasts since the establishment of the station.

E-19a, Abridged Report on River Gage Station: An abridged version of an E-19, an E-19a updates the E-19 as additional information, or changes occur at the station during the intervening five year period. An E-19a is to be completed anytime a significant change occurs at a forecast point. An E-19a is also used to take the place of an E-19 in documenting any gage history, or information of any non-forecast point (i.e; data point).

Earthen (or Earthfill) Dam: An embankment dam in which more than 50% of the total volume is formed of compacted fine-grained material. A homogeneous earthen dam is constructed of similar earthen material throughout. These are the most common type of dam because their construction involves using materials in the natural state, requiring little processing.

Eastern North Pacific Basin: The region north of the Equator east of 140W. The National Hurricane Center in Miami, FL is responsible for tracking tropical cyclones in this region.

Ebb Current: A tidal current that is receding or declining.

Echo: Energy back scattered from a target (precipitation, clouds, etc.) and received by and displayed on a radar screen.

Echo Tops (ET): This WSR-88D radar product displays echo top heights (thousands of feet) based on the highest elevation angle at which greater than or equal to 18 dBZ reflectivities are determined. The heights are referenced to Mean Sea Level (MSL). A circular stair-step appearance often occurs due to echo beam top

Weather Safety
Storm Ready
Education
NOAA Weather Radio
Skywarn
Miscellaneous
Weather Now
Wireless Forecasts
Computer Guidance
Weather Stories
News Archive
Weather Links
Weather Glossary
Our Office
1953 Beecher
Tornado
Contact Us
w-dtx.webmaster
@noaa.gov

limitations. It is used to gain a quick estimation of the most intense convection (highest tops); detect mid-level echoes before low level echoes are detected; and assist in differentiating non-precipitation echoes from real storms.

Echo Tops Contour (ETC): This WSR-88D radar product displays a line contour image of echo tops data. The contour interval and base contour value are selected at the WSR-88D's Principle User Processor (PUP). It is used to view a contour image of echo tops; gain a quick estimation of the most intense convection (highest tops); detect mid-level echoes before low level echoes are detected; and assist in differentiating non-precipitation echoes from real storms.

ECMWF: An acronym for European Centre for Medium-Range Weather Forecasting model. See ***European Model.***

Eddy: A small rotating area of water.

Effective Porosity: The ratio, usually expressed as a percentage, of the volume of water or other liquid which a given saturated volume of rock or soil will yield under any specified hydraulic condition, to the given volume of soil or rock.

Effective Precipitation (Rainfall): 1) That part of the precipitation that produces runoff. 2) A weighted average of current and antecedent precipitation that is "effective" in correlating with runoff. 3) That part of the precipitation falling on an irrigated area that is effective in meeting the consumptive use requirements.

Effective Radar Reflectivity Factor: See ***Equivalent Radar Reflectivity Factor***.

Effluent Seepage: Diffuse discharge of ground water to the ground surface.

Effluent Stream: Any watercourse in which all, or a portion of the water volume came from the Phreatic zone, or zone of saturation by way of groundwater flow, or baseflow.

EHI: An acronym for Energy Helicity Index. See ***Energy Helicity Index***.

EIF: Enhanced IFLOWS Format.

EL: An acronym for Equilibrium Level. See ***Equilibrium Level***.

Elevated Convection: A thunderstorm which occurs above a frontal inversion on the cold side of the surface cold front. Since these thunderstorms form above a very stable layer of atmosphere, surface based indices, such as the **Lifted Index (LI)**, are useless in predicting their development. Severe weather is possible from elevated convection, but is less likely than it is with surface-based convection.

Elevation Angle: The vertical pointing angle of the antenna. The WSR-88D antenna can vary from -1º to +60º.

El Nino: The warm phase of the Southern Oscillation (**SO**). Characterized by the warming of the sea surface temperatures (SST) in the central and eastern equatorial Pacific Ocean, beginning at about Christmas time (hence the name "El Nino", which is Spanish for "Christ child"). This causes the sardine population to die off the Peru coast. The anomalously warm water also causes the deep convection to shift from its normal position near Indonesia to the east. This is also preceded and accompanied by anomalous westerly wind at low levels. The westerly anomalies cause the development of a Kelvin wave in the ocean which slowly propagates eastward. During the warm phase of the **SO** severe drought occurs over Indonesia and Australia. The warming of the ocean in the tropical Pacific increases the strength of the Hadley circulation (a global wind pattern) and causes the entire tropics to warm. The strengthened hemispheric north-south temperature gradient adds energy to the atmosphere. In particular, the subtropical jet is stronger and its maximum wind extends farther to the east than is normal. This is often related to the deeper than normal Aleutian low, a split jet-level flow over the western U.S. and a trough in the southeastern U.S.. This pattern is called the "Pacific North American Teleconnection pattern". When established, it leads to warm, dry conditions over the northern U.S., particularly the Northwest, and to unusually wet conditions over the southern U.S.. The El Nino typically lasts from 12 to 18 months. See *Southern Oscillation* and *ENSO*.

El Nino Southern Oscillation (ENSO): An acronym designed to stress the special importance of the warm phase (El Nino) of the Southern Oscillation. See *El Nino* and *Southern Oscillation*.

Embankment: Fill material, usually earth or rock, placed with sloping sides and usually with length greater than height. All dams are types of embankments.

Emergency Action Plan: A predetermined plan of action to be taken to reduce the potential for property damage and loss of life in an area affected by a dam break or excessive spillway.

Emergency Services: Services provided in order to minimize the impact of a flood that is already happening. These measures are the responsibility of city, or county emergency management staff and the

owners or operators of major, or critical facilities. Some examples of emergency services are flood warning and evacuation, flood response, and post flood activities.

Emergency Managers Weather Information Network (EMWIN): As an integral part of its mission, the NWS recognizes the need to provide the emergency management community with access to a set of NWS warnings, watches, forecasts, and other products at no recurring cost. Toward that end, the Emergency Managers Weather Information Network (EMWIN) system was developed. In partnership with the Federal Emergency Management Agency (FEMA) and other public and private organizations, EMWIN is now evolving into a fully operational and supported NWS service.

EMWIN is a suite of data access methods which make available a live stream of weather and other critical emergency information. Each method has unique advantages. EMWIN's present methods in use or under development for disseminating the basic datastream include:

> **Radio:** Digital weather information is transmitted using inexpensive radio broadcast and personal computer (PC) technologies. The NWS (and other public and private agencies) transmits selected text, graphics, and imagery products as an audio signal on a dedicated VHF or UHF radio frequency. This information can be received, by anyone within the 40-50 mile broadcast area, using an inexpensive radio receiver, a demodulator, and a personal computer. EMWIN software on your PC, running under Windows, receives the signal through a serial port, stores the received weather products onto disk, and simultaneously allows you to display this information.
>
> **Internet:** The Interactive Weather Information Network (IWIN) page uses HTML formatting and additional hyperlinks to an EMWIN server that ingests the data. Access to this data, as a linked series of clickable screens, is provided to clients operating web browsers such as Internet Explorer or Netscape. Graphics or text-only access is provided. FTP access is also available. While Internet access is convenient, there are times, especially during major weather events, that access may be difficult or impossible due to server overloads. The IWIN server has been online since September 1995, handling an average load of 1 million connections per day with peak loads of over 2 million connections per day during major weather events.
>
> **Satellite:** Satellite broadcast makes the datastream available nationwide, but not to provide detailed support (i.e. funding, manpower, or equipment) for state and local efforts to redistribute the datastream after downlink. The NWS broadcasts EMWIN on our own GOES 8 and GOES 10 satellites. GOES 8 is at 75 degrees West, elevation 45 degrees (from the latitude of Washington, DC). GOES 10 is at 135 degrees West. Data is uplinked to satellite from the NOAA Command and Data Acquisition (CDA) Station on Wallops Island, VA. The NWS GOES downlink frequency used for the 9600 baud EMWIN datastream is 1690.725 MHz, 275 KHz lower than the standard WEFAX 1691.0 MHz signal. The signal is passed through a down convertor, received as if a Radio signal at 137.225 MHz for example, and then demodulated to 9600 baud. The EMWIN data is also currently uplinked to the SBS 6 satellite by Spacecom Systems of Tulsa, OK as a public service. SBS 6 is at 74 degrees W: Ku-band, Transponder 13, FM-FM, DFSK, .5425 MHz subcarrier.

Note: The above methods are intended to provide data to users who currently have none or who can afford very little. Be aware that there are other methods available, at higher cost to the end-user, including various commercial weather distribution systems. EMWIN is a supplement to other NWS dissemination services, which include: NOAA Weather Radio (NWR), NOAA Weather Wire System (NWWS), Family of Services (FOS), NOAAPORT, and NEXRAD Information Dissemination Service (NIDS).

Energy Dissipater: A structure which slows fast-moving spillway flows in order to prevent erosion of the stream channel.

Energy Helicity Index (EHI): An index that incorporates vertical shear and instability, designed for the purpose of forecasting supercell thunderstorms. It is related directly to storm-relative helicity in the lowest 2 km (SRH, in m2/s2) and CAPE (in j/kg) as follows: EHI = (CAPE x SRH)/160,000

Thus, higher values indicate unstable conditions and/or strong vertical shear. Since both parameters are important for severe weather development, higher values generally indicate a greater potential for severe weather. Values of 1 or more are said to indicate a heightened threat of tornadoes; values of 5 or more are rarely observed, and are said to indicate potential for violent tornadoes. However, there are no magic numbers or critical threshold values to confirm or predict the occurrence of tornadoes of a particular intensity.

Engineer's Level: A telescope which is attached to a spirit-tube level, all revolving around a vertical axis and is mounted on a tripod. An Engineer's Level is used for determining the difference in elevation between two points. The telescope on the level has a vertical cross hair and a horizontal cross hair. Once the instrument is leveled, the sighting through the horizontal cross hair represent a horizontal plane of equal elevation.

Enhanced V: A pattern seen on satellite infrared photographs of thunderstorms, in which a thunderstorm

anvil exhibits a V-shaped region of colder cloud tops extending downwind from the thunderstorm core. The enhanced V indicates a very strong updraft, and therefore a higher potential for severe weather. Enhanced V should not be confused with V notch, which is a radar signature.

Enhanced Wording: An option used by the Storm Prediction Center (SPC) in Norman, Oklahoma in tornado and severe thunderstorm watches when the potential for strong/violent tornadoes, or unusually widespread damaging straight-line winds, is high. The statement "THIS IS A PARTICULARLY DANGEROUS SITUATION WITH THE POSSIBILITY OF VERY DAMAGING TORNADOES" appears in tornado watches with enhanced wording. Severe thunderstorm watches may include the statement "THIS IS A PARTICULARLY DANGEROUS SITUATION WITH THE POSSIBILITY OF EXTREMELY DAMAGING WINDS," usually when a derecho event is occurring or forecast to occur. See ***PDS Watch***.

Engineer's Level: A telescope which is attached to a spirit-tube level, all revolving around a vertical axis and is mounted on a tripod. An Engineer's Level is used for determining the difference in elevation between two points. The telescope on the level has a vertical cross hair and a horizontal cross hair. Once the instrument is leveled, the sighting through the horizontal cross hair represent a horizontal plane of equal elevation.

Ensemble Hydrologic Forecasting: A process whereby a continuous hydrologic model is successively executed several times for the same forecast period by use of varied data input scenarios, or a perturbation of a key variable state for each model run. A common method employed to obtain a varied data input scenario is to use the historical meteorological record, with the assumption that several years of observed data covering the time period beginning on the current date and extending through the forecast period comprises a reasonable estimate of the possible range of future conditions.

Entrance Region: The region upstream from a wind speed maximum in a jet stream (jet max), in which air is approaching (entering) the region of maximum winds, and therefore is accelerating. This acceleration results in a vertical circulation that creates divergence in the upper-level winds in the right half of the entrance region (as would be viewed looking along the direction of flow). This divergence results in upward motion of air in the right rear quadrant (or right entrance region) of the jet max. Severe weather potential sometimes increases in this area as a result. See also ***exit region*** and ***left exit region***.

Environmental Modeling Center (EMC, formerly the Development Division): This is one of 9 centers that comprises the National Centers for Environmental Prediction (NCEP, formerly the National Meteorological Center). This center improves numerical weather, marine and climate predictions at the , through a broad program of research in data assimilation and modeling. In support of the NCEP operational forecasting mission, the EMC develops, improves and monitors data assimilation systems and models of the atmosphere, ocean and coupled system, using advanced methods developed internally as well as cooperatively with scientists from Universities, NOAA Laboratories and other government agencies, and the international scientific community.

Eosophobia: The fear of dawn or daylight.

Equilibrium Drawdown: The ultimate, constant drawdown for a steady rate of pumped discharge.

Equilibrium Level (EL): It is the height in the upper troposphere where a parcel of saturated air, rising because of its positive buoyancy, becomes equal in temperature to the surrounding environment. Beyond this point, the parcel become colder than its environment. As a result, it will be heavier than the surrounding air and it will begin to fall. Under the right conditions, severe thunderstorm tops can overshoot the EL by a considerable distance without reaching the tropopause. Conversely, non-severe thunderstorm tops can rise above the tropopause without overshooting the EL. Consequently, the EL provides more meaningful information than the tropopause for evaluating the strength of convective updrafts.

Equilibrium Surface Discharge: The steady rate of surface discharge which results from a long-continued, steady rate of net rainfall, with discharge rate equal to net rainfall rate.

Equilibrium Time: The time when flow conditions become substantially equal to those corresponding to equilibrium discharge or equilibrium drawdown..

Equi-Potential Line: A line, in a field of flow, such that the total head is the same for all points on the line, and therefore the direction of flow is perpendicular to the line at all points.

Equivalent Radar Reflectivity (Ze): The concentration of uniformly distributed small (diameter 1/16 wavelength or less) water particles which would return the amount of power received. Typically expressed as: dBZ = 10 Log Ze.

Erosion: Wearing away of the lands by running water, glaciers, winds, and waves, can be subdivided into three process: Corrasion, Corrosion, and Transportation. Weathering, although sometimes included here, is a distant process which does not imply removal of any material.

ESP: Extended Streamflow Prediction.

ESPINIT: ESP Initialization Program

Estimate: A statement of the value of a quantity or function based on a finite number of samples.

Estuary: The thin zone along a coastline where freshwater systems and rivers meet and mix with a salty ocean (such as a bay, mouth of a river, salt marsh, lagoon).

Esturine waters: Deepwater tidal habitats and tidal wetlands that are usually enclosed by land but have access to the ocean and are at least occasionally diluted by freshwater runoff from the land (such as bays, mouths of rivers, salt marshes, lagoons).

Esturine Zone: The area near the coastline that consists of estuaries and coastal saltwater wetlands.

Eta Model: One of the operational numerical forecast models run at NCEP. The Eta is run twice daily, with forecast output out to 48 hours. The ETA model is a newer model, which is very similar to the NGM model and forecasts the same atmospheric variables. The main difference is the ETA model has better resolution (29 kilometers). In other words, the grid box is much smaller than in the NGM. This allows the ETA to give a more detailed forecast over the USA. The ETA model was named after the ETA coordinate system, which is a mathematical coordinate system that takes into account topographical features such as mountains. As a result of using this coordinate system and the higher resolution, the ETA model has a much more accurate picture of the terrain across the USA. By the way, the name, ETA is the seventh letter of the Greek alphabet.

European Model: One of medium-range (3 to 7 days) forecast models that forecasters use to write their extended forecasts. It has a resolution of 75 kilometers and covers the entire northern hemisphere. References to it can be found in NMC (National Meteorological Center) and area forecast discussions. This model comes from European Centre for Medium-Range Weather Forecasts (ECMWF) which is an international organization supported by 18 European Member States. The Centre has three working languages - English, French and German. See ***MRF*** and ***UKMET***.

EVAD: See ***VAD***.

Evaporation: A process by which liquid changes into a gas or vapor.

Evaporation Pan: A pan used to hold water during observations for the determination of the quantity of evaporation at a given location. Such pans are of varying sizes and shapes, the most commonly used being circular or square.

Evaporation Rate: The quantity of water, expressed in terms of depth of liquid water, which is evaporated from a given surface per unit of time. It is usually expressed in inches depth, per day, month, or year.

Evaporimeter: An instrument which measures the evaporation rate of water into the atmosphere.

Evapotranspiration: Combination of evaporation from free water surfaces and transpiration of water from plant surfaces to the atmosphere.

Excessive Heat Warning: This product is issued by the National Weather Service when excessive heat is life threatening. The criteria for this warning varies from state to state. In Michigan, the criteria is a heat index of 115 degree F or higher for a period of 3 hours or more.

Excess Rain: Effective rainfall in excess of infiltration capacity.

Excessive Rainfall Discussion (ERD): This message discusses the potential for excessive rainfall in the contiguous United States until 7 AM EST (8 AM EDT) the next day. This includes mentioning the areas where rainfall is forecast to be locally heavy, approach or exceed flash flood guidance, or exceed 5 inches. This product includes evaluation of initial conditions and short-term numerical model forecasts and analysis of radar and satellite data. This product is issued 3 times a day as described below. There is an accompanying graphic for each forecast under the AFOS identifier 94E.

1) Around 2 AM EST (3 AM EDT), a narrative is issued which describes and explains from 7 AM EST (8 AM EDT) until 7 AM EST (8 AM EDT) the next day. Although this forecast is largely based on interpretation of the numerical model circulation are also considered. This narrative may also address the potential for excessive rainfall from 2 AM EST (3 AM EDT) to 7 AM EST (8 AM EDT) the same day as appropriate.

2) About 9 AM EST (10 AM EDT), the previous ERD is revised to account for analysis of the 7 AM EST (8 AM EDT) upper air data as well as later information from satellite and radar. This revision is valid from 10:00 AM EST (11:00 AM EDT) until 7 AM EST (8 AM EDT) the next day.

3) Around 2 AM EST (3:00 AM EDT), the ERD is revised based on the latest numerical model guidance and observations from satellite, radar, and surface reports. This product is valid from 4 PM EST (5 PM EDT) until 7 AM EST (8 AM EDT) next day.

Unscheduled special updates (NFDQPFSRD) may be issued as needed, particularly around 9 PM EST (10 PM EDT), following careful and detailed analysis and evaluation of the 7 PM EST (8 PM EDT) upper air data. This forecast would generally be valid for the period from 10 PM EST (11 PM EDT) to 7 AM EST (8 AM EDT).

Exclusive Flood Control Storage Capacity: The space in a reservoir reserved for the sole purpose of regulating flood inflows to abate flood damage.

Exit Region: The region downstream from a wind speed maximum in a jet stream (jet max), in which air is moving away from the region of maximum winds, and therefore is decelerating. This deceleration results in divergence in the upper-level winds in the left half of the exit region (as would be viewed looking along the direction of flow). This divergence results in upward motion of air in the left front quadrant (or left exit region) of the jet max. Severe weather potential sometimes increases in this area as a result. See also ***entrance region*** and ***right entrance region***.

Explosive Deepening: A decrease in the minimum sea-level pressure of a tropical cyclone of 2.5 mb/hr for at least 12 hours or 5 mb/hr for at least six hours.

Extended Forecast Discussion (EPD): This discussion is issued once a day around 2 PM EST (3 PM EDT) and is primarily intended to provide insight into guidance forecasts for the 3- to 5-day forecast period. The geographic focus of this discussion is on the United States (including Alaska and Hawaii). Although portions of this narrative will parallel the ***Hemispheric Map Discussion***, a much greater effort is made to routinely relate the model forecasts and necessary modifications to weather forecasts, mainly in terms of temperature and precipitation. Other significant parameters, such as wind, may be discussed when deemed reliably predictable. This discussion serves as primary guidance to local National Weather Service offices for the preparation of their extended forecasts in the ***State Forecast Product*** and some ***Zone Forecast Products***.

Extratropical: A term used in advisories and tropical summaries to indicate that a cyclone has lost its "tropical" characteristics. The term implies both poleward displacement of the cyclone and the conversion of the cyclone's primary energy source from the release of latent heat of condensation to baroclinic (the temperature contrast between warm and cold air masses) processes. It is important to note that cyclones can become extratropical and still retain winds of hurricane or tropical storm force.

Eye: The relatively calm center in a hurricane that is more than one half surrounded by wall cloud. The winds are light, the skies are partly cloudy or even clear (the skies are usually free of rain) and radar depicts it as an echo-free area within the eye wall. The hurricane eye typically forms when the maximum sustained tangential wind speeds exceeds about 78 miles an hour. The eye diameter, as depicted by radar, ranges typically from as small as 5 to 10 miles upwards to about 100 miles. The average hurricane eye diameter is a little over 20 miles. When the eye is shrinking in size, the hurricane is intensifying.

Eye Wall: It is an organized band of cumuliform clouds that immediately surrounds the center (eye) of a hurricane. The fiercest winds and most intense rainfall typically occur near the eye wall. *VIP* levels 3 or greater are typical. Eye wall and wall cloud are used synonymously, but it should not be confused with a wall cloud of thunderstorm.

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National Outlook
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Observations
Satellite Images
Rivers & Lakes AHPS

Radar Imagery
Detroit Radar
Nationwide

Forecasts
Text Forecasts
Graphical
Aviation
Marine
Fire Weather
Weather Planner

Climate
Local Climate
Climate Prediction

F

F scale: See ***Fujita Scale***.

Face: The external surface of a structure, such as the surface of a dam.

Fair: It is usually used at night to describe less than 3/8 opaque clouds, no precipitation, no extremes of visibility, temperature or winds. It describes generally pleasant weather conditions.

Family of Services (FOS): Since 1983, the National Weather Service (NWS) has provided external user access to U.S. Government obtained or derived weather information through a collection of data communication line services called the Family of Services (FOS). FOS is accessible via dedicated telecommunications access lines in the Washington, D.C., area. All FOS data services are driven by the NWS Telecommunication Gateway computer systems located at NWS headquarters in Silver Spring, MD. Users may obtain any of the individual services from NWS for a one-time connection charge and an annual user fee. Several private companies subscriber to the FOS and then resell the data as received and/or provide value-added information services for their customers.

Fathom: A unit of length equal to six feet which is used to measure the depth of water.

FCEXEC: A component of the NWSRFS FCST Program.

FCST: NWSRFS Forecast Program to produce operational forecasts

Federal Emergency Management Agency (FEMA): An agency of the federal government having responsibilities in hazard mitigation; FEMA also administers the National Flood Insurance Program.

Federal Snow Sampler: A snow sampler consisting of five or more sections of sampling tubes, one which has a steel cutter on the end. The combined snowpack measuring depth is 150 inches. This instrument was formerly the ***Mount Rose Type Snow Sampling Set***.

Feeder Bands: Lines or bands of low-level clouds that move (feed) into the updraft region of a thunderstorm, usually from the east through south (i.e., parallel to the inflow). Same as inflow bands. This term also is used in tropical meteorology to describe spiral-shaped bands of convection surrounding, and moving toward, the center of a tropical cyclone.

Feeder Cloud: The flanking lines of developing cumulus congestus clouds that sometimes merge with and appear to intensify supercells.

Fetch: 1) An area from which waves are generated by a wind that is nearly constant in direction and speed. 2) The effective distance which waves have travelled in open water, from their point of origin to the point where they break. 3) The distance of the water or the homogenous type surface over which the wind blows without appreciable change in direction.

Few (FEW): 1) An official sky cover classification for aviation weather observations, descriptive of a sky cover of 1/8 to 2/8. This is applied only when obscuring phenomenon aloft are present--that is, not when

Weather Safety
Storm Ready
Education
NOAA Weather Radio
Skywarn
Miscellaneous
Weather Now
Wireless Forecasts
Computer Guidance
Weather Stories
News Archive
Weather Links
Weather Glossary
Our Office
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Tornado
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obscuring phenomenon are surface-based, such as fog. 2) A National Weather Service convective precipitation descriptor for a 10 percent chance of measurable precipitation (0.01 inch). Few is used interchangeably with isolated. See ***Precipitation Probability (PoP)***.

FFG: An acronym for Flash Flood Guidance. See ***Flash Flood Guidance***.

Field (Moisture) Capacity: The amount of water held in soil against the pull of gravity

Field Moisture Deficiency: The quantity of water, which would be required to restore the soil moisture to field moisture capacity.

Fill Dam: Any dam constructed of excavated natural materials or of industrial wastes.

Fire Behavior: A complex chain-reaction process that describes the ignition, buildup, propagation, and decline of any fire in wildland fuels.

Fire Danger: The result of both constant factors (fuels) and variable factors (primarily weather), which affects the ignition, spread, and difficulty of control of fires and the damage they cause.

Fire Danger Maps: A Fire Danger Rating determination is the cumulative effort of the NFDRS (National Fire Danger Rating System), taking into account current and antecedent weather, fuel types, and the state of both live and dead fuel moisture. Local managers have much flexibility in local application of NFDRS. They may select up to four fuel models from 20 (broadly covering grass, timber, brush, and slash). Staffing levels may be based on one of several NFDRS indexes, though about 90% use the Burning Index (BI) which is related to potential flame lengths for the selected fuel type. Staffing class breakpoints are set by local managers from historical fire weather climatology. The adjective class rating is NFDRS's method of normalizing rating classes across different fuel models and station locations. It is based on the primary fuel model cataloged for the station, the fire danger index selected to reflect staffing levels, and climatological class breakpoints. All this information is provided by local station managers.

Fire Danger Rating: A fire control management system that integrates the effects of selected fire danger factors into one or more qualitative or numerical indices from which ease of ignition and probable fire behavior may be estimated. This is also called a ***Burn Index***.

Fire Weather District: A fire weather district is the area of routine service responsibility as defined by the NWS. This area is usually defined by climatological factors, but may be modified somewhat to administrative boundaries of the User Agencies.

Fire Weather Office Operating Plan: A procedural guide which describes the services provided within the area of a fire weather office's responsibility.

Fire Weather Watch: A NWS Fire Weather Forecaster will issue this product whenever a geographical area has been in a dry spell for a week or two, or for a shorter period , if before spring green-up or after fall color, and the ***National Fire Danger Rating System (NFDRS)*** is high to extreme and the following forecast weather parameters within the next 48 hours are: 1) a sustained wind average 15 mph or greater 2) relative humidity less than or equal to 25 percent and 3) a temperature of greater than 75 degrees F. See ***Red Flag Warning***.

Firn Line: The highest level to which the fresh snow on a glacier's surface retreats during the melting season. The line separating the accumulation area from the ablation area.

Firn Snow: Old snow on top of glaciers, granular and compact and not yet converted into ice. It is a transitional stage between snow and ice. Also called ***Neve***.

Fischer & Porter Punched Tape Recorder Gage: A precipitation gage which converts weight into a code disk position. The code disk position is then punched on paper tape in a binary decimal format suitable for automatic machine processing.

Flare Echo: This image will once in awhile appear on the WSR-88D reflectivity product. It shows up as a straight line along the radial pointing away from a very high reflectivity (usually over 60 dBZ) core of a thunderstorm and the radar site itself. This occurs as a result of the radar beam hitting a hail shaft (usually containing hail of greater than 1 inch in diameter). The hail shaft causes the radar beam to be reflected to the ground. When the radar beam hits the wet ground, it is reflected back up into the hail shaft and eventually arrives at the radar site. When it arrives back at the radar site, it assumes that the radar beam went out further than it actually did and it plots it along the radial beyond the high reflectivity core. This image tells that radar operator that the thunderstorm is likely producing hail of greater than
1 inch in diameter.

Flanking Line: A line of cumulus or towering cumulus clouds connected to and extending outward from the most active part of a supercell, normally on the southwest side. The line normally has a stair-step appearance, with the tallest clouds closest to the main storm, and generally coincides with the pseudo-cold front.

Flashboards: A length of timber, concrete, or steel placed on the crest of a spillway to raise the retention water level but which may be quickly removed in the event of a flood by a tripping device, or by deliberately designed failure of the flashboard or its supports.

Flash Flood: A flood which follows within a few hours (usually less than 6 hours) of heavy or excessive rainfall, dam or levee failure, or the sudden release of water impounded by an ice jam. This is a dangerous situation that threatens lives and property.

Flash Flood Guidance (FFG): An internal product produced by the RFC's containing rainfall threshold values which must be exceeded in order for flooding to occur. These values change daily according to soil moisture, season of year, etc.

Flash Flood Statement (FFS): This product is issued after either a ***Flash Flood Watch*** or a ***Flash Flood Warning*** has been issued by a local National Weather Service Forecast Office (NWFO). It will provide the latest information on the flash flooding situation or event. It will also be used to remove parts of the geographical area covered by the original watch or warning when the flash flooding event is no longer a threat or has ended in a certain area. It cannot be used to add a geographical area to either a watch or a warning. A new watch or warning is required to do this. Finally, this statement can be used to terminate the original watch or warning when it is no longer valid. This is usually optional when either a watch or warning expires.

Flash Flood Table: A table of pre-computed forecast crest stage values for small streams for a variety of antecedent moisture conditions and rain amounts. Soil moisture conditions are often represented by flash flood guidance values. In lieu of crest stages, categorical representations of flooding, e.g., minor, moderate, etc. may be used on the tables.

Flash Flood Warning (FFW): This warning signifies a short duration of intense flooding of counties, communities, streams, or urban areas with high peak rate of flow. Flash floods may result from such things as torrential downpours, dam breaks, or ice jam breaks.

They are issued by the local National Weather Service Office (NWFO) for 4 hours or less. Usually, the 3-hour Flash Flood Guidance values are exceeded for the specified county mentioned in the warning. Since flash flooding can occur in severe thunderstorms, this type of warning can be combined with either a ***Tornado Warning*** or a ***Severe Thunderstorm Warning***.

The warning will include the following: 1) the time period for which the warning is in effect 2) the communities, counties, or river basin which are being affected by the flash flooding 3) the location and movement of the flood-producing storm or storms 4) a site/event specific call-to-action statement highlighting the fact that the flash flooding poses a significant threat to life and property.

Flash Flood Watch (FFA): This product is issued by the local National Weather Service office (NWFO) for events that have the potential for short duration (usually less than 6 hours) intense flooding of counties, communities, streams or areas for which the occurrence is neither certain nor imminent. This watch indicates that flash flooding is a possibility in or close to the watch area. Those in the affected area are urged to be ready to take action if a Flash Flood Warning is issued or flooding is observed.

A Flash Flood Watch may be issued for potential flooding from either dam breaks, ice jam breaks, or torrential downpours. They are usually issued up to 12 hours prior to a possible flash flood event. They are normally issued for the first period of the forecast, but they may extend into the second period of the forecast. Depending on the likelihood and the severity of the event, it may be issued for the second period of the forecast. They can vary in size depending on the size of the meteorological event.

The watch will include the following: 1) the time period for which the watch is in effect 2) The communities, counties, or other geographical areas covered by the watch, 3) the definition of a "Flash Flood Watch" 4) The extent and severity (if possible) of the flash flooding conditions expected 5) A site/event specific call-to-action statement.

Flash Multiplicity: The number of return strokes in a lightning flash.

Float Recording Precipitation Gage: A rain gage where the rise of a float within the instrument with increasing rainfall is recorded. Some of these gages must be emptied manually, while others employ a self-starting siphon to empty old rainfall amounts.

Floc: A cluster of frazil particles

Floe: An accumulation of frazil flocs (also known as a "pan") or a single piece of broken ice.

Flood: The inundation of a normally dry area caused by high flow, or overflow of water 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. This is a duration type event with a slower onset than flash flooding, normally greater than 6 hours.

Flood Control Storage: Storage of water in reservoirs to abate flood damage.

Flood Crest: The Maximum height of a flood wave as it passes a location.

Flood Frequency Curve: 1) A graph showing the number of times per year on the average, plotted as abscissa, that floods of magnitude, indicated by the ordinate, are equaled or exceeded. 2) A similar graph but with recurrence intervals of floods plotted as abscissa.

Flood Loss Reduction Measures: The strategy for reducing flood losses. There are four basic strategies. They are prevention, property protection, emergency services, and structural projects. Each strategy incorporates different measures that are appropriate for different conditions. In many communities, a different person may be responsible for each strategy.

Flood of Record: The highest observed river stage or discharge at a given location during the period of record keeping. (Not necessarily the highest known stage.)

Flood Plain: Lowland, bordering a river, that is usually dry, but which is subject to flooding.

Flood Plain Information Studies: Reports usually prepared by the U.S. Army Corps of Engineers (USACE) following a survey of a flood-impacted community.

Flood Potential Outlook (ESF on AFOS) (FPO for Acronym): This is a long range (36-72 hours) outlook issued by a local National Weather Service Office (NWFO) when forecast meteorological conditions indicate that a significant heavy rainfall event may occur that would either cause flooding or aggravate an existing flooding situation. It is issued when successive numerical guidance model runs indicate that synoptic conditions are favorable for flooding; however, either uncertainty or the time frame precludes the forecaster from issuing either a Flood Watch or Flash Flood Watch. This outlook includes: 1) the area that will be affected 2) the timing of the event 3) a discussion of the hydrometeorological conditions (such as synoptic conditions, ***Quantitative Precipitation Forecast (QPF)***, soil conditions, and River Forecast Center guidance and 4) information as to when an update will be issued.

Flood Prevention: Measures that are taken in order to keep flood problems from getting worse. Planning, land acquisition, river channel maintenance, wetlands protection, and other regulations all help modify development on floodplains and watersheds to reduce their susceptibility to flood damage. Preventive measures are usually administered by the building, zoning, planning and/ or code enforcement offices of the local government.

Flood Problems: Problems and damages that occur during a flood as a result of human development and actions. Flood problems are a result from: 1) Inappropriate development in the floodplain (e.g., building too low, too close to the channel, or blocking flood flows); 2) Development in the watershed that increases flood flows and creates a larger floodplain, or; 3) A combination of the previous two.

Flood Profile: A graph of elevation of the water surface of a river in flood, plotted as ordinate, against distance, measured in the downstream direction, plotted as abscissa. A flood profile may be drawn to show elevation at a given time, crests during a particular flood, or to show stages of concordant flows.

Flood Routing: Process of determining progressively the timing, shape, and amplitude of a flood wave as it moves downstream to successive points along the river.

Flood Stage: A gage height at which a watercouse overtops its banks and begins to cause damage to any portion of the defined reach. Flood stage is usually higher than or equal to bankful stage.

Flood Statement (FLS): This product is issued after either a ***Flash Flood Watch*** or a ***Flash Flood Warning*** has been issued by a local National Weather Service Forecast Office (NWFO). It will provide the latest information on the flash flooding situation or event. It will also be used to remove parts of the geographical area covered by the original watch or warning when the flash flooding event is no longer a threat or has ended in a certain area. It cannot be used to add a geographical area to either a watch or a warning. A new watch or warning is required to do this. Finally, this statement can be used to terminate the original watch or warning when it is no longer valid. This is usually optional when either a watch or warning expires.

Flood Watch (FFA): This watch is issued by a local National Weather Service Office (NWFO) to indicate that there ia a potential of flooding in or close to the watch area. Those in the affected area are urged to be ready to take action if a flood warning is issued or flooding is observed. In flooding, the onset of flooding

take place much slower (usually greater than 6 hours) than a flash flood. This type of flooding usually occurs in Michigan during the convective season with "train echoes" or slow moving thunderstorms, and can also occur with synoptic scale systems that last a relatively long period of time and encompass a large area. They are usually issued up to 12 hours prior to the possible flood event. These watches can vary in size depending on the size of the meteorological event.

The watch will include the following: 1) the time period for which the watch is in effect 2) The communities, counties, or other geographical areas covered by the watch, 3) the definition of a "Flood Watch" 4) The extent and severity (if possible) of the flooding conditions expected, and 5) A site/event specific call-to-action.

Flood Warning (FLW): This warning signifies a longer duration and more gradual flooding of counties, communities, streams, or urban areas. Floods usually begin after 6 hours of excessive rainfall. They are issued by the local National Weather Service Forecast Office (NWFO) for 6 hours or less.

The warning will include the following: 1) the time period for which the warning is in effect 2) the communities, counties, or river basin which are being affected by the flooding 3) the location and movement of the flood producing storm or storms 4) a site/event specific call-to-action statement highlighting the fact that the flooding poses a significant threat to life and property.

Flood Wave: A rise in streamflow to a crest and its subsequent recession caused by precipitation, snowmelt, dam failure, or reservoir releases.

Flooded Ice: Ice which has been flooded by melt water or river water and is heavily loaded by water and wet snow.

Floodproofing: The process of protecting a building from flood damage on site. Floodproofing can be divided into wet and dry floodproofing. In areas subject to slow-moving, shallow flooding, buildings can be elevated, or barriers can be constructed to block the water's approach to the building. These techniques have the advantage of being less disruptive to the neighborhood. It must be noted that during a flood, a floodproofed building may be isolated and without utilities and therefore unusable, even though it has not been damaged.

Floodwall: A long, narrow concrete, or masonry embankment usually built to protect land from flooding. If built of earth the structure is usually referred to as a levee. Floodwalls and levees confine streamflow within a specified area to prevent flooding. The term "dike" is used to describe an embankment that blocks an area on a reservoir or lake rim that is lower than the top of the dam.

Floodway: 1) A part of the flood plain, otherwise levied, reserved for emergency diversion of water during floods. A part of the flood plain which, to facilitate the passage of floodwater, is kept clear of encumbrances. 2) The channel of a river or stream and those parts of the flood plains adjoining the channel, which are reasonably required to carry and discharge the floodwater or floodflow of any river or stream.

Flow: Volume of water in a river or stream, passing a specific observation site, during a specific time period. It is typically expressed in units of cubic feet per second. It is also called "Streamflow", "Discharge", and "Flow Discharge".

Flow Duration Curve: A cumulative frequency curve that shows the percentage of time that specified discharges are equaled or exceeded..

Flowing Well: A well drilled into a confined aquifer with enough hydraulic pressure for the water to flow to the surface without pumping. Also called an Artesian well.

Flurries: Light snowfall that generally does not produce a measurable accumulation.

Fog (FG): A visible aggregate of minute water particle (droplets) which are based at the Earth's surface and reduces horizontal visibility to less than 5/8 statue mile, and unlike drizzle, it does not fall to the ground. It occurs most frequently in coastal regions because of the great water vapor content of the air. However, it can occur anywhere. The rapidity with which fog can form makes it especially hazardous. It forms by any atmospheric process that does one of the following: 1) Cools the air to its dew point 2) Raises the dew point to the air temperature. Names given to fog types identify their methods of formation. The principle types are *radiational fog*, *ice fog*, *advection fog*, *upslope fog*, *rain induced fog*, and *steam fog*. These types of fog are called "dense" when the surface visibility is equal to or less than 1/4 miles. A Dense Fog Advisory will be issued when the dense fog becomes widespread.

Fog Bow: A nebulous arc or circle of white or yellowish light sometimes seen in fog.

Folding: Aliasing; applied to both velocity and range aliasing.

Forebay: The water behind (upstream) of the dam.

Forecast Crest: The highest elevation of river level, or stage, expected during a specified storm event.

Forecast Models: Forecasters use numerical weather models to make their forecasts. These numerical models are classified into four main classes. The first is global models, which focus on the entire northern hemisphere. The second is national models, which focus on the USA. The third is regional models. These regional models have a finer grid than national models and are run out for smaller periods of time. The final class of models is relocatable models, which do not focus on any permanent geographical location. Relocatable models are very limited on the size of the geographical area for which they can forecast, but these models have very high resolutions, or very small forecast grid boxes.

Forecast Point: A location that represents an area (reach of a river), where a forecast is made available to the public. Each NWS river forecast point has an associated E-19a, Abridged Report on River Gage Station, and E-19, Report on River Gage Station.

Foresight: A sighting on a point of unknown elevation from an instrument of known elevation. To determine the elevation of the point in question, the foresight is subtracted from the height of the instrument.

Forestry Weather Interpretation System: A computerized USDA Forest Service program which utilizes National Weather Service (NWS) forecasts, observations, warnings, and advisories for specific forestry operations and problems, such as smoke management, prescribed burning, planting, harvesting, etc.

Forward Flank Downdraft: The main region of downdraft in the forward, or leading, part of a supercell, where most of the heavy precipitation is. Compare with rear flank downdraft. See ***pseudo-warm front*** and ***supercell***.

Fountainhead: The upper end of a confined-aquifer conduit, where it intersects the land surface.

Fracture: Any break or rupture formed in an ice cover or floe due to deformation.

Fracture Zone: An area which has a great number of fractures.

Fracturing: Deformation process whereby ice is permanently deformed, and fracture occurs.

Frazil Ice: Fine spicules, plates, or discoids of ice suspended in water. In rivers and lakes, frazil is formed in supercooled, turbulent water.

Frazil Slush: An agglomerate of loosely packed frazil which floats or accumulates under the ice cover.

Free Ground Water: Unconfined ground water whose upper boundary is a free water table.

Freeboard: The vertical distance between the normal maximum level of the water surface in a channel, reservoir, tank, canal, etc., and the top of the sides of a levee, dam, etc., which is provided so that waves and other movements of the liquid will not overtop the confining structure.

Freeze: It is when the surface air temperature is expected to be 32ºF or below over a widespread area for a climatologically significant period of time. Use of the term is usually restricted to advective situations or to occasions when wind or other conditions prevent frost. Adjectives such as "killing", "severe", or "hard" will be used when appropriate. "Killing" may be used during the growing season when the temperature is expected to be low enough for a sufficient duration to kill all but the hardiest herbaceous crops or plants.

Freezing Level: The lowest altitude in the atmosphere, or a given location, at which the air temperatures is 32 degrees.

Freezing Rain or Drizzle: This occurs when rain or drizzle freezes on surfaces (such as the ground, trees, power lines, motor vehicles, streets, highways, etc.) that have a temperature of 32º F or below. Small accumulations of ice can cause driving and walking difficulties. Meanwhile, heavy accumulations of ice can pull down trees and utility lines. In this situation, it would be called an "Ice Storm".

Freezing Rain Advisory: This product is issued by the National Weather Service when freezing rain or freezing drizzle causes significant inconveniences, but does not meet warning criteria (normally an ice accumulation of 1/4 inch or greater) and if caution is not exercised, it could lead to life-threatening situations.

Freezing Spray: An accumulation of supercooled water droplets on a vessel or object which are below the freezing point of water. It usually develops in areas with winds of at least 25 knots. The following table gives the Categories of Freezing Spray/Icing.

Categories of Freezing Spray/Icing		
Light	**Moderate**	**Heavy**
Less than 0.7 cm/hr	0.7 cm/hr to less than or equal to 2.0 cm/hr	Greater than 2.0 cm/hr
Less than 0.3 ins/hr	0.3 ins/hr to less than or equal to 0.8 ins/hr	Greater than 0.8 ins/hr

Freezeup Date: Date on which the water body was first observed to be completely frozen over.

Freezup Jam: Ice jam formed as frazil ice accumulates and thickens.

French Drain: An underground passageway for water through the interstices among stones placed loosely in a trench.

Frequency: The number of recurrences of a periodic phenomenon per unit time. Electromagnetic energy is usually specified in Hertz (Hz), which is a unit of
frequency equal to one cycle per second. Weather radars typically operate in the GigaHertz range (GHz). See also wavelength.

Frequency Band: A range of frequencies, between some upper and lower limit.

Frequency Carrier: The fundamental transmitted microwave frequency between 2700 and 3000 MHz. It is modulated so that it exists for a few microseconds each pulse.

Frequency Curve: A curve that expresses the relation between the frequency distribution plot, with the magnitude of the variables as abscissas and the number of occurrences of each magnitude in a given period as ordinates. The theoretical frequency curve is a derivative of the probability curve.

Fresnel Reflection: The reflection of a radar signal from a single, dominating discontinuity of the refractive index, usually with a large horizontal extent. Also called "partial reflection" because only a small fraction of the incident power is reflected, "specular reflection" if the horizontal surface discontinuity is assumed to be smooth, or "diffuse reflection" if the discontinuity is assumed to be corrugated or somewhat rough.

Fresnel Scatter: Scatter which occurs if several or many refractive index discontinuities exist along the pointing direction. The difference between Fresnel reflection and scatter may be primarily a matter of resolution of the sampling volume compared to the size of the reflecting target.

Frigophobia: The fear of the cold and cold things.

Front: A boundary or transition zone between two air masses of different density, and thus (usually) of different temperature. A moving front is named according to the advancing air mass, e.g., cold front if colder air is advancing. See *Cold Front*, *Occluded Front*, *Stationary Front*, and *Warm Front*.

Frontal Inversion: A transition zone between 2 different air masses. The temperature curve is the basic reference for locating frontal zones aloft. If the front were a sharp discontinuity, the temperature curve should show a clear cut inversion separating the lapse rates typical of cold and warm air masses. However, a shallow isothermal or relatively stable layer is more usual indication of a well-defined front. Frequently, the frontal boundary is so weak or distorted by other discontinuities that frontal identification is difficult. In an ideal case, the dew point curve through the frontal zone will show an inversion or sharp change associated with that of the temperature curve. The frontal surface is considered to be located at the top of the inversion.

Frontogenesis: The process in which a front forms. This occurs when there is an increase in the temperature gradient across a front.

Frontolysis: The process in which a front dissipates. This occurs when the temperatures and pressures equalize across a front.

Frost: The formation of ice crystals on the ground or other surfaces in the form of scales, needles, feathers, or fans. Frost develops under conditions similar to dew, except the temperatures of the Earth's surface and earthbound objects fall below 32ºF. As with the term "freeze", this condition is primarily significant during the growing season. If a frost period is sufficiently severe to end the growing season or delay its beginning, it is commonly referred to as a "killing frost". Because frost is primarily an event that occurs as the result of radiational cooling, it frequently occurs with a temperature reading in the mid 30s. Frost may also form on aircraft in flight during descent from subfreezing into a warmer, moist layer below. This may cause considerable consternation if the windshield glazes over or the windows frost over.

Frost/Freeze Advisory: This product is issued by the National Weather Service when freezing temperatures or conditions conducive to the formation of frost occur during the growing season.

Frost Point: Dew point below freezing.

Fractus: Ragged, detached cloud fragments; same as scud.

Friction Head: The decrease in total head caused by friction.

FTP (File Transfer Protocol): A method of data transfer that can take place between Frame Relay Networks, and Workstations.

Fuel Moisture: The water content of fuel particle expressed as a percent of the oven dried weight of the fuel particle. Fuel moisture observations are generally for the 10-hour time lag fuels (medium-sized roundwood 1/4 to 1 inch in diameter).

Fujita Scale (F-scale): A scale used to classify the strength of a tornado. It was devised by Dr. Theodore Fujita from the University of Chicago. The F-scale gives tornadoes a numerical rating from F0 to F5. The following table shows the F scale in more detail:

Fujita Damage Scale				
F-scale	**Type of Tornado**	**Intensity**	**Estimated Wind Speeds**	**Description of Damage**
F0	Gale Tornado	Weak	40-72 mph	Some damage to chimneys; breaks branches off trees; push over shallow-rooted trees; damage sign boards.
F1	Moderate Tornado	Weak	73-112 mph	The lower limit (73 mph) is beginning of hurricane wind speed; peels shingles off roofs; mobile homes pushed off foundations or overturned; moving autos pushed off the roads.
F2	Significant Tornado	Strong	113-157 mph	Roofs torn off frame houses; mobile homes demolished; boxcars pushed over; large trees snapped or uprooted; light-object missiles generated.
F3	Severe Tornado	Strong	158-206 mph	Roofs and some walls torn off well-constructed houses; trains overturned; most trees in forest uprooted; heavy cars lifted off the ground and thrown.
F4	Devastating Tornado	Violent	207-260 mph	Well-constructed houses leveled; structure with weak foundation blown off some distance; cars thrown and large missiles generated.
F5	Incredible Tornado	Violent	261-318 mph	Strong frame houses lifted off foundations and carried considerable distance to disintegrate; automobiles-sized missiles fly through the air in the excess of 100 m; trees debarked; incredible phenomena will occur

Since the F-scale is based on tornado damage (primarily to buildings), there is some ambiguity in the scale. For example, a tornado which moves over open country will tend to receive a lower rating than a tornado which strikes a populated area. Since buildings have a wide variation in age, quality of design, and quality of building materials, more uncertainties are thrown into the mix. Tornadoes over open country will probably encounter varying type of vegetation, leading to uncertainties in these cases.

Fujiwhara Effect: A binary interaction where tropical cyclones within a certain distance (300-750 nm depending on the sizes of the cyclones) of each other begin to rotate about a common midpoint.

Funnelling: The process whereby wind is forced to flow through a narrow opening between adjacent land areas, resulting in increased wind speed.

Funnel Cloud (FC): A condensation funnel extending from the base of a towering cumulus or Cb, associated with a rotating column of air that is not in contact with the ground (and hence different from a tornado). A condensation funnel is a tornado, not a funnel cloud, if either a) it is in contact with the ground or b) a debris cloud or dust whirl is visible beneath it.

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G

Gage: 1) A device for indicating the magnitude or position of a thing in specific units, when such magnitude or position undergoes change, for example: The elevation of a water surface, the velocity of flowing water, the pressure of water, the amount or intensity of precipitation, the depth of snowfall, etc. 2) The act or operation of registering or measuring the magnitude or position of a thing when these characteristics are undergoing change. 3) The operation, including both field and office work, of measuring the discharge of a stream of water in a waterway.

Gage Datum: The arbitrary zero datum elevation which all stage measurements are made from.

Gage Height: The water-surface elevation referred to some arbitrary gage datum. Gage height is often used interchangeably with the more general term stage, although gage height is more appropriate when used with a reading on a gage.

Gage Zero: The elevation of zero stage. (Same as ***gage datum***.)

Gaging Station: A particular site on a river, stream, canal, or body of water where systematic observations of stage and/or flow are measured.

Gain: A change in signal power, voltage or current. Usually applied to a change greater than one and frequently expressed in decibels.

Gale Warning: The National Weather Service will issue these marine warnings for 1-minute sustained winds between 34 (39 mph or 63 kph) and 47 knots (54 mph or 87 kph) are expected at end of downwind fetch (nearshore or open waters). This warning will be headlined in the Open Great Lakes Forecast (Product Header CCCGLFXX) and the ***Nearshore Marine Forecast*** (Product Header CCCNSHXXX) when conditions are expected to occur within 24 hours following the forecast issuance time. The headline will be "...GALE WARNING IN EFFECT...". When the hazard has ended, the last forecast will indicate this in the headline by replacing the "IN EFFECT" phrase with "DISCONTINUED".

Gallery: A passageway within the body of a dam or abutment.

Gate: 1) A device in which a leaf or member is moved across the waterway from an external position to control or stop flow. There are many different kinds of gates used on a dam. Some include: Bulkhead, Crest (or Spillway), Emergency, Fixed Wheel, Flap, Flood, Guard, Outlet, Radial, Regulating, and Slide Gates. 2) A radar term see ***Range Gate***.

Gating (Range Gating): The use of electric circuits in radar to eliminate or discard the target signals from all targets falling outside certain desired range limits.

Gaussian: Refers to the normal distribution; phenomena whose events are "normally" distributed are "Gaussian" distributed. This is the most common distribution encountered in physical processes.

Weather Safety
Storm Ready
Education
NOAA Weather Radio
Skywarn
Miscellaneous
Weather Now
Wireless Forecasts
Computer Guidance
Weather Stories
News Archive
Weather Links
Weather Glossary
Our Office
1953 Beecher
Tornado
Contact Us
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Geohydrology: That branch of hydrology relating to subsurface, or subterranean waters.

Geophysics: The study of the physical characteristics and properties of the earth; including geodesy, seismology, meteorology, oceanography, atmospheric electricity, terrestrial magnetism, and tidal phenomena.

Geostrophic Wind: The horizontal wind for which the coriolis acceleration (caused by the Earth's rotation) exactly balances the horizontal pressure force. In practice it is assumed that this marks the upper limit of frictional influence of the Earth's surface. The geostrophic wind blows along the contours on a constant pressure surface. The speed of the geostrophic wind is dependent upon how close your pressure contour are together. Thus, when your pressure contours are close together, you will see a strong geostrophic wind. The opposite occurs when your pressure contours are far apart.

Glacier: Bodies of land ice that consist of recrystallized snow accumulated on the surface of the ground, and that move slowly downslope.

Glacier Dammed Lake: The lake formed when a glacier flows across the mouth of an adjoining valley and forms an ice dam.

Glaze: Ice formed by freezing precipitation covering the ground or exposed objects.

Global Maritime Distress and Safety System (GMDSS): An internationally agreed upon communication system for distributing safety information, including weather warnings and forecasts, to mariners.

Global Ocean Model: Another global model used by NCEP is the Global Ocean Model. The ocean model forecasts seasonal changes in oceanic variables, such as sea surface temperature and ocean currents. The ocean model is coupled with an atmospheric model to help determine how forecasted changes in oceanic variables, such as sea surface temperature, will affect the atmosphere. This model tandem is not used to give detailed daily forecasts for the ocean or the atmosphere like some of the other models. Instead it is mainly used to help forecast seasonal or yearly variations of the ocean and the atmosphere. The ocean model coupled with the atmospheric model is used to forecast events such as an El Nino warming event in the Pacific Ocean and in long range seasonal outlooks.

Global Warming: An overall increase in world temperatures which may be caused by additional heat being trapped by greenhouse gases.

GOES (Geostationary Orbiting Environmental Satellite): Satellites orbiting at 22,370 miles above the Earth's surface with the same rotational velocity as the Earth; therefore, the satellite remains over the same location on the Earth 24 hours a day. Besides sending back satellite pictures to earth, it also relays the DCPs river and rainfall data back to the ground receiving located at Wallops Island, Virginia.

GOES DCS (Data Collection System): A data collection system under NESDIS which is comprised of the DCPs, and the NESDIS Command and Data Acquisition (CDA) System components. This satellite-based system collects a variety of environmental data from locations in the Western Hemisphere. The system is a data relay network for more than 10,000 DCPs which transmits data to one of two GOES satellites (East and West). These data are relayed to the NESDIS CDA ground station located at Wallops Island, VA. The data are then relayed over to Silver Springs, MD, where the data is then distributed to the appropriate recipients.

GPS: An acronym for Global Positioning System. A network of satellites which provide extremely accurate position and time information. Useful in remote locations or for moving platforms.

Graupel: A lightly rimed ice aggregate often found in vigorous storms. Formed when an ice aggregate collects supercooled liquid water droplets.

Gravity Dam: A concrete structure proportioned so that its own weight provides the major resistance to the forces exerted on it.

Great Lakes 5-Day Ice Outlook (Product Header CLEICELIO): This ice outlook is issued by NWFO Cleveland, Ohio daily at about 3:30 PM local time. It includes sections on expected synoptic weather patterns and temperatures for 5 days, expected winds for 3 periods (about 36 hours) and effect of those parameters on ice formation or decay, and other changes affecting navigation. Additional information, such as normal temperatures, the accumulated freezing degree days, and observed ice thicknesses will be included in this product.

Great Lakes Freeze-Up Outlook (Product Header CLEICEFBO): The freeze-up outlook is issued by NWFO Cleveland, Ohio in the fall around November 1st. It indicates whether ice conditions will occur earlier, later, or about the normal times over the lakes. Supporting data, such as selected water temperatures from water intakes and NOAA data buoys, will also be provided in this product.

Great Lakes Ice Outlook for the Opening of Navigation (Product Header CLEICEFBO): This outlook is issued by NWFO Cleveland, Ohio in the spring around March 1st. It gives a summary of current ice thickness and a listing of dates when shipping is expected to be able to navigate an area without icebreaker

assistance.

Great Lakes Marine Synopsis (Product Header CLEGLFGLS): This product is prepared by NWFO Cleveland, Ohio. It summarizes the forecast positions and movements of highs, lows, and fronts affecting the Great Lakes for the 24-hour period beginning at the synoptic time after its issuance. The synopsis will also give the strength of high and low pressure systems in inches of mercury. At the end of the synopsis, there will be a 12-hour outlook. All references to time in the product will be given in Eastern Standard Time (EST) throughout the year.

Great Lakes Storm Outlook (Product Header CLEGLOCLE): This unscheduled product is issued by NWFO Cleveland, Ohio to alert users to potentially dangerous conditions from continuous storm force winds (greater than 48 knots) over one or more of the Great Lakes within a 36- to 48-hour periods after its issuance. The outlook is based on NMC guidance and does not replace any other product.
The outlook will describe where and when the storm force winds may occur, give a brief description of the synoptic weather patterns that would cause such winds, and provide a brief call-to-action statements regarding further information.

Great Lakes Storm Summary (Product Header CLEGLSCLE): These summaries will be issued by NWFO Cleveland, Ohio as soon as sustained winds of 50 knots or more are produced by any synoptic scale storm when such winds are expected to continue on any of the Great Lakes for 12 hours or more. Summaries are numbered consecutively following the media header. The summary will include the following information: 1) storm location, 2) storm movement, 3) highest reported winds, 4) storm intensity trend, 5) current marine warnings in effect, 6) additional information will be included in the Remark Section of the summary, and 7) when the next advisory will be issued by NWFO Cleveland, Ohio. These summaries will normally be issued every 3 hours after the first issuance.

Greenhouse Effect: The heating effect caused by gases in the atmosphere absorbing heat (solar radiation) instead of letting it escape back into space. There are 2 types: 1) **Natural:** It is what keeps the Earth's average temperature at 59ºF instead of 0ºF. In this case, the most abundant greenhouse gas is water vapor. 2) **Anthropogenic:** Additional warming caused by having too much carbon dioxide (CO_2). In the first case, the Greenhouse Effect is good; however, if the second case is occurring it will be bad.

Ground Blizzard Warning: When blizzard conditions are solely caused by blowing and drifting snow.

Ground Clutter: A pattern of radar echoes from fixed ground targets (buildings, hills, etc.) near the radar. Ground clutter may hide or confuse precipitation echoes near the radar antenna. It is usually more noticeable at night when the radar beam is encountering **superrefractive** conditions.

Ground Fog: Fog of little vertical extent (usually 20 feet or less).

Grounded Ice: Ice that has run aground or is contact with the ground underneath it.

Ground Receiver Site: A satellite dish and associated computer which receives signals from the GOES satellite, decodes the information, and transmits it to a another site for further processing. The GOES satellite ground-receive site is located at Wallops Island, VA; and the information is relayed to a mainframe computer at NWSH for processing.

Ground Water: Water within the earth that supplies wells and springs; water in the zone of saturation where all openings in rocks and soil are filled, the upper surface of which forms the water table. Also termed Phreatic water.

Ground Water Divide: A line on a water table where on either side of which the water table slopes downward. It is analogous to a drainage divide between two drainage basins on a land surface.

Ground Water Flow: Streamflow which results from precipitation that infiltrates into the soil and eventually moves through the soil to the stream channel. This is also referred to as baseflow, or dry-weather flow.

Ground Water Hydrology: The branch of hydrology that specializes in ground water; its occurrence and movements; its replenishment and depletion; the properties of rocks that control ground water movement and storage; and the methods of investigation and utilization of ground water

Ground Water Mining: Pumping ground water from a basin where the safe yield is very small, thereby extracting ground water which had accumulated over a long period of time.

Ground Water Outflow: That part of the discharge from a drainage basin that occurs through the ground water. The term "underflow" is often used to describe the ground water outflow that takes place in valley alluvium (instead of the surface channel) and thus is not measure at a gaging station.

Ground Water Overdraft: Pumpage of ground water in excess of safe yield.

Ground Water Runoff: The part of runoff, caused by precipitation and/or snowmelt, that passes into the ground, becomes ground water, and gets discharged into a stream or river as spring or seepage water.

Grout Curtain: A barrier produced by injecting grout into a vertical zone, usually narrow (horizontally), and in the foundation to reduce seepage under a dam.

Growing Degree Days: The number of degrees that the average temperature is above a baseline value. For example, 40 degrees for canning purposes; 45 degree for potatoes; and 50 degrees for sweet corn, snap beans, lima beans, tomatoes, grapes, and field corn. Every degree that the average temperature is above the baseline value becomes a growing degree day. Agricultural related interests use growing degree days to determine planting times.

Gulf Stream: A warm, swift, narrow ocean current flowing along the East Coast of the United States.

Gunge: Slang for anything in the atmosphere that restricts visibility for storm spotting, such as fog, haze, precipitation (steady rain or drizzle), widespread low clouds (stratus), etc.

Gust: A rapid fluctuation of wind speed with variations of 10 knots or more between peaks and lulls.

Gust Front: Formed when the down draft and rain-cooled air of a thunderstorm reach the ground, and then spread out along the ground. Usually marked by a sudden wind shift, sharply falling temperatures, and possibly heavy downpours and/or hail. If two or more of these gust fronts intersect each other, a new thunderstorm could possibly develop. Sometimes it is associated with a shelf cloud or roll cloud. Also, see ***downburst***, ***gustnado***, and ***outflow boundary***.

Gustnado: Slang for a gust front tornado. A small tornado, usually weak and short-lived, that occurs along the gust front of a thunderstorm. Often it is visible only as a debris cloud or dust whirl near the ground. Gustnadoes are not associated with storm-scale rotation (i.e. mesocyclones); they are more likely to be associated visually with a shelf cloud than with a wall cloud.

Gyre: A circular or spiral motion, primarily referring to water currents.

Gyro: A device used for measuring changes in direction. Often used in antenna stabilization.

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H

HADS (Hydrometeorological Automated Data System): Software that replaced GDDS to process and distribute the GOES DCP data and CADAS data collected from DCP's and LARCS.

Hail (GR): Precipitation in the form of balls or lumps usually consisting of concentric layers of ice. A thunderstorm is classified as severe when it produces hail 3/4 of an inch or larger in diameter. The following table shows hail size estimates:

Hail Size Estimates			
Description	**Size**	**Description**	**Size**
Pea	0.25 inch	Golfball	1.75 inches
Marble or Mothball	0.50 inch	Hen Egg	2.00 inches
Penny or Dime	0.75 inch	Tennis Ball	2.50 inches
Nickel	0.88 inch	Baseball	2.75 inches
Quarter	1.00 inch	Tea Cup	3.00 inches
Half Dollar or Susan B. Anthony Dollar	1.25 inches	Grapefruit	4.00 inches
Walnut or Ping Pong Ball	1.50 inches	Softball	4.50 inches

Hail Index (HI): This WSR-88D radar product displays an indication of whether the thunderstorm structure of each identified by the storm series algorithm is conducive to the production of hail. A green triangle indicates areas where the algorithm thinks that there is hail. It will also display an estimated hail size. This does not mean that there is actually hail occurring or the hail is the size that the radar is indicating, but it does attract the radar operator's attention to check out the thunderstorm more closely.

Hail Spike: When looking at a WSR-88D Cross-Section, one will occasionally see a distinctive spike above the actual top of the thunderstorm. This is due to the high reflective properties of hail. When the side lobe energy hits the hail, it reflects enough energy back to be detected by the radar receiver even when the radar beam 1/2 power width has exceeded the top of the storm. The radar receiver "thinks" that the detected energy is coming from the center of the radar beam as a result it extends the actual top of the storm in the form of a spike. This "hail spike" has been associated with many hail producing thunderstorms.

Haines Index: This is also called the Lower Atmosphere Stability Index. It is computed from the morning (12Z) soundings from RAOB stations across North America. The index is composed of a stability term and a moisture term. The stability term is derived from the temperature difference at two atmosphere levels. The moisture term is derived from the dew point depression at a single atmosphere level. This index has been shown to be correlated with large fire growth on initiating and existing fires where surface winds do not dominate fire behavior. The Haines Indexes range from 2 to 6 for indicating potential for large fire growth:

Weather Safety
Storm Ready
Education
NOAA Weather Radio
Skywarn
Miscellaneous
Weather Now
Wireless Forecasts
Computer Guidance
Weather Stories
News Archive
Weather Links
Weather Glossary
Our Office
1953 Beecher
Tornado
Contact Us
w-dtx.webmaster
@noaa.gov

Haines Index	What Does it Mean?
2	Very Low Potential -- (Moist Stable Lower Atmosphere)
3	Very Low Potential
4	Low Potential
5	Moderate Potential
6	High Potential ------ (Dry Unstable Lower Atmosphere)

Halos: Rings or arcs that encircle the sun or moon. These are caused by refraction of light through ice crystals that make up cirrus clouds.

Hanging (Ice) Dam: A mass of ice composed mainly of frazil or broken ice deposited underneath an ice cover in a region of low flow velocity.

Haze (HZ): A concentration of salt particles or other dry particles not readily classified as dust or other phenomenon. Occurs in stable air usually only a few thousand feet thick, but may extend as high as 15,000 feet. Haze layers often have definite tops above which the visibilities are good. However, the visibility in the haze layer can be very poor.

HDRAIN: An Hourly Digital Rainfall Product of the WSR-88D.

Head: The difference between the pool height and tailwater height. Usually expressed in feet of head, or in lbs./sq. inch

Head Loss: The decrease in total head caused by friction.

Head Race: A channel which directs water to a water wheel; a forebay.

Headward Erosion: Erosion which occurs in the upstream end of the valley of a stream, causing it to lengthen its course in such a direction.

Headwaters: Streams at the source of a river.

Headwater Advisory Program (ADVIS): A Program which uses the Antecedent Precipitation Index (API) method of estimating runoff, unit hydrograph theory and stage-discharge ratings to produce hydrologic forecasts for headwater basins.

Headwater Advisory Table: A table developed by a River Forecast Center for a Headwater Guidance Point; a pre-computed matrix of values allows a forecaster to ascertain an anticipated crest or rise on a small river or stream for a variety of rainfall events and soil moisture conditions.

Headwater Basin: A basin at the headwaters of a river. All discharge of the river at this point is developed within the basin.

Heat Advisory: This product is issued by the National Weather Service when excessive heat may pose a hazard or is life threatening if action is not taken. The criteria for this advisory varies from state to state. In Michigan, the criteria is a heat index of 105 degree F or higher for a period of 3 hours or more.

Heating Degree Day: see ***Degree Day***

Heat Index: The Heat Index (HI) or the "Apparent Temperature" is an accurate measure of how hot it really feels when the Relative Humidity (RH) is added to the actual air temperature. To find the Heat Index (HI), look at the Heat Index (HI) Chart below. As an example, if the air temperature is 90ºF (found at the left side of the table) and the Relative Humidity (RH) is 70% (found at the top of the table), the Heat Index (HI)--or how hot it actually feels--is 106ºF. This is at the intersection of the row 90ºF and the 70% column.

This index was devised for shady, light wind conditions. Exposure to full sunshine can increase Heat Index (HI) values by up to 15ºF. Also strong winds, particularly with very hot, dry air, can be extremely dangerous. Any value Heat Index (HI) greater than 105ºF is in the **Danger Category**. This is denoted by a thick line on the chart. Any number below or to the right of the thick line is in this category. When the Heat Index is between 105-115ºF for 3 hours or more, a ***Heat Advisory*** will be issued by the local National Weather Service Forecast Office (NWSO). If the Heat Index is greater than 115ºF for 3 hours or more, an ***Excessive Heat Warning*** will be issued by the local National Weather Service Forecast Office (NWSO).

Heat Index

		Relative Humidity (%)												
		40	45	50	55	60	65	70	75	80	85	90	95	100
A	110	136												
i	108	130	137											
r	106	124	130	137										
	104	119	124	131	137									
T	102	114	119	124	130	137								
e	100	109	114	118	124	129	136							
m	98	105	109	113	117	123	128	134						
p	96	101	104	108	112	116	121	126	132					
e	94	97	100	103	106	110	114	119	124	129	136			
r	92	94	96	99	101	105	108	112	116	121	126	131		
a	90	91	93	95	97	100	103	103	109	113	117	122	127	132
t	88	88	89	91	93	95	98	100	103	106	110	113	117	121
u	86	85	87	88	89	91	93	95	97	100	102	105	108	112
r	84	83	84	85	86	88	89	90	92	94	96	98	100	103
e	82	81	82	83	84	84	85	86	88	89	90	91	93	95
(°F)	80	80	80	81	81	82	82	83	84	84	85	86	86	87

With Prolonged Exposure and/or Physical Activity			
Extreme Danger	Danger	Extreme Caution	Caution
Heat stroke or sunstroke highly likely	Sunstroke, muscle cramps, and/or heat exhaustion likely	Sunstroke, muscle cramps, and/or heat exhaustion possible	Fatigue possible

The following table describes the symptoms of the various heat disorders in the previous table. It also tells what to do for each heat disorder:

3 Types of Heat Disorders		
Heat Disorder	**Symptoms**	**First Aid**
Heat Cramps	Painful spasms usually in the muscles of the legs and abdomen. Heavy sweating.	Get the person to a cooler place. If the victim has no other injuries and can tolerate water, give him or her one-half glassful every 15 minutes for an hour.

Heat Exhaustion	Heavy sweating, weakness, skin cold, pale, and clammy. Pulse thready. Normal temperature possible. Fainting and vomiting.	Get the person out of the heat and into a cooler place. Have him or her lie down on their back and elevate the feet with something. Either remove or loosen the victim's clothing. Cool him or her by fanning and applying cold packs (putting a cloth between the pack and the victim's skin) or wet towels or sheets. Care for shock. Give the victim one-half glassful or water to drink every 15 minutes, if he or she can tolerate it. These first aid steps should bring improvement within a half hour.
Heat Stroke or Sun Stroke	High body temperature (106 degree F of higher). Hot, dry skin. Rapid and strong pulse. Possible unconsciousness.	Heat Stroke is a life-threatening situation. Call 911. Get the person out of the heat and into a cooler place. Cool the victim fast. Immerse him or her in a cool bath, or wrap wet sheets around the body and fan it. Care for shock by laying the victim on his or her back and elevate the feet with something. Wait for medical help to arrive. Also, do **not** give anything by mouth.

See ***Apparent Temperature***.

Heat Lightning: Lightning that occurs at a distance such that thunder is **no** longer audible.

Heavy Snow Discussion (HSD): This message discusses the potential for heavy snowfall in the contiguous United States. The threshold value in this product for heavy snow is 4 inches or more in a 12-hour period. However, this product discusses all potential snowstorms, including those not expected to attain the threshold. Although the focus is on the meteorological reasoning for the forecast, the impact of numerical model forecasts and model differences are also explained. This narrative is a 3-part product. The first part is a synopsis and short-term forecast for the few hours before the main 12-hour forecast period. The second part includes the 12-hour forecast and the accompanying meteorological reasoning. The third part is a meteorological discussion of the outlook period that extends 12 hours beyond the forecast period. There is an accompanying graphic for each forecast under the AFOS identifier 93S. The HSD is issued 4 times a day from September 15 to May 15 and other times as needed as described below. A revised or amended HSD may be issued as necessary. Routine issuances are as follows:

1) Around 9 PM EST (10 PM EDT), a forecast is issued for 1 AM EST (2 AM EDT) to 1 PM EST (2 PM EDT), and the outlook is issued for 1 PM EST (2 PM EDT) to 1 AM EST (2 AM EDT) the next day.

2) Around 2 AM EST (3 AM EDT), a forecast is issued for 7 AM EST (8 AM EDT) to 7 PM EDT (8 PM EDT), and the outlook is issued for 7 AM EST (8 AM EDT) to 7 PM EST (8 PM EDT).

3) Around 9 AM EST (10 AM EDT), a forecast is issued for 1 PM EST (2 PM EDT) to 1 AM EDT (2 AM EDT) the next day, and the outlook is issued for 1 AM EST (2 AM EDT) to 1 PM EST (2 PM EDT).

4) Around 2 PM EST (3 PM EDT), a forecast is issued for 7 PM EST (8 PM EDT) to 7 AM EDT (8 AM EDT) the next day, and the outlook is issued for 7 AM EST (8 AM EDT) to 7 PM EST (8 PM EDT).

Heavy Surf: Large waves breaking on or near the shore resulting from swells spawned by a distant storm.

Helicity: A property of a moving fluid which represents the potential for helical flow (i.e. flow which follows the pattern of a corkscrew) to evolve. Helicity is proportional to the strength of the flow, the amount of vertical wind shear, and the amount of turning in the flow (i.e. vorticity). Atmospheric helicity is computed from the vertical wind profile in the lower part of the atmosphere (usually from the surface up to 3 km), and is measured relative to storm motion. The helicity is the area on a hodograph that is enclosed by a line from

the tip of the storm motion vector to the surface wind vector, then following the ***hodograph*** curve to 3 km level, then back to storm motion vector. This value allows the forecaster to determine the rotational tendency of a thunderstorm. Higher values of helicity (generally, around 150 m2/s2 or more) favor the development of mid-level rotation (i.e. mesocyclones). Extreme values can exceed 600 m2/s2. It is dependent on the local environmental wind profile in which a thunderstorm develops and the thunderstorm motion.

Heliophobia: The fear of the sun.

Hemispheric Map Discussion (HMD): This discussion is issued once a day around 1 PM EST (2 PM EDT) and is primarily intended to provide insight into the hemispheric circulation patterns over the next 5 days. This includes a discussion of the 5-day mean circulation pattern. Comparisons, differences, and continuity among the numerical models are highlighted, and preferred solutions are proposed with an explanation of why a solution is preferred. This includes any reasons why the preferred solution differs from any model. In cases where certain models are not universally available, an attempt will be made to describe that model's solution to an extent that a reader can understand it's important aspects. Although actual or forecast sensible surface weather conditions are not a focus of this discussion, some discussion, some discussion may be made to correlate them to circulation patterns.

HIC: 1) Hydrologist in Charge of an RFC. 2) The Hydrometeorological Information Center of the Office of Hydrology (OH).

High: A region of high pressure, marked as "H" on a weather map. A high is usually associated with fair weather. See ***Anticyclone***.

High Clouds: These clouds have bases between 16,500 and 45,000 feet in the mid latitudes. At this level they are composed of primarily of ice crystals. Some clouds at this level are cirrus, cirrocumulus, and cirrostratus.

High Risk of Severe Thunderstorms: Severe weather is expected to affect more than 10 percent of the area. A high risk is rare, and implies an unusually dangerous situation and usually the possibility of a major severe weather outbreak. Also, see ***slight risk***, ***moderate risk***, and ***convective outlook***.

High Seas: The major oceans of the world including, for National Weather Service purposes, the coastal and offshore areas. Areas of responsibility for the United States are determined by international agreements under the auspices of the World Meteorological Organization (WMO). The United States is responsible for that portion of the Atlantic and Pacific oceans which extends from 20 to 40 nm off the Western and Eastern US coasts and extends to 35W in the Atlantic ocean and to 160E in the Pacific Ocean. The area includes both the coastal and offshore waters.

High Seas Forecasts (HSF): This National Weather Service (NWS) marine forecast are designed to meet the needs of ships making ocean transits; therefore, the primary focus is on major weather systems and sea states affecting oceangoing vessels. NWS units issuing High Seas Forecasts are the Marine Forecasting Branch of the National Meteorological Center (NMC), the Tropical Satellite Analysis and Forecast Unit of the Tropical Prediction Center (formerly called the National Hurricane Center), and the marine forecast section of the WFO Honolulu.

High Wind Advisory: This product is issued by the National Weather Service when high wind speeds may pose a hazard. The criteria for this advisory varies from state to state. In Michigan, the criteria is sustained non-convective (not related to thunderstorms) winds greater than or equal to 30 mph lasting for one hour or longer, or winds greater than or equal to 45 mph for any duration.

High Wind Watch: This product is issued by the National Weather Service when there is the potential of high wind speeds developing that may pose a hazard or is life threatening. The criteria for this watch varies from state to state. In Michigan, the criteria is the potential for sustained non-convective (not related to thunderstorms) winds greater than or equal to 40 mph and/or gusts greater than or equal to 58 mph.

High Wind Warning: This product is issued by the National Weather Service when high wind speeds may pose a hazard or is life threatening. The criteria for this warning varies from state to state. In Michigan, the criteria is sustained non-convective (not related to thunderstorms) winds greater than or equal to 40 mph lasting for one hour or longer, or winds greater than or equal to 58 mph for any duration.

Hinge Crack: Crack caused by significant changes in water level.

HOD: 1) The Hydrologist on Duty at an RFC. 2) The Hydrologic Operations Division of the Office of Hydrology (OH).

Hodograph: A polar coordinate graph which shows the vertical wind profile of the lowest 7000 meters of the atmosphere. These plots are used to determine the advection patterns aloft, whether a thunderstorm will rotate, and the type of thunderstorms that you will likely see that day. On the graph, only the tip of wind vectors are plotted on this graph. The tips are denoted by a dot. As the distance between the dot and the center of the graph increases, the magnitude of the wind will also increase. These dots are sequentially

connected together by a line beginning with the first wind reported and ending with last wind reported. This is similar to a dot to dot book. Normally, they are plotted every 500 meters from the surface to 7000 meters. Another interesting feature of this graph is that the axes are rotated 180 degrees. This means that 180º is located on the top of the graph, 270º is located on the right side of the graph, 0º is located on the bottom of the graph, and finally 90º is located on the left side of the graph. Therefore, if you are going to plot a west wind, it would be located to the right of the center of the graph. Interpretation of a hodograph can help in forecasting the subsequent evolution of thunderstorms (e.g., squall line vs. supercells, splitting vs. non-splitting storms, tornadic vs. nontornadic storms, etc.).

Homichlophobia: The fear of fog.

Homodyning: The transfer of signal intelligence from one carrier to another by mixing of signals at different frequencies.

Hook or Hook Echo: A pendant or hook on the right rear of a radar echo that often identifies mesocyclones on the radar display. The hook is caused by precipitation drawn into a cyclonic spiral by the winds, and the associated notch in the echo is caused by precipitation-free, warm, moist air flowing into the storm. A hook often is associated with a mesocyclone, and indicates favorable conditions for tornado development.

Hourly Precipitation Data (HPD): This National Climatic Data Center (NCDC) publication is produced monthly by state or region. It contains data on nearly 3,000 hourly precipitation stations (National Weather Service, Federal Aviation Administration, and cooperative observer stations) in inches to tenths or inches to hundredths at local standard time. HPD includes maximum precipitation for nine (9) time periods from 15 minutes to 24 hours, for selected stations.

HMT (Hydrometeorological Technicians): Individuals who, at the technical level, have knowledge in meteorology and hydrology. Among their duties are data collection, quality control, gage network maintenance, as well as the gathering and disseminating of data and products.

HP (High Precipitation) Storm or HP (High Precipitation) Supercell: High-Precipitation storm (or High-Precipitation supercell). A supercell thunderstorm in which heavy precipitation (often including hail) falls on the trailing side of the mesocyclone. Precipitation often totally envelops the region of rotation, making visual identification of any embedded tornadoes difficult and very dangerous. Unlike most classic supercells, the region of rotation in many HP storms develops in the front-flank region of the storm (i.e., usually in the eastern portion). HP storms often produce extreme and prolonged downburst events, serious flash flooding, and very large damaging hail events. Mobile storm spotters are strongly advised to maintain a safe distance from any storm that has been identified as an HP storm; close observations (e.g., core punching) can be extremely dangerous. See ***Bear's Cage***.

HPC: An acronym for the Hydrometeorological Prediction Center. See ***Hydrometeorological Prediction Center***.

HRL: The Hydrological Research Laboratory at the Office of Hydrology (OH).

HSA (Hydrologic Service Area): A geographical area assigned to Weather Service Forecast Office's/Weather Forecast Office's that embraces one or more rivers.

HSB: The Hydrologic Systems Branch in the Office of Hydrology (OH).

HTC: The Hydrometeorological Training Council

Humidity: Generally, a measure of the water vapor content of the air. Popularly, it is used synonymously with relative humidity.

Hummock: A hillock of broken ice which has been forced upward by pressure.

Hummocked Ice: Ice piled haphazardly one piece over another to form an uneven surface.

Hurricane: A warm-core tropical cyclone in which the maximum sustained surface wind (using the U.S. 1-minute average) is 64 kt (74 mph or 119 kph) or more. The term hurricane is used for Northern Hemisphere cyclones east of the International Dateline to the Greenwich Meridian. It has a diameter of 250 to 500 miles and a cyclonic circulation typically extending to near 50,000 feet. It is called a *Typhoon* in the western Pacific north of the Equator and west of the International Dateline, a *Cyclone* in the Indian Ocean, and *Baguio* in the Philippines area. See *Saffir-Simpson Hurricane Intensity Scale*.

Hurricane Local Statement (HLS): This products is issued by a local National Weather Service office when it is in or near an area threatened by a tropical storm or a hurricane. This statement will take the place of Special (SPS) and Severe (SVS) Statements, Flash Flood/Flood (FFS) Statements, Coastal Flood Statements, and Marine Weather (MWS) Statements. This statement does not replace the tropical storm or hurricane advisory from a hurricane center; rather, it complements the advisory with crucial local

information. It is normally issued whenever the local National Weather Service warning area of responsibility is under one or more of the following: a tropical storm or hurricane watch or warning, evacuation orders, or rumors which the local station manager feels should be clarified. Inland offices close to the coast may use HLSs if tropical storm or hurricane conditions are forecasted or observed. It is optional to include the probability of hurricane/tropical storm conditions from the hurricane center's advisory. This product contains information that affects the local county or parish warning area such as weather conditions, areas that should be evacuated, other precautions to protect life and property, and any other relevant information. They are issued at regular and frequent intervals. When a tropical storm or hurricane is close to the coast, HLSs may be issued every 2 or 3 hours, but more frequently if information and conditions warrant.

Hurricane Model: The Geophysical and Fluid Dynamics Laboratory(GFDL) developed the hurricane model in order to improve hurricane landfall forecasts. The hurricane model is centered on the eye of the hurricane for each run of the model. Since hurricanes do not always form over the same locations, the geographical location of the model's forecast varies from run to run. This is called a relocatable model. The model does not forecast for large distances away from the hurricane because its main focus is the development and the movement of the hurricane. As a result of forecasting for small horizontal distances, the resolution of the hurricane model is 10 kilometers. The model got a very good test of its skill during its first year of operation in the hurricane season of 1995, which was one of the most active hurricane seasons in history. The results show a 20% improvement in hurricane landfall forecasts 48 to 72 hours in advance. This improvement gives people living in the regions expected to be hit by a hurricane more time to prepare or evacuate. Another file gives more details on the hurricane model.

Hurricane Season: The portion of the year having a relatively high incidence of hurricanes. The hurricane season in the Atlantic, Caribbean, and Gulf of Mexico runs from June 1 to November 30. The hurricane season in the Eastern Pacific basin runs from May 15 to November 30. The hurricane season in the Central Pacific basin runs from June 1 to November 30.

Hurricane Warning: A warning that sustained winds 64 kt (74 mph or 119 kph) or higher associated with a hurricane are expected in a specified coastal area in 24 hours or less. A hurricane warning can remain in effect when dangerously high water or a combination of dangerously high water and exceptionally high waves continue, even though winds may be less than hurricane force.

Hurricane Watch: An announcement of specific coastal areas that a hurricane or an incipient hurricane condition poses a possible threat, generally within 36 hours

Hydraulic Fill Dam: A dam constructed of materials, often dredged, that are conveyed and placed by suspension in flowing water.

Hydraulic Grade Line: A line whose plotted ordinate position represents the sum of pressure head plus elevation head for the various positions along a given fluid flow path, such as along a pipeline or a ground water streamline.

Hydraulic Head: 1) The height of the free surface of a body of water above a given point beneath the surface. 2) The height of the water level at the headworks, or an upstream point, of a waterway, and the water surface at a given point downstream. 3) The height of a hydraulic grade line above the center line of a pressure pipe, at a given point.

Hydraulic Mean Depth: The right cross-sectional area of a stream of water divided by the length of that part of its periphery in contact with its containing conduit; the ratio of area to wetted perimeter. Also called Hydraulic Radius.

Hydraulic Permeability: The flow of water through a unit cross-sectional area of soil normal to the direction of flow when the hydraulic gradient is unity.

Hydraulic Radius: The right cross-sectional area of a stream of water divided by the length of that part of its periphery in contact with its containing conduit; the ratio of area to wetted perimeter. Also called Hydraulic Mean Depth.

Hydrograph: A graph showing the water level (stage), discharge, or other property of a river with respect to time. The common hydrographs in National Weather Service usage depict stage vs. time and flow vs. time.

Hydrographic Survey: An instrumental survey to measure and determine characteristics of streams and other bodies of water within an area, including such things as location, areal extent, and depth of water in lakes or the ocean; the width, depth, and course of streams; position and elevation of high water marks; location and depth of wells, etc.

Hydrograph Separation: The process where the storm hydrograph is separated into baseflow components and surface runoff components.

Hydrologic Budget: An accounting of the inflow to, outflow from, and storage in, a hydrologic unit, such as

a drainage basin, aquifer, soil zone, lake, reservoir, or irrigation project.

Hydrologic Cycle: The constant movement of water above, on, and below the Earth's surface. Processes such as precipitation, evaporation, condensation, infiltration, and runoff comprise the cycle. Within the cycle, water changes forms in response to the Earth's climatic conditions.

Hydrologic Equation: The water inventory equation (Inflow = Outflow + Change in Storage) which expresses the basic principle that during a given time interval the total inflow to an area must equal the total outflow plus the net change in storage.

Hydrologic Model: A conceptual or physically-based procedure for numerically simulating a process or processes which occur in a watershed.

Hydrologic Service Area (HSA): A geographical area assigned to Weather Service Forecast Office's/Weather Forecast Office's that embraces one or more rivers.

Hydrologic Services: A general Term referring to the operations, products, verbal communications, and related forms of support provided by the NWS for the Nation's streams, reservoirs, and other areas affected by surface water.

Hydrologic Unit: A geographical area representing part or all of a surface drainage basin or distinct hydrologic feature such as a reservoir, lake, etc.

Hydrology: The applied science concerned with the waters of the earth, their occurrences, distribution, and circulation through the unending hydrologic cycle of: Precipitation, consequent runoff, infiltration, and storage; eventual evaporation; and so forth. It is concerned with the physical and chemical reaction of water with the rest of the earth, and its relation to the life of the earth.

Hydrometeor: A particle of condensed water (liquid, snow, ice, graupel, hail) in the atmosphere.

Hydrometeorological Prediction Center (HPC): This is one of 9 centers that comprises the National Centers for Environmental Prediction (NCEP, formerly the National Meteorological Center). This national center provides basic hydrometeorological analysis and forecasts for National Weather Service Field Offices and the entire meteorological community. HPC meteorologists serve as experts in quantitative precipitation forecasting and numerical model interpretation. Products provided by the HPC include surface analyses, outlooks for heavy rain and snow, as well as guidance weather forecasts through five days.

Hydrometeorologists: Individuals who have the combined knowledge in the fields of both meteorology and hydrology which enables them to study and solve hydrologic problems where meteorology is a factor.

Hydrometeorology: The interdisciplinary science involving the study and analysis of the interrelationalships between the atmospheric and land phases of water as it moves through the hydrologic cycle.

Hydrosphere: The region that includes all the earth's liquid water, frozen water, floating ice, frozen upper layer of soil, and the small amounts of water vapor in the earth's atmosphere.

Hydrostatic Head: A measure of pressure at a given point in a liquid in terms of the vertical height of a column of the same liquid which would produce the same pressure.

Hyetograph: A graphical representation of rainfall intensity with respect to time.

Hygrometer: An instrument which measures the humidity of the air.

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Weather Planner

Climate
Local Climate
Climate Prediction

I

i: i = square root of (-1); a mathematical operator which, when multiplied with a number or parameter, has the effect of turning the vector 90 degrees counter clockwise from its original position

'I': See ***inphase***.

Ice Boom: A floating structure designed to retain ice.

Ice Bridge: A continuous ice cover of limited size extending from shore to shore like a bridge.

Ice Crystals (IC): A fall of unbranched (snow crystals are branched) ice crystals in the form of needles, columns, or plates. They are also referred to as ***Diamond Dust***.

Ice Fog: Occurs when the temperature is much below freezing and water vapor condenses directly as ice crystals (sublimation). It is a radiational fog and the conditions for its formation are the same as for radiational fog except that the temperature must be cold. It occurs mostly in Arctic regions, but it is not unknown in middle latitudes during the cold season.

Ice Gorge: The gorge or opening left in a jam after it has broken.

Ice Jam: A stationary accumulation that restricts or blocks streamflow.

Ice Pellets (PL): Precipitation of transparent and translucent pellets of ice, which are round or irregular, rarely conical, and which have a diameter of 0.2 inch (5 mm), or less. Ice Pellets bounce when they make contact with the ground. It is sometimes called "Sleet". There are two main types:

1) Hard grains of ice consisting of frozen raindrops, or largely melted and refrozen snowflakes.

2) Pellets of snow encased in a thin layer of ice which have formed from the freezing, either of droplets intercepted by the pellets, or of water resulting from the partial melting of the pellets.

The following table shows how ice pellet intensity is determined:

Ice Pellet Intensity			
Ice Pellet Intensity	**Rate-of-fall in 6-minutes**	**Rate-of-fall in one hour**	**Visual Estimation**
Light	less than 0.01 inch	Up to 0.10 inch	Scattered pellets that do **not** completely cover an exposed surface regardless of duration. Visibility is **not** affected.

Weather Safety
Storm Ready
Education
NOAA Weather Radio
Skywarn
Miscellaneous
Weather Now
Wireless Forecasts
Computer Guidance
Weather Stories
News Archive
Weather Links
Weather Glossary
Our Office
1953 Beecher
Tornado
Contact Us
w-dtx.webmaster
@noaa.gov

Moderate	0.01 to 0.03 inches	0.11 to 0.30 inches	Slow accumulation on the ground. Visibility reduced by ice pellets to less than 7 statue miles.
Heavy	more than 0.03 inches	more than 0.30 inch	Rapid accumulation on ground. Visibility reduced by ice pellets to less than 3 statue miles.

Ice Push: Compression of an ice cover particularly at the front of a moving section of ice cover.

Ice Run: Flow of ice in a river. An ice run may be light or heavy, and may consist of frazil, anchor, slush, or sheet ice.

Ice Shove: On-shore ice push caused by wind, and currents, changes in temperature, etcetera.

Ice Storm: It is usually used to describe occasions when damaging accumulations of ice are expected during freezing rain situations. Significant accumulations of ice pull down trees and utility lines resulting in the loss of power and communications. These accumulations of ice make walking and driving extremely dangerous. Significant ice accumulation are accumulations of 1/4 inch or greater.

Ice Storm Warning: This product is issued by the National Weather Service when freezing rain produces a significant and possibly damaging accumulation of ice. The criteria for this warning varies from state to state. In Michigan, the criteria is normally an ice accumulation of 1/4 inch or greater.

Ice Twitch: Downstream movement of a small section of an ice cover. Ice twitches occur suddenly and often appear successively.

IFLOWS: The Integrated Flood Observing and Warning System.

Impermeable: Material that does not permit fluids to pass through it.

Impervious: The ability to repel water, or not let water infiltrate.

Import: Water piped or channeled into an area.

Impulse: See ***upper level system***.

Inactive Storage Capacity: The portion of capacity below which the reservoir is not normally drawn, and which is provided for sedimentation, recreation, fish and wildlife, aesthetic reasons, or for the creation of a minimum controlled operational or power head in compliance with operating agreements or restrictions.

Incident Power Density: Energy per unit area incident on the radar target.

In-Cloud Lightning (IC): Lightning that takes place within the cloud.

Inch-Degrees: The product of inches of rainfall multiplied the temperature in degrees above freezing (Fahrenheit Scale), used as a measure of the snowmelting capacity of rainfall..

Inches of Runoff: The volume of water from runoff of a given depth over the entire drainage basin.

Inclined Staff Gage: A staff gage that is placed on the slope of a stream bank and graduated so that the scale reads directly in vertical depth.

Index of Refraction: See ***refractive index***.

Index of Wetness: The ratio of precipitation for a given year over the mean annual precipitation..

Indirect Flood Damage: Expenditures made as a result of the flood (other than repair) such as relief and rescue work, removing silt and debris, etc.

Indian Summer: A warm, calm spell of weather occurring in autumn, especially in October and November. Usually follows a substantial period of cool weather.

Indirect Flood Damage: Expenditures made as a result of the flood (other than repair) such as relief and rescue work, removing silt and debris, etc.

Industrial Consumption: The quantity of water consumed in a municipality or district for mechanical, trade, and manufacturing purposes, in a given period, generally one day. The per capita use is generally based

on the total population of the locality, municipality, or district.

Index Model: In hydrology, a hydrologic computer model based on empirical, statistical relationship.

Infiltration: Movement of water through the soil surface into the soil. The infiltration rate is a function of surface wetness soil texture, surface residue cover, irrigation application or precipitation rate, surface topography and other factors.

Infiltration Capacity: The maximum rate at which water can enter the soil at a particular point under a given set of conditions.

Infiltration Capacity Curve: A graph showing the time-variation of infiltration capacity. A standard infiltration capacity curve shows the time-variation of the infiltration rate which would occur if the supply were continually in excess of infiltration capacity.

Infiltration Index: An average rate of infiltration, in inches per hour, equal to the average rate of rainfall such as that the volume of rainfall at greater rates equals the total direct runoff.

Infiltration Rate: 1) The rate at which infiltration takes place expressed in depth of water per unit time, usually in inches per hour. 2) The rate, usually expressed in cubic feet per second, or million gallons per day per mile of waterway, at which ground water enters an infiltration ditch or gallery, drain, sewer, or other underground conduit..

Inflow Bands (or Feeder Bands): Bands of low clouds, arranged parallel to the low-level winds and moving into or toward a thunderstorm. They may indicate the strength of the inflow of moist air into the storm, and, hence, its potential severity. Spotters should be especially wary of inflow bands that are curved in a manner suggesting cyclonic rotation; this pattern may indicate the presence of a mesocyclone.

Inflow Jets: Local jets of air near the ground flowing inward toward the base of a tornado.

Inflow Notch: A radar signature characterized by an indentation in the reflectivity pattern on the inflow side of the storm. The indentation often is V-shaped, but this term should not be confused with V-notch. Supercell thunderstorms often exhibit inflow notches, usually in the right quadrant of a classic supercell, but sometimes in the eastern part of an HP storm or in the rear part of a storm (rear inflow notch).

Inflow Stinger: A beaver tail cloud with a stinger-like shape.

Influent Seepage: Movement of gravity water in the zone of aeration from the ground surface toward the water table.

Influent Stream: Any watercourse in which all, or a portion of the surface water flows back into the ground namely the, vadose zone, or zone of aeration.

Infrared (IR) Satellite Imagery: This satellite imagery senses surface and cloud top temperatures by measuring the wavelength of electromagnetic radiation emitted from these objects. This energy is called "infrared". High clouds are very cold, so they appear white. Mid-level clouds are somewhat warmer, so they will be a light gray shade. Low cloud are warmer still, so they appear as a dark shade of gray or black. Often, low clouds are the same temperature as the surrounding terrain and cannot be distinguished at all. The satellite picks up this infrared energy between 10.5 and 12.6 micrometer (um) channels.
This imagery can be used both during the day and night.

Initial Detention: The volume of water on the ground, either in depressions or in transit, at the time active runoff begins.

Initial Loss: In hydrology, rainfall preceding the beginning of surface runoff. It includes interception, surface wetting, and infiltration unless otherwise specified.

Initial Moisture Deficiency: The quantity, usually expressed in depth of water in inches upon a unit area, by which the actual water content of a given soil zone (usually the root zone) in such area is less than the field capacity of such zone at the beginning of the rainy season. Also called ***Initial Water Deficiency***.

Initial Water Deficiency: The quantity, usually expressed in depth of water in inches upon a unit area, by which the actual water content of a given soil zone (usually the root zone) in such area is less than the field capacity of such zone at the beginning of the rainy season. Also called ***Initial Moisture Deficiency***.

Inland Freshwater Wetlands: Swamps, marshes, and bogs found inland beyond the coastal saltwater wetlands.

Inphase or 'I' Component: The component of a complex signal along the real axis in the complex plane.

Insolation: Incoming solar radiation. Solar heating; sunshine.

Instability (Unstable Air): A state of atmosphere in which the vertical distribution of temperature allows rising, warm air to continue to rise and accelerate. This kind of motion is conducive for thunderstorm development. Instability is a prerequisite for severe weather - the greater the instability, the greater the potential for severe thunderstorms. See ***lifted index*** and ***sounding***.

Instantaneous Unit Hydrograph: The theoretical, ideal, unit hydrograph that has a infinitesimal duration.

Instream Use: The use of water that does not require withdrawal or diversion from its natural watercourse; for example, the use of water for navigation, recreation, and support of fish and wildlife.

Intangible Flood Damage: Estimates of the damage done by disruption of business, danger to health, shock, and loss of life and in general all costs not directly measurable which require a large element of judgment for estimating.

Integrated Flood Observing and Warning System (IFLOWS): A 1200 baud wide area network utilizing UHF/VHF radio and land line communications; IFLOWS components include rainfall and stage sensors, transceivers, store-forward repeaters and computer base stations.

Interbasin Transfer: The physical transfer of water from one watershed to another.

Intercepting Drain: A drain constructed at the upper end of the area to be drained, to intercept surface or ground water flowing toward the protected area from higher ground, and carry it away from the area. Also called ***Curtain Drain***.

Interception: The process by which precipitation is caught and held by foliage, twigs, and branches of trees, shrubs, and other vegetation, and lost by evaporation, never reaching the surface of the ground. Interception equals the precipitation on the vegetation minus streamflow and through fall.

Interception Storage Requirements: Water caught by plants at the onset of a rainstorm. This must be met before rainfall reaches the ground.

Interflow: The lateral motion of water through the upper layers until it enters a stream channel. This usually takes longer to reach stream channels than runoff. This also called subsurface storm flow.

Interflow Runoff: The parts of runoff, caused by precipitation and/or snowmelt, that enters the ground and moves in upper levels of the soil mantle above the water table, heading towards the streams.

Intermediate Zone: The subsurface water zone below the root zone and above the capillary fringe.

Intermittent Stream: A stream that flows periodically. Compare perennial stream.

International Flight Folder Documentation Program (IFFDP): International air transport has grown at double-digit rates from its earliest post-1945 days, until the first oil crisis in 1973. The "scheduled" carrier activity is now more than 100 times what it was in 1945. Much of the impetus for this growth came from technical innovation through the introduction of turboprop aircraft in the early 1950s, transatlantic jets in the late 1950s, wide-bodied transports in the late 60s, airline deregulation in the mid-70s, and now fuel efficient twin jets with improved avionics and Extended-Range Twin-Engine Operations over water (ETOPS) certification. This industry is projected to continue its growth meeting increased loads with single (vice double) aisle aircraft, due to passenger comfort and fuel economy demands. Paralleling the rise in international flights, is the need for global weather information.

Standardized meteorological services are provided by all countries under the International Civil Aviation Organization (ICAO) in order to ensure safety of flight and a consistent level of service world wide. As a contracting state of ICAO, the United States agreed to provide flight documentation services to the international aviation community. On October 1, 1998, and in accordance with Chapter Nine of Annex 3 to the Convention of International Civil Aviation, the Aviation Weather Center (AWC) began providing the required meteorological information to operators and flight crew members for: a) dispatch planning; b) flight crew pre-flight; and c) flight crews en route. Information for the IFFDP is available via a FAX Back service and eventually will have operational Internet posting capability.

AWC currently provides meteorological flight documentation to specified airports within the United States, its territories and possessions. The flight folder consists of the following, pertaining to the route of flight and approximate altitude; wind and temperature aloft forecast charts; significant weather charts (with abbreviated plain language descriptions of forecasts as appropriate); Terminal Aerodrome Forecasts (TAFs) for departure, destination and alternate; significant meteorological information (SIGMET) charts of tropical cyclones and/or volcanic ash as appropriate; and for flights of 2 hours or less, aerodrome reports (METAR); special reports (SPECI); SIGMETs (for any phenomena), and appropriate special air reports (AIREPs). Weather data is obtained from the World Area Forecast System (WAFS), utilizing a high-speed data line from the Office of System Operations (OSO) in Washington, DC, and the AWC.

International SIGMET (SIGnificant METeorlogical Information): This NWS aviation product advises of weather potentially hazardous to all aircraft. The purpose of this information is to advise pilots of the occurrence or expected occurrence of en-route weather phenomena which may affect the safety of aircraft operations. Criteria for Domestic and International SIGMETs are similar, however the format, contractions, and wording used are different. International SIGMETs are issued for oceanic areas adjacent to the United States by a Meteorological Watch Office (MWO). The National Weather Service has MWOs at Anchorage, AK, Guam Island in the Pacific Ocean, Honolulu, HI, Kansas City, MO, and the Tropical Prediction Center in Miami, FL.

International SIGMET criteria are:

- Thunderstorms
  - Tornadoes
  - Lines of thunderstorms
  - Embedded thunderstorms
  - Large areas of thunderstorms
  - Large hail
- Tropical cyclone
- Severe icing
- Severe or extreme turbulence
- Duststorms and sandstorms lowering visibilities to less that three (3) miles.
- Volcanic Ash

These SIGMET items are considered to be widespread because they must be affecting or be forecast to affect an area of at least 3000 square miles at any one time.

International SIGMETs are issued for 12 hour periods for volcanic ash events, 6 hours for hurricanes and tropical storms and 4 hours for all other criteria. If conditions persist beyond the forecast period, the SIGMET is updated and reissued.

Intertropical Convergence Zone (ITCZ): The boundary zone separating the northeast trade winds of the Northern Hemisphere from the southeast trade winds of the Southern Hemisphere.

INU or INS: An acronym for Inertial Navigation Unit or System: A highly accurate tool for measuring and keeping track of motions and accelerations. Often composed of laser gyros. Can be used in stabilizing antennas on moving platforms.

Inundation Map: A map delineating the area that would be inundated in the event of a dam failure.

Inversion: Generally, a departure from the usual increase or decrease in an atmospheric property with altitude. Specifically it almost always refers to a temperature inversion, i.e., an increase in temperature with height, or to the layer within which such an increase occurs. This occurs when warm air sits over cold air, possibly trapping moisture and pollutants in the surface air layer. An inversion is present in the lower part of a cap.

INVOF: An acronym for "in vicinity of".

IR: An acronym for Infrared. See ***Infrared Satellite Imagery***.

Iridescent Clouds: Clouds that exhibit brilliant bright spots, bands, or borders of colors, usually red and green, observed up to about 30 degrees from the sun. The coloration is due to the diffraction with small cloud particles producing the effect. It is usually seen in thin ***cirrostratus***, ***cirrocumulus***, and ***altocumulus*** clouds.

Irrigated Area: The gross farm area upon which water is artificially applied for the production of crops, with no reduction for access roads, canals, or farm buildings.

Irrigation: The controlled application of water to arable lands to supply water requirements not satisfied by rainfall.

Irrigation Efficiency: The percentage of water applied that can be accounted for in soil moisture increase for consumptive use.

Irrigation Requirement: The quantity of water, exclusive of precipitation, that is required for crop production. It includes surface evaporation and other economically unavoidable wastes.

Isallobar: A line of equal change in atmospheric pressure during a specified time period.

Isentropic Analysis: It is a way in the forecaster can look at the atmosphere in 3-dimensions instead of looking at constant pressure surfaces (such as the 850 mb, 700 mb, 500 mb, etc.) which are in 2-dimensions.

In this analysis method, the forecaster looks at constant potential temperature (the temperature that it would take if we compressed or expanded it adiabatically to the pressure of 1000 mb) surfaces. Air parcels move up and down these surfaces; therefore, the forecaster can see where the moisture is located and how much moisture is available. The forecaster can also induce stability the atmosphere. When these surfaces are closely packed together, the atmosphere is very stable. When these surfaces are far apart, the atmosphere is unstable. This type of analysis helps to forecast the freezing level and icing, clear air turbulence, and overrunning convection.

Isentropic Lift: Lifting of air that is traveling along an upward-sloping isentropic surface. Isentropic lift often is referred to erroneously as overrunning, but more accurately describes the physical process by which the lifting occurs. Situations involving isentropic lift often are characterized by widespread stratiform clouds and precipitation, but may include elevated convection in the form of embedded thunderstorms.

Isentropic Surface: A two-dimensional surface containing points of equal potential temperature.

Isobar: Lines of equal barometric pressure as shown on a weather map.

Isobaric Chart: Same as a constant pressure chart.

Isobaric Process: Any thermodynamic change of state of a system that takes a place at constant pressure.

Isobaric Surface: A surface along which the atmospheric pressure is everywhere equal.

Isobath: A contour (or surface) of equal depth in a body of water. It is plotted on a bathymetric chart. It is also a contour or surface of equal depth of the water table below the ground surface.

Isochrone: A line on a chart connecting equal times of occurrence of an event. In a weather analysis, a sequence plotted on a map of the frontal positions at several different observation times would constitute a set of isochrones.

Isodop: A contour of constant Doppler velocity values.

Isodrosotherm: A line on a chart connecting points of equal dewpoint.

Isohaline: A line (or surface) connecting points of equal or constant salinity in water bodies or groundwater.

Isoheight: Same as a contour depicting vertical height of some surface above a datum plane.

Isohel: A line on a weather map connecting points receiving equal sunlight.

Isohyet: A line on a weather map connecting points receiving equal precipitation amounts.

Isolated: A National Weather Service convective precipitation descriptor for a 10 percent chance of measurable precipitation (0.01 inch). Isolated is used interchangeably with few. See ***Precipitation Probability (PoP)***.

Isolated Storm: An individual cell or a group of cells that are identifiable and separate from other cells in a geographic area.

Isopleth: A line on a weather map connecting constant thickness (layer of atmosphere).

Isotach: A line on a weather map connecting points of equal wind speed.

Isotherm: A line on a weather map connecting points of equal temperature.

Isothermal: Of equal or constant temperature with respect to either space or time.

Isothermal Atmosphere: An atmosphere in hydrostatic equilibrium in which the temperature is constant with altitude and in which, the pressure decreases exponentially upward.

Isothermal Layer: Any layer where the temperature is constant with altitude, such that the temperature lapse rate is zero. Specifically, the approximately isothermal region of the atmosphere immediately above the tropopause.

Isothermal Process: Any thermodynamic change of state of a system that takes place at constant temperature.

Isotropic: Having the same characteristics in all directions, as with isotropic antennas. Directional or focused antennas are not isotropic.

ITCZ: Acronym for ***Intertropical Convergence Zone***.

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J

J/KG: Joules per Kilogram. These are the units for CAPE and CIN. See ***Cape*** and ***Cin***.

Jet Max (or Speed Max, Jet Streak): a point or area of relative maximum wind speeds within a jet stream.

Jet Streak: A concentrated region within the jet stream where the wind speeds are the strongest. It sets up unique wind currents in its vicinity which either enhance or diminish the likelihood of clouds and precipitation. It will propagate downstream along the jet stream axis.

Jet Stream: A narrow band of strong winds in the atmosphere that controls the movement of high and low pressure systems and associated fronts. Jet Streams meander from time to time. Wind speeds can reach 200 mph or higher in certain cases. It is usually found at 30,000 to 40,000 feet above the earth's surface. It owes its existence to the large temperature contrast between the polar and equatorial regions. The position and orientation of jet streams vary from day to day. General weather patterns (hot/cold, wet/dry) are related closely to the position, strength and orientation of the jet stream (or jet streams). A jet stream at low levels is known as a low-level jet.

Jetty: A structure (e.g.; a pier, or mole of wood or stone) extending into a sea, lake, or river to influence the current or tide or to protect a harbor.

Jokulhlaup: An Icelandic term meaning glacier dammed lake outburst flood.

Juvenile Water: Water formed chemically within the earth and brought to the surface in intrusive rock.

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- NOAA Weather Radio
- Skywarn

Miscellaneous
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- Wireless Forecasts
- Computer Guidance
- Weather Stories
- News Archive
- Weather Links
- Weather Glossary
- Our Office
- 1953 Beecher

Tornado

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K

|K|^2: A dielectric constant term in the radar equation. K = (m^2 - 1) / (m^2 + 1), where |K| is the magnitude of the expression for the complex index of refraction m. For water, |K|^2 = 0.93; for ice, |K|^2 = 0.197.

K-Index: It is a measure of the thunderstorm potential based on vertical temperature lapse rate, moisture content of the lower atmosphere, and the vertical extent of the moist layer. The temperature difference between 850 mb and 500 mb is used to parameterize the vertical temperature lapse rate. The 850 dew point provides information on the moisture content of the lower atmosphere. The vertical extent of the moist layer is represented by the difference of the 700 mb temperature and 700 mb dew point. This is called the *700 mb temperature-dew point depression*. The index is derived arithmetically and does not require a plotted sounding. K-index = (850 mb temperature - 500 mb temperature) + 850 mb dew point - 700 dew point depression

The K-index favors non-severe convection, especially heavy rain producing convection. Threshold values vary with season, location, and synoptic situation. The following table shows what various K-indices mean.

K-index values vs. Airmass Thunderstorm Probability East of the Rocky Mountains	
K-index value	**Thunderstorm Probability**
Less than 20	None
20 to 25	Isolated thunderstorms
26 to 30	Widely scattered thunderstorms
31 to 35	Scattered thunderstorms
Above 35	Numerous thunderstorms

K-indices are also used to determine the potential of flooding. When your K-index is high (above 35), it means that you will likely see numerous thunderstorms develop. If these thunderstorms track across the same area, you may have a various serious flooding situation on your hands.

Keetch-Byram Drought Index (KBDI): A soil/duff drought index that ranges from 0 (no drought) to 800 (extreme drought) and is based on a soil capacity of 8 inches of water. Factors in the index are maximum daily temperature, daily precipitation, antecedent precipitation, and annual precipitation.

KBDI	What does it mean?

Weather Safety
Storm Ready
Education
NOAA Weather Radio
Skywarn
Miscellaneous
Weather Now
Wireless Forecasts
Computer Guidance
Weather Stories
News Archive
Weather Links
Weather Glossary
Our Office
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0 - 200	Soil moisture and large class fuel moistures are high and do not contribute much to fire intensity. Typical of spring dormant season following winter precipitation.
200 - 400	Typical of late spring, early growing season. Lower litter and duff layers are drying and beginning to contribute to fire intensity.
400 - 600	Typical of late summer, early fall. Lower litter and duff layers actively contribute to fire intensity and will burn actively.
600 - 800	Often associated with more severe drought with increased wildfire occurrence. Intense, deep burning fires with significant downwind spotting can be expected. Live fuels can also be expected to burn actively at these levels.

Keraunophobia: The fear of thunder and lightning. See ***Astraphobia, Astrapophobia, Brontophobia, Ceraunophobia,*** and ***Tonitrophobia.***

Klystron: An electron tube used as a low-power oscillator or a high-power amplifier at ultrahigh frequencies. Noted for exceptional stability over long periods of transmission.

Knot: Unit of speed used in aviation and marine activities which is equal to 1 nautical mile per hour or about 1.15 statue miles an hour.

Knuckles: Slang for lumpy protrusions on the edges, and sometimes the underside, of a thunderstorm anvil. They usually appear on the upwind side of a back-sheared anvil, and indicate rapid expansion of the anvil due to the presence of a very strong updraft. They are not mammatus clouds. See also ***cumuliform anvil*** and ***anvil rollover***.

Kymophobia: The fear of waves.

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L

Lag: 1) The measure of the time between the center of mass of precipitation to the center of mass of runoff (on the hydrograph); basin lag is a function of not only basin characteristics, but also of storm intensity and movement. Some hydrologic texts define lag from the center of mass of rainfall to the hydrograph peak. 2) The time it takes a flood wave to move downstream.

Lake/Land Breeze: A lake breeze occurs when prevailing winds blow off the water, while a land breeze indicates winds blowing from land to sea. Both are caused by the difference in surface temperature (heating) of the land and water. As a result, a lake breeze occurs during the day while a land breeze happens at night.

Lake-Effect Snow Advisory: This product is issued by the National Weather Service when pure lake effect snow (this is where the snow is a direct result of lake effect snow and not because of a low pressure system) may pose a hazard or it is life threatening. The criteria for this advisory varies from area to area. In Michigan, the criteria for its issuance is a pure lake effect snow event that is forecasted to produce snow (average of forecast range) greater than 3 inches, but less than warning criteria (6 inches in Lower Michigan and 8 inches in Upper Michigan) in 12 hours. If the forecaster feels that it is warranted, he or she can issued it for amounts less than the minimum criteria. For example, it may be issued for the first snow of the season or when snow has not fallen in long while. In cases where you have a system snow transitioning to a pure lake effect snow, the criteria for defining this transition is when the mid and high clouds have been stripped away leaving only the stratocumulus clouds behind.

Lake-Effect Snow Squall: A local, intense, narrow band of moderate to heavy snow squall that can extend long distances inland. It may persist for many hours. It may also be accompanied by strong, gusty, surface winds and possibly lightning. Accumulations can be 6 inches or more in 12 hours.

Lake-Effect Snow Warning: This product is issued by the National Weather Service when pure lake effect snow (this is where the snow is a direct result of lake effect snow and not because of a low pressure system) may pose a hazard or it is life threatening. The criteria for this warning varies from area to area. In Lower Michigan, the criteria is a pure lake effect snow event that is forecasted to produce snow greater than or equal to 6 inches in 12 hours, or greater than 8 inches in 24 hours. In Upper Michigan, the criteria is a pure lake effect snow event that is forecasted to produce snow greater than or equal to 8 inches in 12 hours, or greater than 10 inches in 24 hours. In cases where you have a system snow transitioning to a pure lake effect snow, the criteria for defining this transition is when the mid and high clouds have been stripped away leaving only the stratocumulus clouds behind.

Lake St. Clair Forecast: Until the spring of 1996, the lake forecast for Lake St. Clair was issued as an Open Great Lakes Forecast. It is now a combination of ***Open Great Lakes Forecast*** and the ***Great Lakes Nearshore Forecast***. This was done due to the size of the lake. This product includes: winds (in 8 points of the compass), waves, and significant weather, and sky conditions. Unlike the Open Great Lakes Forecast, this product does not include a ***MAFOR*** at the end of the narrative portion of the lake forecast. Unlike the Great Lake Nearshore Forecast, this product is issued all year round. If the forecaster issues a Small Craft Advisory, Gale Warning, and Storm Warning for Lake St. Clair, it will appear as a headline at the beginning of this product. Like other marine forecast products, it is issued 4 times a day (3-4 AM, 9-10 AM, 3-4 PM,

Weather Safety
Storm Ready
Education
NOAA Weather Radio
Skywarn
Miscellaneous
Weather Now
Wireless Forecasts
Computer Guidance
Weather Stories
News Archive
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and 9-10 PM) and each forecast will contain 3 time periods covering usually 36 hours. This product is issued by NWFO Detroit/Pontiac Michigan.

Lakeshore Statement: The local National Weather Service Offices with Great Lakes responsibility will issue this product to alert the public when their is either a potential or actual reports of minor Great Lakes lakeshore flooding and erosion. This means that the lakeshore flooding or erosion would not cause too much damage to property, but it would be an inconvenience to living or driving in those areas.

Lakeshore Warning: The local National Weather Service Offices with Great Lakes responsibility will issue this product to alert the public when there is either a potential or actual reports of major Great Lakes lakeshore flooding and erosion. If precautions are not taken, this could pose a considerable threat to life and property.

Laminar: Smooth, non-turbulent. Often used to describe cloud formations which appear to be shaped by a smooth flow of air traveling in parallel layers or sheets.

Laminar Flow: Streamline flow in which successive flow particles follow similar path lines and head loss varies with velocity to the first power.

Landspout: Slang for a tornado that does not arise from organized storm-scale rotation and therefore is not associated with a wall cloud (visually) or a mesocyclone (on radar). Landspouts typically are observed beneath Cbs or towering cumulus clouds (often as no more than a dust whirl), and essentially are the land-based equivalents of waterspouts.

Lapse Rate: The rate of change of an atmospheric variable, usually temperature, with height. A steep lapse rate implies a rapid decrease in temperature with height (a sign of instability) and a steepening lapse rate implies that destabilization is occurring. The global average rate of temperature change with height in the atmosphere is 6.5 degrees C/km. The adiabatic lapse rate (or dry adiabatic lapse rate) is the normal rate of change (9.8 degrees C/km) for a dry parcel of air that is moved up or down and cools or warms as the pressure changes. The wet (moist) adiabatic lapse rate (4.9 degrees C/km) is the rate at which satuarted air cools as it ascends.

LARC (Limited Automatic Report Collector): An electronic device that interfaces a river or precipitation gage with a telephone line making it possible for remote computers to call a gaging site and retrieve data. Eventually LARCs will Replace DARCs.

Large-scale: See ***synoptic-scale***.

LAWEB: An acronym for Great Lakes Weather Bulletin. This consists of weather reports from Canadian and United States lighthouses, automated stations located adjacent to ***The Great Lakes***, and buoys from 0000, 0300, 0600, 0900, 1200, 1500, 1800, and 2100 UTC. These reports are carried as part of the appropriate Continuous Marine Broadcasts for 3 hours after the time of the observation.

Layer Composite Reflectivity Average (LRA): This WSR-88D radar product displays the average reflectivities for a layer. Data is taken from all elevation angles contained in a given layer for each grid box. It is available for 3 layers (low, mid, high). It is used to aid in determining storm intensity trends by comparing mid level layer composite products with a low level elevation angle base reflectivity product and aid in routing air traffic

Layer Composite Reflectivity Maximum (LRM): This WSR-88D radar product displays the maximum reflectivities for a layer. Data is taken from all elevation angles contained in a given layer for each grid box. It is available for 3 layers (low, mid, high). Currently, the low layer extends from the surface to 24,000 feet, the mid layer extends from 24,000 feet to 33,000 feet, and high layer extends above 33,000 feet. It is used to aid in determining storm intensity trends by comparing mid level layer composite products with a low level elevation angle base reflectivity product and aid in routing air traffic.

LCD (Local Climatological Data): This National Climatic Data Center (NCDC) publication is produced monthly and annually for some 270 United States cities and it's territories. The LCD summarizes temperature, relative humidity, precipitation, cloudiness, wind speed and direction observation. Most monthly publications also contain the 3-hourly weather observations for that month and an hourly summary of precipitation. Annual LCD publications contain a summary of the past calendar year as well as historical averages and extremes.The LCD contains 3-hourly, daily, and monthly values. The annual issue contains the year in review plus normals, means and extremes.

LCL: An acronym for Lifted Condensation Level. See ***Lifted Condensation Level***.

Leader: The streamer which initiates the first phase of each stroke of a lightning discharge. The first stroke is led by a steeped leader, which may be preceded by a pilot streamer. All subsequent strokes begin with a dart leader.

Lee Effect: The effect of topography on winds to the lee (downwind) side of an obstacle such as a steep

island, cliff, or mountain range.

Leeside Low: Extratropical cyclones that form on the downwind (lee) side of a mountain chain. In the United States, they frequently form on the eastern side of the Rockies and Sierra Nevadas.

Leeward/Windward: Leeward is on the side facing the direction toward which the wind is blowing. On the other hand, windward is on the side facing the direction away from the wind.

Left Front Quadrant (or Left Exit Region): The area downstream from and to the left of an upper-level jet max (as would be viewed looking along the direction of flow). Upward motion and severe thunderstorm potential sometimes are increased in this area relative to the wind speed maximum. Also, see ***entrance region*** and ***right rear quadrant***.

Left Mover: A thunderstorm which moves to the left relative to the steering winds, and to other nearby thunderstorms; often the northern part of a splitting storm. Also, see ***right mover***.

Length: The distance in the direction of flow between two specific points along a river, stream, or channel.

Lentic System: A nonflowing or standing body of fresh water, such as a lake or pond. Compare ***lotic system***.

Levee (Dike): A long, narrow embankment usually built to protect land from flooding. If built of concrete or masonary the structure is usually referred to as a flood wall. Levees and floodwalls confine streamflow within a specified area to prevent flooding. The term "dike" is used to describe an embankment that blocks an area on a reservoir or lake rim that is lower than the top of the dam.

Level of Free Convection (LFC): It is the height at which a parcel of air lifted dry-adiabatically until saturated (this is the ***Lifting Condensation Level***) and moist-adiabatically thereafter would first become warmer (less dense) than the surrounding air. At this point, the buoyancy of the parcel would accelerate upward without further need for forced lift.

LEWP: An acronym for Line Echo Wave Pattern. See ***Line Echo Wave Pattern***.

LFC: An acronym for Level of Free Convection. See ***Level of Free Convection***.

LFWS: A generic term for any type of Local Flood Warning System.

LI: An acronym for Lifted Index. See ***Lifted Index***.

Lid: see ***Cap Strength***

Lifted Index (LI): It is a stability index used to determine thunderstorm potential. The LI is calculated by taking a representative low level air parcel and lifting it adiabatically to 500 mb. The algebraic difference between this air parcel and the sounding temperature at 500 mb (around 18,000 feet) denotes the LI. Since the LI accounts for moisture below 850 mb, it provides more reliable stability information than the ***"Showalter Index (SWI)"***. The greater negative values of LI indicate energy available for parcel ascent. The following table shows what LI values mean:

Lifted Index (LI) versus Thunderstorm Indications	
Lifted Index (LI)	**Thunderstorm Indication**
0 to -2	Marginally Unstable - Thunderstorms possible
-3 to -5	Unstable - thunderstorms probable
less than -5	Very Unstable - heavy to strong thunderstorm potential

Light Icing: The rate of ice accumulation that may create a problem if the flight is prolonged in this environment (over one hour). Occasional use of de-icing equipment removes/prevents accumulation. It does not present a problem if de-icing/anti-icing equipment is used. This standard of reporting this type of icing was based on a recommendation set forth by the subcommittee for Aviation Meterorological Services in the Office of the Federal Coordinator for Meteorology in November 1968. The convetion has been to designate icing intensity in terms of its operational effect upon reciprocating engine, straight wing transport aircraft as used by commuter operators.

Lifting Condensation Level (LCL): It is the height at which a parcel of air becomes saturated when lifted dry-adiabatically.

Lightning: A sudden visible flash of energy and light caused by an electrical discharges from thunderstorms.

Lightning Channel: The irregular path through the air along which a lightning discharge occurs. A typical

discharge of flash between the ground and the cloud is actually a composite flash which is composed of several sequential lightning strokes, each of which is initiated by a leader and terminated by a return streamer.

Lightning Discharge: The series of electrical processes by which charge is transferred along a channel of high ion density between electrical charge centers of opposite sign. This can be between a cloud and the Earth's surface of a cloud-to-ground discharge.

Lightning Flash: The total luminous phenomenon accompanying a lightning discharge. It may be composed of one to a few tens of strokes that use essentially the same channel to ground.

Lightning Ground Flash Density: The number of cloud-to-ground flashes per unit time per unit area.

Lightning Ignition Efficiency: Ignition efficiency is calculated by algorithm, using the National Fire Danger Rating System (NFDRS) 100 hour fuel moisture and specialized fuel type maps for the western United States to indicate probability of ignition, given occurrence of lightning.

Lightning Stroke: Any of a series of repeated electrical discharges comprising a single lightning discharge (strike). Specifically, in the case of a cloud-to-ground discharge, a leader plus its subsequent return streamer.

Likely: A National Weather Service precipitation descriptor for a 60 or 70 percent chance of measurable precipitation (0.01 inch). When the precipitation is convective in nature, the term numerous will occasionally be used. See ***Precipitation Probability (PoP)***.

Lilapsophobia: The fear of tornadoes and hurricanes.

Limited Automatic Report Collector (LARC): An electronic device that interfaces a river of precipitation gage with a telephone line making it possible for remote computers to call a gaging site and retrieve data.

Limnology: The branch of hydrology that pertains to the study of lakes.

Limnophobia: The fear of lakes.

Line Echo Wave Pattern (LEWP): A radar echo pattern formed when a segment of a line of thunderstorms surges forward at an accelerated rate. A meso-high pressure area is usually present behind the accelerating thunderstorms. A meso-low pressure area is usually present at the crest of the wave. The potential for strong outflow and damaging straight-line winds increases near the bulge, which often resembles a bow echo. Severe weather potential also is increased with storms near the crest of a LEWP.

Lining: A coating of concrete, rubber, or plastic to a canal, tunnel, shaft or reservoir to provide water-tightness, prevent erosion, reduce friction, or support the periphery of the structure.

Lithosphere: That part of the earth which is composed predominantly of rocks (either coherent or incoherent, and including the disintegrated rock materials known as soils and subsoils), together with everything in this rocky crust.

Littoral Zone: The area on, or near the shore of a body water.

Live Capacity: The total amount of storage capacity available in a reservoir for all purposes, from the dead storage level to the normal water or normal pool level surface level. Does not include surcharge, or dead storage, but does include inactive storage, active conservation storage and exclusive flood control storage.

Live Fuel Moisture -- Greenness Maps: Four vegetation greenness maps are derived weekly from Normalized Difference Vegetation Index (NDVI) data observed by satellites and provided by the EROS Data Center, U.S. Geological Survey. These maps have a 1 kilometer (.6 mile) spatial resolution. Maps with historical references (RG and DA) are based on the years 1989 through 1995. The derived maps are:

> **Visual Greenness Maps:** These maps portray vegetation greenness compared to a very green reference such as an alfalfa field or a golf course. The resulting image is similar to what you would expect to see from the air. Normally dry areas will never show as green as normally wetter areas.
>
> **Relative Greenness Maps:** These maps portray how green the vegetation is compared to how green it has been historically (since 1989). Because each pixel is normalized to its own historical range, all areas (dry to wet) can appear fully green at some time during the growing season.
>
> **Departure from Average Greenness Maps:** These maps portray how green each pixel is compared to its average greenness for the current week of the year.
>
> **Live Moisture Maps:** These maps portray experimental live vegetation moisture with values ranging from 50 to 250 percent of dry weight.

LLJ: An acronym for Low Level Jet. See ***Low Level Jet***.

Loaded Gun (Sounding): Slang for a sounding characterized by extreme instability but containing a cap, such that explosive thunderstorm development can be expected if the cap can be weakened or the air below it heated sufficiently to overcome it.

Local Flooding: Flooding conditions over a relatively limited (localized) area.

Local Flood Warning System (LWFS): A general designator for a network of stream and rain gages implemented by a community or local government to monitor hydrologic events as they occur. LFWS gages are either read manually by spotters or fitted with radio transmitter to communicate data to a computerized base station (see ***IFLOWS*** and ***ALERT***).

Log and Safety Boom: A net-like device installed in a reservoir, upstream of the principal spillway, to prevent logs, debris and boaters from entering a water discharge facility or spillway.

Logarithmic Scale: 10^x, where x is a number.

Long Term Storage Dams: Reservoirs used for recreational use or storage of irrigation, municipal or industrial water. Because water is impounded on a "permanent" basis, the design of these dams is more complex than for tailings or flood control detention dams. A long term storage dam may include an impermeable core surrounded by shell materia, have many types of drains and filters, outlet works, with gates and valves, seepage collection boxes, and possibly several spillways. The capacity of the spillway is dependant upon the downstream hazard potential.

Longwave Trough: A trough in the prevailing westerly flow aloft which is characterized by large length and (usually) long duration. Generally, there are no more than about five longwave troughs around the Northern Hemisphere at any given time. Their position and intensity govern general weather patterns (e.g., hot/cold, wet/dry) over periods of days, weeks, or months. Smaller disturbances (e.g., shortwave troughs) typically move more rapidly through the broader flow of a longwave trough, producing weather changes over shorter time periods (a day or less).

Look Angle: A given radar's "perspective" on a storm; i.e., the angle at which its antenna beam hits it. By using more than one radar with different look angles, multiple Doppler analysis can be performed to retrieve the 2D and 3D winds.

Lotic System: A flowing body of fresh water, such as a river or stream. Compare ***lentic system***.

Low: A region of low pressure, marked as "L" on a weather map. A low center is usually accompanied by precipitation, extensive cloudiness, and moderate winds. See ***Cyclone***.

Low Clouds: The bases of these clouds range from near the surface to about 6,500 feet in middle latitudes. These clouds are almost entirely of water, but the water may be supercooled at sub-freezing temperatures. Low clouds at sub-freezing temperatures can also contain snow and ice particles. The two most common members of this family are stratus and stratocumulus.

Low Drifting (DR): A descriptor used to describe snow, sand, or dust raised to a height of less than 6 feet above the ground.

Lowland Flooding: Inundation of low areas near the river, often rural, but may also occur in urban areas.

Low Level Jet (LLJ): It often forms at 1-1.5 km under the exit region (the place just ahead of a speed maximum) of an upper-level jet (ULJ) streak. It has a strong isallobaric component due to the pressure rise/fall pattern under the right exit/left exit region of the jet streak, respectively. It is usually at a significant angle with respect to the ULJ and has a strong southerly component. This enhances the warm, moist air ahead of an upper level front-jet system. This is common over the Plains states at night during the warm season (spring and summer). Another type of a LLJ is called a "Nocturnal Jet". See ***Nocturnal Jet***.

Low Water Statements: The local National Weather Service Offices with Great Lakes responsibility will issue this product to alert mariners when the Great Lake water levels are too low for safe navigation.

LP Storm (or LP Supercell) - Low-Precipitation storm (or Low-Precipitation supercell): A supercell thunderstorm characterized by a relative lack of visible precipitation. Visually similar to a classic supercell, except without the heavy precipitation core. LP storms often exhibit a striking visual appearance; the main tower often is bell-shaped, with a corkscrew appearance suggesting rotation. They are capable of producing tornadoes and very large hail. Radar identification often is difficult relative to other types of supercells, so visual reports are very important. LP storms almost always occur on or
near the dry line, and thus are sometimes referred to as dry line storms.

LSR - Local Storm Report: A product issued by local NWS offices to inform users of reports of severe and/or significant weather-related events.

Lygophobia: The fear of darkness.

Lysimeter: A device to measure the quantity or rate of downward water movement through a block of soil usually undisturbed, or to collect such percolated water for analysis as to quality.

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M

m2/s2: meters squared per second squared, equivalent to J/kg. See ***CAPE*** and ***CIN***.

Macroburst: One of 2 categories of **downbursts** (the other category is called a **microburst**). This Down burst has an affected outflow area of at least 2.5 miles wide and peak winds lasting between 5 and 20 minutes. Intense macrobursts may cause tornado-force damage up to F-3.

Macroscale: Large scale, characteristic of weather systems several hundred to several thousand kilometers in diameter.

Magnetron: A self-exciting oscillator tube used to produce the radio frequency signal transmitted by some radars. It utilizes a strong magnetic field to help induce the RF signal generated.

Main Lobe: The envelope of electromagnetic energy along the main axis of the radar beam.

Main Stem: The reach of a river/stream formed by the tributaries that flow into it.

Major Flooding: A general term including extensive inundation and property damage. (Usually characterized by the evacuation of people and livestock and the closure of both primary and secondary roads.)

Mammatus Clouds: Rounded, smooth, sack-like protrusions hanging from the underside of a cloud (usually a thunderstorm anvil). Mammatus clouds often accompany severe thunderstorms, but do not produce severe weather; they may accompany non-severe storms as well.

MAP (Mean Areal Precipitation): The average rainfall over a given area, generally expressed as an average depth over the area.

MAREP: An acronym for the Marine Reporting Program. These are recreation craft equipped with VHF radio to assist Environment Canada, Ontario Region and the National Weather Service in preparing reliable marine forecasts for vessels operating in near-shore waters around ***The Great Lakes***.

Marine Inversion: A temperature inversion created by the cooling of a warm airmass from below by the cool lakes on spring and summer days. The same effect can occur along the oceans anytime of the year.

Marine Prediction Center (MPC): This is one of 9 centers that comprises the National Centers for Environmental Prediction (NCEP, formerly the National Meteorological Center). The Marine Prediction Center (MPC) is an integral component of the National Centers for Environmental Prediction (NCEP). MPC is located at the NOAA Science Center in Camp Springs, MD. The primary responsibility is the issuance of marine warnings, forecasts, and guidance in text and graphical format for maritime users. Also, the MPC quality controls marine observations globally from ship, buoy, and automated marine observations for gross errors prior to being assimilated into computer model guidance. In addition MPC coordinates with the National Hurricane Center (NHC) with forecast points for Tropical Cyclones in the Atlantic Ocean E of 65W.

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The MPC originates and issues marine warnings and forecasts, continually monitors and analyzes maritime data, and provides guidance of marine atmospheric variables for purposes of protection of life and property, safety at sea, and enhancement of economic opportunity. These products fulfill U.S. responsibilities with the World Meteorological Organization and Safety of Life at Sea Convention (SOLAS). In emergency situations MPC acts as a backup to the Tropical Prediction Center (TPC) taking over the marine functions of TPC.

Areal Extent: Region of coverage is the over marine areas of the Northern Hemisphere S of 67N to 15 degrees S (except Indian Ocean).

Temporal Extent: Guidance and forecasts are issued for time periods where useful skill exists out to 48 hours for seas and 120 hours for weather systems.

Application Activities: Conducted to support the civilian maritime community and other government agencies in support of safety of life at sea , ie. U.S. Coast Guard.

Product Suite: Support for transoceanic, fishing, and recreational marine users, coastal communities, marine navigation, and other marine interests.

Product Distribution: Direct support for all national and international marine users. MPC produces principal guidance for National Weather Forecast Offices with offshore and coastal responsibilities, and other marine related programs.

Both graphical and text products are disseminated covering these geographical regions: synoptic scale coverage over the entire North Atlantic and North Pacific Oceans, and mesoscale coverage for the coastal and offshore portions of the eastern and western United States.

Marine Small Craft Thunderstorm Advisory: A marine warning issued by Environment Canada Atmospheric Environment Branch when the possibility of thunderstorms is greater than 40 percent.

Marine Small Craft Wind Warning: A marine warning issued by Environment Canada Atmospheric Environment Branch for winds which are forecasted to be in the 20-33 knot range inclusive.

Marine Weather Statement: The National Weather Service will issue this statement: 1) To provide follow-up information on Special Marine Warnings and to cancel all or part of a warning. 2) To describe short duration, nonsevere, but potentially hazardous conditions which sustained winds or frequent gusts are less than 34 knots for 2 hours or less. Short-lived increases in winds, although below threshold for Special Marine Warnings, that may make small craft handling difficult especially for inexperienced boaters. 3) To provide information for a variety of conditions not covered by warnings or routine forecasts (e.g., low water conditions, dense fog, etc.). 4) To discuss increasing or decreasing winds and to convey details on possible later warnings.

Mass Curve: A graph of the cumulative values of a hydrologic quantity (such as precipitation or runoff), generally as ordinate, plotted against time or date.

MAX: An abbreviation of maximum.

Max Parcel Level (MPL): This signifies the highest attainable level that a convective updraft can reach; therefore, it is a good indication of how tall a thunderstorm may reach.

Maximum Spillway Discharge: Spillway discharge (cfs) when reservoir is at maximum designed water surface elevation.

Maximum Unambiguous Range: The greatest distance a pulse can travel and return before the next pulse is transmitted. R_max = c / (2*PRF), where c is the speed of light, PRF is pulse repetition frequency.

Maximum Unambiguous Velocity: The maximum radial velocity that can be detected without velocity aliasing. V_max = PRF * L / 4, where PRF is pulse repetition frequency, L is wavelength.

MB: An acronym for Millibars. See ***Millibars***.

MCC: An acronym for ***Mesoscale Convective Complex***. See ***Mesoscale Convective Complex***.

MCD: An acronym for Mesoscale Discussion. See ***Mesoscale Discussion***.

McIDAS: An acronym for Man-computer Interactive Data Access System.

MCS: An acronym for Mesoscale Convective System. See ***Mesoscale Convective System***.

Meander: The winding of a stream channel.

Meander Belt: The area between lines drawn tangential to the extreme limits of fully developed meanders.

Mean Areal Precipitation: The average rainfall over a given area, generally expressed as an average depth over the area.

Mean Depth: The average depth of water in a stream channel or conduit. It is equal to the cross-sectional area divided by the surface width.

Mean Doppler Velocity: Reflectivity-weighted average velocity of targets in a given pulse resolution volume. Usually determined from a large number of successive radar pulses. Also called mean radial (towards or away from the antenna) velocity. Doppler velocity refers to spectral density first moment, radial velocity to base data. It is also called **mean radial velocity**.

Mean Low Water (MLW): The average height of the daily low tides recorded over a 19-year period at a specific location.

Mean Lower Low Water (MLLW): The average height of the lower of the two low tides occurring during a tidal cycle recorded over a 19-year period at a particular location.

Mean Sea Level (MSL): The average height of the surface of the sea at a particular location for all stages of the tide over a 19-year period. This is usually determined from the hourly height readings of the tide gage at that site.

Medium Range: In forecasting, (generally) three to seven days in advance.

Melting Level: The altitude which ice crystals and snowflakes melt as they descend through the atmosphere.

Meniscus: The curved surface of the liquid at the open end of a capillary column.

Meridional Flow: Large-scale atmospheric flow in which the north-south component (i.e., longitudinal, or along a meridian) is pronounced. The accompanying zonal (east-west) component often is weaker than normal. Compare with ***zonal flow***.

Mesocyclone (M): This WSR-88D radar product displays information regarding the detection of the following 3 types of azimuthal shear patterns:

1) **Uncorrelated Shear:** It is a sufficiently strong circulation detected on only one elevation angle within a thunderstorm.

2) **3-Dimensional Correlated Shear:** It is a sufficiently strong circulation detected on two or more elevation angles within a thunderstorm, but less than two of the features are symmetrical. It is displayed on the radar display as a thin yellow circle.

3) **Mesocyclone:** It is a sufficiently strong circulation detected on two or more elevation angles which are symmetrically linked within a thunderstorm. It is indicated on the radar display as a thick yellow circle.

It is used to identify mesocyclones (they are sometimes associated severe weather--hail greater than 3/4 inch, wind gusts greater than 58 mph, and/or tornadoes).

Mesocyclone (MESO): A storm-scale region of rotation, typically around 2-6 miles in diameter and often found in the right rear flank of a supercell (or often on the eastern, or front, flank of an HP storm). The circulation of a mesocyclone covers an area much larger than the tornado that may develop within it. Properly used, mesocyclone is a radar term; it is defined as a rotation signature appearing on Doppler radar that meets specific criteria for magnitude, vertical depth, and duration. It will appear as a yellow solid circle on the Doppler velocity products. Therefore, a mesocyclone should not be considered a visually-observable phenomenon (although visual evidence of rotation, such as curved inflow bands, may imply the presence of a mesocyclone).

Mesohigh: A relatively small area of high atmospheric pressure that forms beneath a thunderstorm. It is usually associated with MCSs or their remnants.

Mesolow (or Sub-synoptic Low): A mesoscale low-pressure center. Severe weather potential often increases in the area near and just ahead of a mesolow. Mesolow should not be confused with mesocyclone, which is a storm-scale phenomenon.

Mesonet: A regional network of observing stations (usually surface stations) designed to diagnose mesoscale weather features and their associated processes.

Mesoscale: Size scale referring to weather systems smaller than synoptic-scale systems but larger than storm-scale systems. Horizontal dimensions generally range from around 50 miles to several hundred miles. Squall lines, MCCs, and MCSs are examples of mesoscale weather systems.

Mesoscale Convective Complex (MCC): A large MCS, generally round or oval-shaped, which normally

reaches peak intensity at night. The formal definition includes specific minimum criteria for size, duration, and eccentricity (i.e., "roundness"), based on the cloud shield as seen on infrared satellite photographs:

Size: Area of cloud top -32 degrees C or less: 100,000 square kilometers or more (slightly smaller than the state of Ohio), and area of cloud top -52 degrees C or less: 50,000 square kilometers or more.
Duration: Size criteria must be met for at least 6 hours.
Eccentricity: Minor/major axis at least 0.7.

MCCs typically form during the afternoon and evening in the form of several isolated thunderstorms, during which time the potential for severe weather is greatest. During peak intensity, the primary threat shifts toward heavy rain and flooding.

Mesoscale Discussions (MCD): When conditions actually begin to shape up for severe weather, SPC often issues a Mesoscale Discussion (MCD) statement anywhere from roughly half an hour to several hours before issuing a weather watch. SPC also puts out MCDs for hazardous winter weather events on the mesoscale, such as locally heavy snow, blizzards and freezing rain (see below). MCDs are also issued on occasion for heavy rainfall, convective trends, and other phenomena, when the forecaster feels he/she can provide useful information that is not readily available or apparent to field forecasters. MCDs are based on mesoscale analysis and interpretation of observations and of short term, high resolution numerical model output.

The MCD basically describes what is currently happening, what is expected in the next few hours, the meteorological reasoning for the forecast, and when/where SPC plans to issue the watch (if dealing with severe thunderstorm potential). Severe thunderstorm MCDs can help you get a little extra lead time on the weather and allow you to begin gearing up operations before a watch is issued. The MCD begins with a numerical string that gives the LAT/LON coordinates of a polygon that loosely describes the area being discussed.

Mesoscale Convective System (MCS): A complex of thunderstorms which becomes organized on a scale larger than the individual thunderstorms, and normally persists for several hours or more. MCSs may be round or linear in shape, and include systems such as tropical cyclones, squall lines, and MCCs (among others). MCS often is used to describe a cluster of thunderstorms that does not satisfy the size, shape, or duration criteria of an ***MCC***.

Meteoric Water: Water derived from precipitation.

Microburst: One of 2 categories of **downbursts** (the other category is called a **macroburst**). This Down burst has an affected outflow area of less than 2.5 miles wide and peak winds lasting less than 5 minutes. They may induce dangerous horizontal/vertical wind shears, which can adversely affect aircraft performance and cause property damage. They can be sub-classified into either dry or wet microburst depending on how much (or little) rain accompanies the microburst when it reaches the ground. Most microbursts are rather short-lived (5 minutes or so), but on rare occasions they have been known to last up to 6 times that long.

Microcomputer Automatic Radiotheodolite Master Control Unit (Micro-ART): This microcomputer system helps interpret the radiosonde data that it receives from the **Automatic Radiotheodolite Control Unit (ART)**. This system can calculate the lapse rate, the ascension rate of the balloon, and many other things. It also codes up the radiosonde messages for the Hydrometeorological Technician or Intern to send out to the various users.

Michigan Travel Advisory: This is a product issued by the Michigan State Police. It summarizes road conditions as related to weather factors.

Middle Clouds: In the middle family are the altostratus, altocumulus, and nimbostratus clouds. The height of the bases of these clouds ranges from 6,500 to 23,000 feet in middle latitudes. These clouds are primarily water; however, much of the water may be supercooled and the clouds can contain some ice crystals.

Mid-Latitude Areas: Areas between 30º and 60º north and south of the Equator.

Mid-level Cooling: Local cooling of the air in middle levels of the atmosphere (roughly 8 to 25 thousand feet), which can lead to destabilization of the entire atmosphere if all other factors are equal. Mid-level cooling can occur, for example, with the approach of a mid-level cold pool.

Mie Scattering: Any scattering produced by spherical particles whose diameters are greater than 1/10 the wavelength of the scattered radiation. This type of scattering causes the clouds to appear white in the sky. Often, hail exhibits in this type of scattering.

Millibar (mb): Unit of atmospheric pressure. It is equal to 0.03 inches of mercury. One thousand millibars equals 29.55 inches of mercury on a barometer.

Miners' Inch: A rate of discharge through an orifice one inch square under a specific head.

Minimum Discernible Signal (MDS): In a receiver, it is the smallest input signal that will a produce a detectable signal at the output. In radar terms, it is the minimal amount of back scattered energy that is required to produce a target on the radar screen. In other words, MDS is a measure of the radar's sensitivity.

Minor Flooding: A general term indicating minimal or no property damage but possibly some public inconvenience.

Minor Tidal Overflow: Minor flooding caused by high tides that results in little if any damage.

Mist (BR): A visible aggregate of minute water particles suspended in the atmosphere that reduces visibility to less than 7 statue miles, but greater than or equal to 5/8 statue miles.

Misoscale: The scale of meteorological phenomena that ranges in size from a 40 meters to about a 4 kilometers. It includes rotation within a thunderstorm.

Mission of the National Weather Service: To provide weather and flood warnings, public forecasts and advisories for all of the United States, its territories, adjacent waters and ocean areas, primarily for the protection of life and property. NWS data and products are provided to private meteorologist for the provision of all specialized services.

Mission of the Hydrologic Services Program: To provide river and flood forecasts and warnings for the protection of life and property and to provide basic hydrologic forecast information for the Nation's economic and environmental well being.

MLCAPE: CAPE calculated using a parcel consisting of Mean Layer values of temperature and moisture from the lowest 100 mb above ground level. See ***Convective Available Potential Energy (CAPE)***.

MLLI: Lifted Index (LI) calculated using a parcel consisting of Mean Layer values of temperature and moisture from the lowest 100 mb above ground level. See ***Lifted Index***.

Model Output Statistics (MOS): The Hydrometeorological Center of the National Environmental Prediction Centers (formerly National Meteorological Center) produces a short range (6 to 60 hours) MOS (Model Output Statistics) guidance package generated from the NGM (Nested Grid Model) for over 300 individual stations in the continental United States. These alphanumeric messages are made available at approximately 0400 and 1600 UTC for the 0000 and 1200 UTC forecast cycles, respectively. Model Output Statistics are a set of statistical equations that use model output to forecast the probability of precipitation, high and low temperature, cloud cover, and precipitation amount for many cities across the USA. The statistical equations were specifically tailored for each location, taking into account factors such as each location's climate. To indicate snow and precipitation type forecasts, the message varies between the cold (September 16 through May 15) and warm (May 16 through September 15) seasons. Snow and precipitation type forecasts are never issued for certain Florida and California stations.

Moderate Flooding: The inundation of secondary roads; transfer to higher elevation necessary to save property -- some evacuation may be required.

Moderate Icing: The rate of ice accumulation on an aircraft is such that even short encounters becomes potentially hazardous and the use of de-icing/anti-icing equipment or a diversion is necessary. This standard of reporting this type of icing was based on a recommendation set forth by the subcommittee for Aviation Meterorological Services in the Office of the Federal Coordinator for Meteorology in November 1968. The convetion has been to designate icing intensity in terms of its operational effect upon reciprocating engine, straight wing transport aircraft as used by commuter operators.

Moderate Risk of Severe Thunderstorms: Severe thunderstorms are expected to affect between 5 and 10 percent of the area. A moderate risk indicates the possibility of a significant severe weather episode. See ***high risk***, ***slight risk***, and ***convective outlook***.

Modulation: Variation of the amplitude, frequency, or phase of a wave due to the mixing of two signals.

Moist Adiabats: They show how the air temperature would change inside a rising parcel of saturated air.

Moisture Advection: Transport of moisture by horizontal winds.

Moisture Convergence: A measure of the degree to which moist air is converging into a given area, taking into account the effect of converging winds and moisture advection. Areas of persistent moisture convergence are favored regions for thunderstorm development, if other factors (e.g., instability) are favorable.

Moisture Equivalent: The ratio of 1) the weight of water which the soil, after saturation, will retain against a centrifugal force 1,000 times the force of gravity, to 2) the weight of the soil when dry. The ratio is stated as a percentage.

Monostatic Radar: This is a radar that uses a common antenna for both transmitting and receiving.

Monthly Climatological Report: This climatological product is issued once a month by each National Weather Service office. It is a mix of tabular and narrative information. It is organized so that similar items are grouped together (i.e., temperature, precipitation, wind, heating/cooling degree information, etc.).

Monthly Climatic Data of the World (MCDW): This National Climatic Data Center (NCDC) publication contains monthly mean temperature, pressure, precipitation, vapor pressure, and sunshine for approximately 2,000 surface data collection stations worldwide and monthly mean upper air temperatures, dew point depressions, and wind velocities for approximately 800 upper air stations.

Monsoon: A wind which blow from opposite directions between winter and summer. Usually the wind blows from land to sea in winter and from sea to land in summer.

Monstatic Radar: A radar that uses a common antenna for both transmitting and receiving.

Morning Glory: An elongated cloud band, visually similar to a roll cloud, usually appearing in the morning hours, when the atmosphere is relatively stable. Morning glories result from perturbations related to gravitational waves in a stable boundary layer. They are similar to ripples on a water surface; several parallel morning glories often can be seen propagating in the same direction.

MOS: An acronym for Model Output Statistics. See ***Model Output Statistics***.

Mostly Clear: When the predominant/average sky condition is covered 1/8 to 2/8 with opaque (not transparent) clouds. Called ***Mostly Sunny*** if it is during the day.

Mostly Cloudy: When the predominant/average sky condition is covered by more than half, but not completely covered by opaque (not transparent) clouds. In other words, 5/8 to 7/8 of the sky is covered by opaque clouds. Same as ***Considerable Cloudiness***.

Mostly Sunny: When the predominant/average sky condition is covered 1/8 to 2/8 with opaque (not transparent) clouds. Same as ***Mostly Clear***.

Movable Bed: A stream bed made up of materials readily transportable by the stream flow.

Moveable Bed Streams: These are most common in the arid West, where steep slopes and lack of vegetation result in a lot of erosion. During a flood, a channel may be eroded more deeply, or it may become filled with sediment and move to a different location.

MRF - Medium-Range Forecast model: One of the operational forecast models run at NCEP. The MRF is one of the main models forecasters use for the medium range time period beyond 48 hours into the future. It is run twice daily (0000 UTC and 1200 UTC). The MRF model forecasts for the entire northern hemisphere, unlike the national models, which only forecast for North America. The resolution of the MRF model is about 150 km, which is far less than the national models. The MRF is primarily used for the medium range time period from 60 to 240 hours (10 days) into the future. The MRF, like the previous models, has its own set of Model Output Statistics (MOS) equations known as MRF MOS.

MUCAPE: CAPE calculated using a parcel from a pressure level that results in the Most Unstable CAPE possible. See ***Convective Available Potential Energy (CAPE)***.

MULI: Lifted Index (LI) calculated using a parcel from the pressure level that results in the Most Unstable value (lowest value) of LI possible. See ***Lifted Index***.

Multicell Thunderstorms: These thunderstorms are organized in clusters of at least 2-4 short-lived cells. Each cell generates a cold air outflow and these individual outflows combine to form a large gust front. Convergence along the gust front causes new cells to develop every 5 to 15 minutes. The cells move roughly with the mean wind. However, the area (storm) motion usually deviates significantly from the mean wind due to discrete propagation (new cell development) along the gust front. The multicellular nature of the storm is usually apparent on radar with multiple reflectivity cores and maximum tops.

Severe multicell thunderstorms occur in environments possessing moderate vertical wind shear and moderate to large positive buoyancy (CAPE). The moderate vertical wind shear leads to the development of a non-symmetric surface convergence pattern associated with the thunderstorm outflow, with the strongest convergence taking place on the downwind from the storm's motion. New cells developing along this enhanced convergence zone tend to move in the same direction as the older cells, which increases the time that the new cells will experience low-level convergence and tap into the warm, moist inflow air. Cell regeneration in the convergence zone along an outflow boundary is the primary physical mechanism for maintaining a multicell storm. Moderate to large buoyancy ensures that strong updrafts are possible.

Multicell thunderstorms usually develop in an environment where the vertical wind shear is characterized by a straight line hodograph. The name describes well what it looks like on the hodograph. The Bulk Richardson number for a multicellular thunderstorm environment is typically above 50. These thunderstorms can become severe producing hail greater than 3/4 inch hail, wind gusts greater than 58 miles an hour, and possibly a

tornado. Nearly all thunderstorms (including supercells) are multi-cellular, but the term often is used to describe a storm which does not fit the definition of a supercell.

Multiple Doppler Analysis: The use of more than one radar (and hence more than one look angle) to reconstruct spatial distributions of the 2D or 3D wind field, which cannot be measured from a single radar alone. Includes dual Doppler, triple Doppler, and overdetermined multiple Doppler analysis.

Multiple-vortex (or Multi-vortex) Tornado: A tornado in which two or more condensation funnels or debris clouds are present at the same time, often rotating about a common center or about each other. Multiple-vortex tornadoes can be especially damaging. See ***suction vortex***.

Multipurpose Reservoir: A reservoir constructed and equipped to provide storage and release of water for two or more purposes such as flood control, power development, navigation, irrigation, recreation, pollution abatement, domestic water supply, etc.

Municipal Use of Water: The various uses to which water is put to use developed urban areas, including domestic use, industrial use, street sprinkling, fire protection, etc. The term is an inclusive one, applied where the uses are varied.

Mushroom: Slang for a thunderstorm with a well-defined anvil rollover, and thus having a visual appearance resembling a mushroom.

Myctophobia: The fear of darkness.

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N

Nacreous Clouds: Clouds of unknown composition that have a soft, pearly luster and that form at altitudes about 25 to 30 km above the Earth's surface. They are also called "***mother-of-the-pearl clouds***".

Narrowband Communications: This is the narrowband (9600 Baud Rate) communication lines that distribute the WSR-88D radar products to the various users.

National Fire Danger Rating System (NFDRS): A system that directly integrates the effects of fuels, topography, and weather into components that deal with fire occurrence and fire behavior potential. The system uses the components to derive indices that indicate the number of fires, difficulty of containment, and finally, the total fire control job in a rating area. The system is intended to provide guidance for short-range planning by evaluating the near upper limits of the behavior of fires that might occur in an area during the rating period. It is not designed to serve as a direct fire behavior forecast. NFDRS computations are based on once-daily, mid-afternoon observations (2 p.m. LST) from the Fire Weather Network which is comprised of some 1500 weather stations throughout the Conterminous United States and Alaska. These observations are reported to the Weather Information Management System (WIMS) where they are processed by NFDRS algorithms. Many of the stations are seasonal and do not report during the off season. WFAS queries WIMS each afternoon and generates maps from the day's weather observations. Each afternoon Fire Weather Forecasters from the National Weather Service also view these local observations and issue trend forecasts for fire weather forecast zones. WIMS processes these forecasts into next-day index forecasts. On the maps, reporting station locations are indicated with a marker. Values between stations are estimated with an inverse distance-squared technique on a 10-km grid. This works pretty well in areas of relatively high station density, but has obvious shortcomings in other areas. Station location is based on the latitude/longitude cataloged by local station managers in WIMS.

National Flood Summary (FLN): This NWS daily product contains nationwide information on current flood conditions. It is issued by the Hydrometeorological Information Center of the Office of Hydrology.

National Climatic Data Center (NCDC): This Center is part of the Department of Commerce, National Oceanic and Atmospheric Administration (NOAA), and the National Environmental Satellite, Data and Information Service (NESDIS). The Center is responsible for archiving and distributing climate data. In November 1951, the Weather Bureau, Air Force and Navy Tabulation Units in New Orleans, LA were combined and formed into the National Weather Records Center in Asheville, NC. Authority to establish the joint Weather Records Center was granted under section 506(c) of the Federal Records Act of 1950 (Public Law 754, 81st Congress). The Center was eventually renamed the National Climatic Data Center. The climate data that NCDC receives are from a wide variety of sources, including satellites, radar, remote sensing systems, NWS cooperative observers, aircraft, ships, radiosonde, wind profiler, rocketsonde, solar radiation networks, NWS Forecast/Warnings/Analyses Products, Military Services, Federal Aviation Administration, and the Coast Guard. NCDC archives 99 percent of all NOAA data, including over 320 million paper records; 2.5 million microfiche records; over 500,000 tape cartridges/magnetic tapes, and has satellite weather images back to 1960. As operator of the World Data Center-A for Meteorology, which provides for international data exchange, NCDC also collects data from around the globe. The Center has more than 150 years of data on hand with 55 gigabytes of new information added each day--that is equivalent

Weather Safety
Storm Ready
Education
NOAA Weather Radio
Skywarn
Miscellaneous
Weather Now
Wireless Forecasts
Computer Guidance
Weather Stories
News Archive
Weather Links
Weather Glossary
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@noaa.gov

to 18 million pages a day. NCDC supports many forms of data and information dissemination such as paper copies of original records, publications, atlases, computer printouts, microfiche, microfilm, movie loops, photographs, magnetic tape, floppy disks, CD-ROM, electronic mail, on-line dial-up, telephone, facsimile and personal visit. The National Archives and Records Administration has designated NCDC as the Commerce Department's only Agency Records Center. The Center, which produces numerous climate publications and responds to requests from all over the world, provides historical perspectives on climate which are vital to studies on global climate change, the greenhouse effect, and other environmental issues. The Center stores information essential to industry, agriculture, science, agriculture, hydrology, transportation, recreation, and engineering. This information can mean tens of millions of dollars to concerned parties. NCDC annually publishes over 1.2 million copies of climate publications that are sent to individual users and 33,000 subscribers. NCDC maintains over 500 digital data sets to respond to over 170,000 requests each year.

National Hurricane Center (NHC): One of three branches of the ***Tropical Prediction Center (TPC)***. This center maintains a continuous watch on tropical cyclones over the Atlantic, Caribbean, Gulf of Mexico, and the Eastern Pacific from 15 May through November 30. The Center prepares and distributes hurricane watches and warnings for the general public, and also prepares and distributes marine and military advisories for other users. During the "off-season" NHC provides training for U.S. emergency managers and representatives from many other countries that are affected by tropical cyclones. NHC also conducts applied research to evaluate and improve hurricane forecasting techniques, and is involved in public awareness programs.

National Weather and Crop Summary: A product of the National Agricultural Statistics Service, Agricultural Statistics Board, and U.S. Department of Agriculture. It contains weekly national agricultural weather summaries, including the weather's effect on crops; summaries and farm progress for 44 states and New England area.

Natural Control: A stream gaging control which is natural to the stream channel, in contrast to an artificial control structure by man.

Navigation Methods: Three basic methods of providing and managing inland waterways - 1) Run-of-the-River: no provision of upstream storage; 2) Slack-Water: locks and dams provide slack water or pools with adequate depth for the draft of heavy barges and area to prevent excessive velocities; 3) Canalization: in lieu of a series of dams on the river a canal with locks adjoins the river.

Navigational Telex (Navtex): One part of ***Global Maritime Distress and Safety System (GMDSS)*** for automatically disseminating safety information, including weather warnings and forecasts, in text form via medium frequency radio to mariners within 200 nautical miles of shore.

Nautical Mile: A unit of distance used in marine navigation and marine forecasts. It is equal to 1.15 statue miles. It is also the approximate length of 1 minute of latitude.

NCCF: An acronym for the NOAA Central Computer Facility.

NCEP: An acronym for the National Centers for Environmental Prediction. The National Oceanic and Atmospheric Administration created the National Centers for Environmental Prediction (NCEP) to take advantage of improving technology and better serve the public and modernized National Weather Service. The NCEP's goal is to protect life and property, as well as mitigate economic loss, by providing accurate forecasts and forecast guidance products to weather service field offices.

The NCEP prepares and makes available national forecasts and outlooks of weather and climate. Meteorologists currently
generate weather forecasts for three to five days, soon to extend to seven days. Climate predictions are made for two weeks
out to a year.

Nine national centers comprise the NCEP:

Aviation Weather Center
Climate Prediction Center
Environmental Modeling Center
Hydrometeorological Prediction Center
Marine Prediction Center
NCEP Central Operations
Space Environmental Center
Storm Prediction Center
Tropical Prediction Center

The NCEP was established in 1958 as the National Meteorological Center (NMC). Since the center's beginning, operational weather forecasting has transformed from an infant discipline into a mature science.

Neap Tide: A minimum tide occurring at the first and third quarters of the moon.

Nearshore Lake Forecast (NSH): This National Weather Service Marine forecast is issued every 6 hours and they will usually cover a 36 hour period. The term nearshore refers to ***The Great Lakes*** waters within 5 nautical miles of shore. Since The Great Lakes have a large shoreline, these forecasts are broken up into numerous segments and they are issued by several National Weather Service offices in Minnesota, Michigan, Wisconsin, Illinois, Ohio, and New York.

Nearshore Waters: The waters of ***The Great Lakes*** extending out to five miles from shore.

Nebulaphobia: The fear of fog. See ***Homichlophobia***.

Negative-Tilt Trough: An upper level system which is tilted to the west with increasing latitude (i.e., with an axis from southeast to northwest). A negative-tilt trough often is a sign of a developing or intensifying system.

Negative Vorticity Advection (NVA): A region of negative vorticity usually several hundred of kilometers wide on a upper level chart that moves with the general wind flow. It aids in weather prediction by showing where regions of sinking air. This is typically associated with clear skies.

Nephophobia: The fear of clouds.

NESDIS (National Environmental Satellite, Data, and Information Service): NESDIS collects, processes, stores, analyzes, and disseminates various types of hydrologic, meteorologic, and oceanic data. NESDIS is also responsible for the development of analytical and descriptive products so as to meet the needs of it's users.

Net Rainfall: The portion of rainfall which reaches a stream channel or the concentration point as direct surface flow.

NEXRAD: An acronym that stands for NEXt generation of weather RADar. It is a technologically-advanced weather radar deployed to replace WSR-57 and WSR-74 units. NEXRAD is a high-resolution Doppler radar with increased emphasis on automation, including use of algorithms and automated volume scans. NEXRAD units are known as WSR-88D.

NEXRAD Base Data: Those digital fields of reflectivity, mean radial velocity and spectrum width data in spherical coordinates provided at the finest resolution available.

NGM: Nested Grid Model; one of the operational forecast models run at NCEP. The NGM is run twice daily, with forecast output out to 48 hours. The NGM is a short range model that forecasts variables such as temperature at various levels of the atmosphere, amount of precipitation, position of upper level troughs and ridges, and the position of surface high and low pressure areas. In the nested grid model and others like it, the atmosphere is divided into squares, or a grid, for various levels of the atmosphere. Grids with smaller squares are "nested" inside larger ones for areas forecasters are particularly interested in, such as North America. The smaller the grids, the more calculations that have to be made and the bigger the computer needed. The resolution of the NGM is about 80 kilometers. The NGM produces forecasts every 6 hours from 0 hours to 48 hours into the future.

Nimbostratus (Ns): A dark, gray cloud characterized by more or less continuously falling precipitation. It is not accompanied by lightning, thunder, or hail. They normally occur between 6,500 and 23,000 feet above the ground.

NMC: National Meteorological Center, with headquarters near Washington D.C.; now known as NCEP.

NOAA: An acronym for National Oceanographic and Atmospheric Administration. NOAA warns of dangerous weather, charts our seas and skies, guides our use and protection of ocean and coastal resources, and conducts research to improve our understanding and stewardship of the environment which sustains us all. NOAA is an organization of the Department of Commerce. NOAA is composed of the National Ocean Service, National Weather Service, National Marine Fisheries Service, National Environmental Satellite Data, and nformation Service, and Office of Oceanic and Atmospheric Research.

NOAAPORT Broadcast System: This provides a one-way broadcast communication of NOAA environmental data and information in near-real time to NOAA and external users. This broadcast service is implemented by a commercial provider of satellite communications utilizing C-band. Weather data is collected by GOES satellite enviromental sensors and NWS observing systems, and processed to create products. The products are fed to the AWIPS Network Control Facility (NCF) which routes the products to the appropriate NOAAPORT channel for uplink and broadcast.

NOAA Weather Radio: It is the voice of the National Weather Service. NOAA Weather Radio broadcasts National Weather Service warnings, watches, forecasts and other hazard information 24 hours a day. It is provided as a public service by the Department of Commerce's National Oceanic and Atmospheric

Administration. The NOAA Weather Radio network has more than 480 stations in the 50 states and near adjacent coastal waters, Puerto Rico, the U.S. Virgin Islands and U.S. Pacific Territories.

NOAA Weather Wire Service (NWWS): The NOAA Weather Wire Service is the primary telecommunications network for NWS forecasts, warnings and other products to the mass media (newspapers, radio stations, TV, etc.) and emergency management agencies. The NWWS is a satellite communications system that transmits NWS products directly from NWS offices to external users. The NWWS satellite communications system is operated by GTE Corp., under contract to the NWS. The system uses satellite transmitting (i.e. "uplink") equipment at more than 58 major NWS forecast offices throughout the continental U.S., Alaska, Hawaii and Puerto Rico. Each uplink site transmits NWS-generated weather information products to GTE's master facility in Mountain View, CA, which are then re-broadcasted via satellite to more than 1,500 users. Users then have access to this broadcast data stream of NWS products. More than 6,400 individual products per day are transmitted. To use the system, users must obtain the equipment needed to receive the data broadcast from the system contractor. As the NWS modernizes, it anticipates little change to this satellite system. NWS may reconfigure the number and location of its satellite uplink sites, but these changes should be transparent to subscribers. The NWS expects, however, that modernizing operations will be matched with a significant growth in the total number of weather products available to subscribers. As part of the transition to modernized operations, the NWS is investigating the feasibility of using the NWWS to transmit forecasts and warnings in graphical form to users for direct display on computer terminals.

Noctilucent Clouds: Wavy, thin, bluish-white clouds that are best seen at twilight in polar latitudes. They form at altitudes about 80 to 90 km above the Earth's surface.

Noctiphobia: The fear of the night.

Nocturnal: Related to nighttime, or occurring at night.

Nocturnal Inversion: see *Radiational Inversion*

Nocturnal Jet: This wind speed maximum occurs just above the nocturnal inversion at night. It is typically found in the south central United States during the late spring and summer months. It is important in the development of Mesoscale Convective Complex (MCC) or Mesoscale Convective Systems (MCS).

NOHRSC (The National Operational Hydrologic Remote Sensing Center): An organization under the National Weather Service Office of Hydrology (OH) that mainly deals with snow mapping.

Nor'easter: A strong low pressure system that affects the Mid Atlantic and New England States. It can form over land or over the coastal waters. It usually produces heavy snows, flooding rains, strong northeast winds, coastal flooding, and beach erosion.

Normal Water Surface Elevation (Normal Pool Level): The lowest crest level of overflow on a reservoir with a fixed overflow level (spillway crest elevation). For a reservoir whose outflow is controlled wholly or partly by movable gates, siphons, or other means, it is the maximum level to which water may rise under normal operating conditions, exclusive of any provision for flood surcharge.

Normal Year: A year during which the precipitation or stream flow approximates the average for a long period of record.

Notch Width: The 3 dB band width of a rejection filter.

Nowcast: A short-term weather forecast, generally out to six hours or less. This is also called a ***Short Term Forecast***.

NVA: An acronym for Negative Vorticity Advection. See ***Negative Vorticity Advection***.

NSSFC: National Severe Storms Forecast Center, in Norman, OK; now known as SPC.

NSSL (National Severe Storms Laboratory) : This is one of NOAA's internationally known Environmental Research Laboratories, leading the way in investigations of all aspects of severe weather. Headquartered in Norman OK with staff in Colorado, Nevada, Washington, Utah, and Wisconsin, the people of NSSL, in partnership with the National Weather Service, are dedicated to improving severe weather warnings and forecasts in order to save lives and reduce property damage.

Numerous: A National Weather Service convective precipitation descriptor for a 60 or 70 percent chance of measurable precipitation (0.01 inch). See ***Precipitation Probability (PoP)***.

NWP: Numerical Weather Prediction.

NWS: National Weather Service.

NWSH: The National Weather Service Headquarters.

NWSO: An accronym for National Weather Service Office. This local NWS office is responsible for issuing advisories, warnings, statements, aviation forecasts, marine forecasts, **Area Forecast Discussions**, and **Short Term Forecasts** for its county warning area.

NWSRFS V5.0, or Version 5 (National Weather Service River Forecast Model Version 5): The system of data entry, data preprocessing, and forecast programs which are used by RFCs. To make river forecasts, RFCs run NWSRFS V5.0 on a mainframe computer in NWSH through Remote Job Entry, or locally via Government Development Platforms, GDPs.

Nyquist Frequency: The highest frequency that can be determined in data that have been discretely sampled. For data sampled at frequency f, this frequency is (f / 2). Doppler radar sampling frequency (rate) is equal to the pulse repetition frequency (PRF).

Nyquist Velocity or Interval: The maximum unambiguous velocity that can be measured by a Doppler radar.

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O

Observation Well: A non-pumping well used for observing the elevation of the water table or piezometric surface.

Occluded Front (Occlusion): A complex frontal system that ideally forms when a cold front overtakes a warm front. When the air is colder than the air ahead of it, the front is called a ***Cold Occlusion***. When the air behind the front is milder than the air ahead of it, it is called a ***Warm Occlusion.*** These processes lead to the dissipation of the front in which there is no gradient in temperature and moisture.

Occluded Mesocyclone: A mesocyclone in which air from the rear-flank downdraft has completely enveloped the circulation at low levels, cutting off the inflow of warm unstable low-level air.

Offshore/Onshore Flow: Offshore flow occurs when air moves from land to sea. It is usually associated with dry weather. Meanwhile onshore flow is when air over the water advances across land. It usually indicates an increase in moisture.

Offshore Forecast (OFF): This National Weather Service marine forecast is designed to serve users who operate beyond the coastal waters where it usually requires more than a day or more of sailing to and from port. These users are mainly commercial fishermen and merchant shipping and, to a lessor extent, government and research vessels and large recreational craft.

Offshore (Open) Waters: 1) The waters extending from 5 miles to the midpoint of the Great Lakes. 2) That portion of the oceans, gulfs, and seas beyond the coastal waters extending to a specified distance from a coastline, to a specific depth contour, or covering an area defined by a specific latitude and longitude points.

Ogee: A reverse curve, shaped like an elongated letter S. The downstream faces of overflow dams are often made to this shape. (From the French word Ogive).

OH: The Office of Hydrology, located in Silver Springs, MD.

Ohm's Law: I = E / R, where I is current (amperes), E is electromotive force (i.e., voltage) and R is resistance (ohms)

Ombrophobia: The fear of rain or of being rained on.

Omega High: A blocking ridge of high pressure that forms in the middle or upper troposphere. It looks like the Greek letter omega.

OML: An Operations Manual Letter. These serve as updates to policy and procedure for the National Weather Service Operations Manual (WSOM).

One-Hour Rainfall Rate (OHP): This WSR-88D radar product displays hourly precipitation total (in inches) as a graphical image. This product is done in polar format with resolution 1.1 nm by 1 degree and it requires 54 minutes of precipitation for initial product. The product is then updated every volume scan for the most recent hourly precipitation accumulation. It is used to: 1) Assess rainfall intensities and amounts and 2) Aid in forecast procedures for flash flood watches and warnings, various statements, and river

Weather Safety
Storm Ready
Education
NOAA Weather Radio
Skywarn
Miscellaneous
Weather Now
Wireless Forecasts
Computer Guidance
Weather Stories
News Archive
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forecasts.

One Percent Chance Flood (One Hundred Year Flood): Flood magnitude that has one chance in 100 of being exceeded in any future 1-year period. The occurrence of floods is assumed to be random in time, or regularity of occurrence is implied. The exceeding of a 1-percent chance is no guarantee, therefore, that a similar size flood will not occur next week. The risk of experiencing a large flood within time periods longer than 1 year increases in a nonadditive fashion. For example, the risk of exceeding a 1-percent chance flood one or more times during a 30-year period is 25 percent and during a 70-year period is 50 percent.

On-site Meteorological Services: Meteorological services provided at or near the site of a wildland fire or major project site, normally, but not necessarily, utilizing a mobile fire weather support unit. NWS personnel provide forecasts, summaries, and updates directly to the official having overall planning responsibility for the fire or project. These services are usually provided on a reimbursable basis.

Open Lake: The Great Lakes waters beyond 5 nautical miles from shore.

Open Great Lakes Marine Forecasts: This type of marine forecast is issued every 6 hours for the open waters of ***The Great Lakes*** and all of Lake St. Clair. The term open waters refers to those areas of ***The Great Lakes*** which are beyond 5 nautical miles from shore. The only exception to this rule in on Lake St. Clair. The reason for this is that the open waters on this lake would be such a small area that it would be ridiculous to split the lake up in this way. This forecast will usually cover a 36 hour period. It contains the expected wind direction (to 8 points of the compass) and speed, waves heights, and significant weather conditions. They will also include information regarding structural icing and lake ice. If these conditions are expected to vary across one of ***The Great Lakes***, the lakes will be broken up into pieces. This forecast is also used to let the mariner know when either a ***Gale*** or ***Storm Warning*** has been issued on the lake. The range of waves in this forecast indicate the heights to the nearest foot at the end of the fetch (downwind end of the lake--that area where the greatest significant waves are expected). The range in the forecast is intended to show the uncertainty of precise values in the downwind area. It is not intended to indicate a range of wave heights over the entire lake area. The mariner should infer the wave heights in other areas of the lake based on his/her position and wind direction.

This product is currently issued by: NWFO Buffalo, New York (Lake Ontario); NWFO Cleveland, Ohio (Lake Erie); NWFO Chicago, Ohio (Lake Michigan); NWFO Marquette, Michigan (Lake Superior) and NWFO Detroit/Pontiac Michigan (Lake Huron). This product is issued 4 times a day and it covers three periods (about 36 hours). The following table shows the times that this product is issued and what periods that they cover:

Open Great Lakes Forecasts Issuance Time	
Issuance Time	**Periods Covered**
Early Morning (3-4 AM)	**Today, Tonight, Tomorrow**
Late Morning (9-10 AM)	**This Afternoon, Tonight, Tomorrow**
Late Afternoon (3-4 PM)	**Tonight, Tomorrow, Tomorrow Night**
Evening (9-10 PM)	**Overnight, Tomorrow, Tomorrow Night**

Operational Mode: A combination of scanning strategies and product mixes tailored to one or more meteorological situations.

Orifice: 1) An opening with closed perimeter, usually sharp edged, and of regular form in a plate, wall, or partition through which water may flow, generally used for the purpose of measurement or control of water. 2) The end of a small tube, such as a Pitot tube, piezometer, etc.

Orographic: Related to, or caused by, physical geography (such as mountains or sloping terrain).

Orographic Lifting (Upslope Flow): Occurs when air is forced to rise and cool due to terrain features such as hills or mountains. If the cooling is sufficient, water vapor condenses into clouds. Additional cooling results in rain or snow. It can cause extensive cloudiness and increased amounts of precipitation in higher terrain.

Orographic Precipitation: Precipitation which is caused by hills or mountain ranges deflecting the moisture-laden air masses upward, causing them to cool and precipitate their moisture.

Orphan Anvil: Slang for an anvil from a dissipated thunderstorm, below which no other clouds remain.

Oscillator: The general term for an electric device that generates alternating currents or voltages. The oscillator is classified according to frequency of the desired signal.

Outburst Flood: See ***Jokulhlaup***.

Outer Convective Bands: These bands occur in advance of main rain shield and up to 300 miles from the eye of the hurricane. The typical hurricanes has 2 or 3 bands and sometimes more of these bands which are comprised of cells resembling ordinary thunderstorms. Wind gusts are usually higher in these bands than in the ***Pre-Hurricane Squall Line***.

Outflow Boundary: A storm-scale or mesoscale boundary separating thunderstorm-cooled air (outflow) from the surrounding air; similar in effect to a cold front, with passage marked by a wind shift and usually a drop in temperature. Outflow boundaries may persist for 24 hours or more after the thunderstorms that generated them dissipate, and may travel hundreds of miles from their area of origin. New thunderstorms often develop along outflow boundaries, especially near the point of intersection with another boundary (cold front, dry line, another outflow boundary, etc.; see triple point).

Outflow Channel: A natural stream channel which transports reservoir releases.

Outlet: An opening through which water can be freely discharged from a reservoir.

Outlet Discharge Structure: Protects the downstream end of the outlet pipe from erosion and is often designed to slow down the velocity of released water to prevent erosion of the stream channel.

Outlook: It is used to indicate that a hazardous weather or hydrologic event may develop. It is intended to provide information to those who need considerable lead time to prepare for the event.

Outlook for Freeze-up on the St. Lawrence Sea Way: In late autumn, NWFO Buffalo, New York will issue an outlook for freeze-up on the St. Lawrence at Massena. Other ice products are normally not needed for Lake Ontario and the seaway since the Welland Canal and the seaway close in December.

Overcast (OVC): An official sky cover classification for aviation weather observations, when the sky is completely covered by an obscuring phenomenon. This is applied only when obscuring phenomenon aloft are present--that is, not when obscuring phenomenon are surface-based, such as fog.

Overdetermined Multiple Doppler Analysis: A multiple Doppler analysis technique in which there are more radars than the desired number of wind components to be retrieved. The wind retrieval can then be performed as an 'optimization' to reduce the retrieval errors.

Overhang: Radar term indicating a region of high reflectivity at middle and upper levels above an area of weak reflectivity at low levels. (The latter area is known as a weak-echo region, or WER.) The overhang is found on the inflow side of a thunderstorm (normally the south or southeast side).

Overland Flow: The flow of rainwater or snowmelt over the land surface toward stream channels. After it enters a watercourse, it becomes runoff.

Overrunning: A weather pattern in which a relatively warm air mass is in motion above another air mass of greater density at the surface. Embedded thunderstorms sometimes develop in such a pattern; severe thunderstorms (mainly with large hail) can occur, but tornadoes are unlikely. Overrunning often is applied to the case of warm air riding up over a retreating layer of colder air, as along the sloping surface of a warm front. Such use of the term technically is incorrect, but in general it refers to a pattern characterized by widespread clouds and steady precipitation on the cool side of a front or other boundary.

Overshooting: The failure of the radar to detect a target due to the radar beam passing above the target.

Overshooting Top (or Penetrating Top): A dome-like protrusion above a thunderstorm anvil, representing a very strong updraft and hence a higher potential for severe weather with that storm. A persistent and/or large overshooting top (anvil dome) often is present on a supercell. A short-lived overshooting top, or one that forms and dissipates in cycles, may indicate the presence of a pulse storm or a cyclic storm.

Ozone: A nearly colorless (but faintly blue) gaseous form of oxygen, with a characteristic odor like that of weak chlorine. Its chemical formula is O_3. It is usually found in trace amounts in the atmosphere, but it is primarily found at 30,000 to 150,000 feet above the ground. Its production results from photochemical process involving ultraviolet radiation. Because it absorbs harmful radiation at those heights, it is a very beneficial gas. However, photochemical processes involving industrial/vehicle emissions can produce ozone near the ground. In this case, it can be harmful to people with respiratory or heart problems.

Ozone Action Day: A "heads-up" message issued by the Department of Natural Resources (DNR) through the National Weather Service when ozone levels may reach dangerous levels the next day. This message encourages residents to prevent air pollution by postponing the use of lawn mowing, motor vehicles, boats, as well as filling their vehicle gas tanks.

Ozone Advisory: It is issued by the Department of Natural Resources (DNR) through the National Weather

Service when ozone levels reach 100. Ozone levels above 100 are unhealthy for people with heat and/or respiratory ailments.

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P

Pagophobia: The fear of ice or frost.

Palmer Drought Severity Index: An index whereby excesses or deficiencies of precipitation are determined in relation to average climate values. The index takes in to account precipitation, potential and actual evapotransporation, infiltration of water into the soil, and runoff.

Pan Handle Hook: Low pressure systems that originate in the panhandle region of Texas and Oklahoma which initially move east and then "hook" or recurve more northeast toward the upper Midwest or Great Lakes region. In winter, these systems usually deposit heavy snows north of their surface track. Thunderstorms may be found south of the track.

Pancake Ice: Circular flat pieces of ice with a raised rim; the shape and rim are due to repeated collisions.

Parametric Data: Data such as rating curves, unit hydrographs, and rainfall/runoff curves which define hydrologic variables in models.

Parapet Wall: A solid wall built along the top of the dam for ornament, safety, or to prevent overtopping.

Partial-Duration Flood Series: A list of all flood peaks that exceed a chosen base stage or discharge, regardless of the number of peaks occurring in a year.

Partly Cloudy: When the predominant/average sky condition is covered 3/8 to 4/8 with opaque (not transparent) clouds. Same as ***Partly Sunny***.

Partly Sunny: When the predominant/average sky condition is covered 3/8 to 4/8 with opaque (not transparent) clouds. Same as ***Partly Cloudy***.

PC-GRIDDS (PC-Gridded Interactive Display and Diagnostic System): This software package was developed by Dr. Ralph Peterson in 1993. It allows the forecaster to view fields of gridded model output in contour or vector format. By doing this, the forecaster can extract relevant information from the numerical model grid-point data.

PDS Watch: Slang for a tornado watch with enhanced wording (Particularly Dangerous Situation).

Peak Discharge: Rate of discharge of a volume of water passing a given location. (Usually in cubic feet per second.)

Peak Power: The amount of power transmitted by a radar during a given pulse. Note that because these pulses are widely spaced, the average power will be much smaller.

Peak Wind Speed: The maximum instantaneous wind speed since the last observation that exceeded 25 knots.

Pedestal: A generic radar term for the structure supporting the antenna dish. Usually includes the drive motors and one end of the servo loop.

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Local Outlook
National Outlook
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Current Conditions
Observations
Satellite Images
Rivers & Lakes AHPS
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Nationwide
Forecasts
Text Forecasts
Graphical
Aviation
Marine
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Weather Planner
Climate
Local Climate
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Weather Stories
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Pendant Echo: Radar signature generally similar to a hook echo, except that the hook shape is not as well defined.

Penetrating Top: Same as ***overshooting top***.

Perched Groundwater: Local saturated zones above the water table which exist above an impervious layer of limited extent.

Perched Water Table: The water table of a relatively small ground-water body supported above the general ground water body.

Percolation: The movement of water, under hydrostatic pressure, through the interstices of a rock or soil, except the movement through large openings such as caves. In other words, the movement of water within the soil.

Percolation Deep: In irrigation or farming practice, the amount of water that passes below the root zone of the crop or vegetation.

Percolation Path: The course followed by water moving or percolating through any other permeable material, or under a dam which rests upon a permeable foundation.

Percolation Rate: The rate, usually expressed as a velocity , at which water moves through saturated granular material. The term is also applied to quantity per unit of time of such movement, and has been used erroneously to designate ***Infiltration Rate*** or ***Infiltration Capacity***.

Perennial Stream: A stream that flows all year round. Compare ***intermittent stream***.

Perigee: The closest distance between moon and earth or the earth and sun.

Permanent Control: A stream gaging control which is substantially unchanging and is not appreciably affected by scour, fill, or backwater.

Permanent Monument: Fixed monuments placed away from the dam which allow movements in horizontal and vertical control points on the dam to be monitored by using accurate survey procedures.

Permeability: The ability of a material to transmit fluid through its pores when subjected to a difference in head.

Permeability Coefficient: The rate of flow of a fluid through a cross section of a porous mass under a unit hydraulic gradient, at a temperature of 60 degrees Fahrenheit. The standard coefficient of permeability used in hydrologic work in Meinzer's Units is defined as the rate of flow of water at 60 degrees Fahrenheit, in gallons per day, through a cross section of 1 sq. ft., under a hydraulic gradient of 100%. A related coefficient, which may be called the Field Coefficient of Permeability, is defined as the rate of flow of water, in gallons a day, under prevailing conditions, through each foot of thickness of a given aquifer in a width of 1 mile, for each foot per mile of hydraulic gradient..

Permeameter: A laboratory instrument for determining permeability by measuring the discharge through a sample of the material when a known hydraulic head is applied.

Persistence: The length of time during which a signal is visible on a radar display.

Pervious Zone: A part of the cross section of an embankment dam comprising material of high permeability.

Phase: A particular angular stage or point of advancement in a cycle; the fractional part of the angular period through which the wave has advanced, measured from the phase reference.

Phase Shift: The angular difference of two periodic functions.

Phasor Diagram: A diagram used to represent complex numbers. The x-axis is the real component and the y-axis is the imaginary component. The x-axis can be the in-phase and the y-axis the quadrature components (I and Q components).

Phengophobia: The fear of daylight or sunshine.

Phiezometer: An instrument used to measure pressure head in a conduit, tank, soil, etc. They are used in dams to measure the level of saturation.

Phreatic Surface: The free surface of ground water at atmospheric pressure.

Phreatic Water: Water within the earth that supplies wells and springs; water in the zone of saturation

where all openings in rocks and soil are filled, the upper surface of which forms the water table. Also termed ***Groundwater***.

Phreatic Zone: The locus of points below the water table where soil pores are filled with water. This is also called the ***zone of saturation***.

Phreatophyte: A plant that habitually obtains its water supply from the zone of saturation, either directly or through the capillary fringe.

Pibal: An acronym for pilot-balloon observation. A method of winds aloft observation; that is, the determination of wind speeds and directions in the atmosphere abive a station. This is done by reading the elevation and azimuth angles of a theodolite while visually tracking a pilot balloon.

Piezometer: An instrument for measuring pressure head in a conduit, tank, soil, etc. It usually consists of a small pipe or tube tapped into the side of the container, the inside end being flush with, and normal to, the water face of the container, connected with a manometer pressure gage, mercury of water column, or other device for indicating pressure head.

Piezometric Level (or Surface): Confined groundwater is usually under pressure because of the weight of the overburden and the hydrostatic head. If a well penetrates the confining layer, water will rise to this level, the piezometric level, the artesian equivalent of the water table. If the piezometric level is above ground level, the well discharges as a flowing well, artesian well, or a spring.

Pilot Balloon: A small balloon whose ascent at a constant rate is followed by a theodolite in order to obtain data for the computation of the speed and direction of winds at various levels in the upper air above the station.

Pilot Report (PIREP): A report of inflight weather by an aircraft pilot or crew member. A complete coded report includes the following information in this order: location and/or extent of reported weather phenomenon: type of aircraft (only with reports ***turbulence*** or ***icing***.

Pingo: A large frost mound of more than one-year duration.

Piping: The progressive development of internal erosion by seepage, appearing downstream as a hole or seam discharging water that contains soil particles.

PIREP: An acronym for ***pilot report***.

Pixel: A contraction of "picture element" representing the smallest discrete element of an electronically encoded image (having both spatial and spectral components) recorded by a satellite sensor.

Pitot Tube: A device for measuring the velocity of flowing water using the velocity head of the stream as an index of velocity. It consists essentially of an orifice held to a point upstream in the water, connected with a tube in which the rise of water due to velocity head may be observed and measured. It also may be constructed with an upstream and downstream orifice, with two water columns, in which case the difference in height of water column in the tubes is the index of velocity.

Platform: A generic radar term, often used to encompass the pedestal and antenna assembly; sometimes including the radar control, display and analysis hardware and software as well.

Plow Wind: A term used in the midwestern United States to describe strong, straight-line winds associated with the downdrafts spreading out in advance of squall lines and thunderstorms. Resulting damage is usually confined to narrow zones like that caused by tornadoes; however, the winds are all in one direction (straight-line winds).

Pluvial: In hydrology, anything that is brought about directly by precipitation.

Pluviophobia: The fear of rain or of being rained on. See ***Ombrophobia***.

Point Discharge: Instantaneous rate of discharge, in contrast to the mean rate for an interval of time.

Point Precipitation: Precipitation at a particular site, in contrast to the mean precipitation over an area.

Polar Coordinates: A coordinate system in which the two directions are distance from the origin and angle (sweeping around the origin like a clock). The "natural" coordinate system in which data is collected by many radars. Data in polar coordinates can always be transformed to Cartesian coordinates.

Polar Front: A semipermanent, semicontinuous front that separates tropical air masses from polar air masses.

Polarization: In the context of particles in an electric field, it is the displacement of charged centers within a

particle in response to the electrical forces acting thereon.

Polarization Radar: A radar which takes advantage of ways in which the transmitted waves' polarization affect the backscattering. Such radars may alternately transmit horizontal and vertically polarized beams, and measure differential reflectivity.

Polar Jet Stream: A jet stream that is associated with the polar front in the middle and high latitudes. It is usually located at altitudes between 9,000 and 12,000 km.

Polar Orbiting Satellite: A weather satellite which travels over both poles each time it orbits the Earth. It orbits about 530 miles (850 km) above the Earth's surface.

Pondage: 1) The holding back of water for later release for power development above the dam of a hydroelectric plant to a) equalize daily or weekly fluctuations of streamflow or b) to permit irregular hourly use of water by the wheels to care for fluctuations in the load demand. 2) In general the holding back of water for later releases. 3) The storage capacity available for the use of such water.

Ponding: In flat areas, runoff collects, or ponds in depression and cannot drain out. Flood waters must infiltrate slowly into the soil, evaporate, or be pumped out.

Pool Height: The height of the water behind a dam. (Various datums may be used and various pool height may be used, e.g., conservation pool, flood control pool, etc.)

Popcorn Convection: Slang for showers and thunderstorms that form on a scattered basis with little or no apparent organization, usually during the afternoon in response to diurnal heating. Individual thunderstorms typically are of the type sometimes referred to as air-mass thunderstorms: they are small, short-lived, very rarely severe, and they almost always dissipate near or just after sunset.

Pore Pressure: The interstitial pressure of water within a mass of soil, rock, or concrete.

Porosity: 1) The ratio of pore volume to total volume of the formation. Sandy soils have large pores and a higher porosity than clays and other fine-grained soils. 2) An index of the void characteristics of a soil or stream as pertaining to percolation; degree of previousness.

Positive Area: The area on a sounding representing the layer in which a lifted parcel would be warmer than the environment; thus, the area between the environmental temperature profile and the path of the lifted parcel. Positive area is a measure of the energy available for convection; see ***CAPE***.

Positive Cloud to Ground (CG) Lightning: A CG flash that delivers positive charge to the ground, as opposed to the more common negative charge. Positive CGs have been found to occur more frequently in some severe thunderstorms. Their occurrence is detectable by most lightning detection networks, but visually it is not considered possible to distinguish between a positive CG and a negative CG. (Some claim to have observed a relationship between staccato lightning and positive CGs, but this relationship is as yet unproven.)

Positive-Tilt Trough: An upper level system which is tilted to the east with increasing latitude (i.e., from southwest to northeast). A positive-tilt trough often is a sign of a weakening weather system, and generally is less likely to result in severe weather than a negative-tilt trough if all other factors are equal.

Positive Vorticity Advection (PVA): A region of positive vorticity usually several hundred of kilometers wide on a upper level chart that moves with the general wind flow. It aids in weather prediction by showing where regions of rising air. This usually results in clouds and precipitation.

Post-storm Report: A report issued by a local National Weather Service office summarizing the impact of a tropical cyclone on it's forecast area. These reports include information on observed winds, pressures, storm surges, rainfall, tornadoes, damage and casualties.

Potamophobia: The fear of rivers or running water.

Potential Temperature: The temperature a parcel of dry air would have if brought adiabatically (i.e., without transfer of heat or mass) to a standard pressure level of 1000 mb.

Potential Vorticity: This plays an important role in the generation of vorticity in cyclogenesis, especially along the polar front. It is also very useful in tracing intrusions of stratospheric air deep into the troposphere in the vicinity of jet streaks.

Power: A radar equation to describe the amount of power that a radar emits. $P = I * V = V * V / R = I * I / R$, where I is current (amps), V is voltage (volts), R is resistance (ohms), P is power (watts). *I is not to be confused with the 'I' of 'I and Q', the in-phase and quadrature components.

PPINE: Plan Position Indicates No Echoes, referring to the fact that a radar detects no precipitation within its range. An intensity-modulated display on which echo signals are shown in plan view with range and azimuth angle displayed in polar coordinates, forming a map-like display. Each PPI is taken at a single, fixed

elevation angle, and thus forms a cone of coverage in space. PPIs may be run in sequence, creating a "volume scan".

Precipitable Water (PW): It measures the depth of liquid water at the surface that would result after precipitating all of the water vapor in a vertical column usually extending from the surface to 300 mb.

Precipitation: 1) The process where water vapor condenses in the atmosphere to form water droplets that fall to the Earth as rain, sleet, snow, hail, etc. 2) As used in hydrology, precipitation is the discharge of water, in a liquid or solid state, out of the atmosphere, generally onto a land or water surface. It is the common process by which atmospheric water becomes surface, or subsurface water. The term "precipitation" is also commonly used to designate the quantity of water that is precipitated. Precipitation includes rainfall, snow, hail, and sleet, and is therefore a more general term than rainfall.

Precipitation Attenuation: The loss of energy that radar beam experiences as it passes through an area of precipitation.

Precipitation Processing System: The WSR-88D system that generates 1-hour running, 3-hourly, and running storm total precipitation accumulations. Five functional steps are performed to calculate the best estimate of precipitation: 1) development of a sectorized hybrid scan, 2) conversion to precipitation rate, 3) precipitation accumulation, 4) adjustment using rain gages, 5) product update.

Precision: The accuracy with which a number can be represented, i.e., the number of digits used to represent a number.

Predominant Wind: It is the wind that in the forecasters judgment generates (or is expected to generate) the local component of the significant sea conditions across the forecast area.

Pre-Hurricane Squall Line: It is often the first serious indication that a hurricane is approaching. It is a generally a straight line and resembles a squall-line that occurs with a mid-latitude cold front. It is as much as 50 miles or even more before the first ragged rain echoes of the hurricane's bands and is usually about 100 to 200 miles ahead of the eye, but it has been observed to be as much as 500 miles ahead of the eye in monstrous size hurricanes.

Preliminary Notification of Forthcoming Watch (SAW): This is an alerting message issued by the Storm Prediction Center (SPC) in Norman, Oklahoma that either a Tornado or Severe Thunderstorm Watch is about to be issued. This product will contain the distances of the axis coordinates in statue miles, the aviation coordinates will be given in nautical miles, the half widths, valid times in Coordinated Universal Time (UTC), hail size (except when it is a Tornado Watch associated with a Hurricane) at the surface and aloft, the surface wind gusts in knots, maximum tops, and the mean wind vector. As the name indicates, this is a preliminary notification not the actual watch itself. Since the affected local National Weather Service Office has the final say on which counties will be included in the watch, it should be only used as a reference product.

Preliminary Tropical Cyclone Report (PSH): A report summarizing the life history and effects of an Atlantic or eastern Pacific tropical cyclone. It contains a summary of the cyclone life cycle and pertinent meteorological data, including the post-analysis best track (six-hourly positions and intensities) and other meteorological statistics. It also contains a description of damage and casualties the system produced, as well as information on forecasts and warnings associated with the cyclone. NHC writes a preliminary report on every tropical cyclone in its area of responsibility.

Prescribed Burn: Fire applied to wildland fuels, in a definite place for a specific purpose under exacting weather and fuel conditions (the prescription), to achieve a specific objective of resource management.

Present Movement: The best estimate of the movement of the center of a tropical cyclone at a given time and given position. This estimate does not reflect the short-period, small scale oscillations of the cyclone center.

Pressure: The force exerted by the weight of the atmosphere, also known as atmospheric pressure. When measured on a barometer, it is referred to as barometric pressure and it is expressed in inches of mercury, millibars, or kiloPascals.

Pressure Couplet: It is an area where you have a high pressure area located adjacent to a low pressure area.

Pressure Gage: A device for registering the pressure of solids, liquids, or gases. It may be graduated to register pressure in any units desired.

Pressure Gradient: The amount of pressure change occurring over a given distance.

Pressure Gradient Force: A three-dimensional force vector operating in the atmosphere that accelerates air parcels away from regions of high pressure and toward regions of low pressure in response to an air pressure gradient. Usually resolved into vertical and horizontal components.

Pressure Falling Rapidly: A decrease in station pressure at a rate of 0.06 inch of mercury or more per hour which totals 0.02 inch or more.

Pressure Head: Energy contained by fluid because of its pressure, usually expressed in feet of fluid (foot pounds per pound).

Pressure Ice: Floating sea, river, or lake ice that has been deformed, altered, or forced upward in ***pressure ridges*** by the lateral stresses of any combination of wind, water currents, tides, waves, and surf.

Pressure Jump: A sudden, sharp increase in atmospheric pressure, typically occurring along an active front and preceding a storm.

Pressure Ridge: A discernible rise or ridge, up to 90 feet (30 meters) high and sometimes several miles (kilometers) long, in ***pressure ice***.

Pressure Relief Pipes: Pipes used to relieve uplift or pore pressure in a dam foundation or in the dam structure.

Pressure Rising Rapidly: An increase in station pressure at a rate of 0.06 inch of mercury or more per hour which totals 0.02 inch or more.

Pressure Tendency: The character and amount of atmospheric pressure change during a specified period of time, usually 3-hour period preceding an observation.

Pressure Unsteady: A pressure that fluctuates by 0.03 inch of mercury or more from the mean pressure during the period of measurement.

Prevailing Visibility: The visibility that is considered representative of conditions at the station; the greatest distance that can be seen throughout at least half the horizon circle, not necessarily continuous.

Prevailing Wind: A wind that consistently blows from one direction more than from any other.

Price Current Meter: A current meter with a series of conical cups fastened to a flat framework through which a pin extends. The pin sets in the framework of the meter, and the cups are rotated around it in a horizontal plane by the flowing water, registering the number of revolutions by acoustical or electrical devices, from which the velocity of the water may be computed.

Precipitation Probabilities (PoP): It is defined as the likelihood of occurrence (expressed as a percent) of a measurable amount of liquid precipitation (or the water equivalent of frozen precipitation) during a specified period of time at any given point in the forecast area. Measurable precipitation is defined as equal to or greater than .01 inch or .2 mm. Normally, the period of time is 12 hours, unless specified otherwise. The forecast area, or zone, is generally considered to be a county. In some geographically unique areas (mountains), the forecast area/zone may consist of portions of a county or two counties. At times, some NWS forecasters will use occasional or periods of to describe a precipitation event that has a high probability of occurrence, i.e., they expect any given location in a forecast zone area to most likely have precipitation, but it will be of an on and off nature. Usually, away from the mountains, each and every county is a forecast zone area itself. The following table shows precipitation probabilities used in National Weather Service forecasts and a brief explanation of each.

Precipitation Probabilities (PoP) used in National Weather Service Forecasts

PoP Percent	Expressions of Uncertainty	Equivalent Areal Qualifiers (convective only)
10 percent	none used	isolated, or few
20 percent	slight chance	widely scattered
30-40-50 percent	chance	scattered
60-70 percent	likely	numerous (or none used)
80-90-100 percent (categorical)	none used	none used

Probability of Tropical Cyclone Conditions (SPF): The probability in percent, that the cyclone center will pass within 50 miles to the right or 75 miles to the left of the listed location within 72 hours of landfall when looking at the coast in the direction of the cyclone's movement. However, these advisories will usually state that the probability for each location is for the storm center passing within 65 miles of it; this is done to

preclude verbiage misinterpretation. They are not given if the storm has made landfall and is not expected to re-emerge over water, or if the computed probabilities are not significant. This product is only generated for the Atlantic Basin.

Probabilistic Quantitative Precipitation Forecast (PQPF): A form of QPF (see below) that includes an assigned probability of occurrence for each numerical value in the forecast product.

Product Resolution: The smallest spatial increment or data element that is distinguishable in a given Doppler radar product.

Profile: A graph showing variation of elevation with distance along a traverse.

Profiler: An instrument designed to measure horizontal winds directly above its location, and thus measure the vertical wind profile. Profilers operate on the same principles as Doppler radar.

Prognostic Discussion (PMD): This Hydrometeorological Prediction Center (HPC) discussion may include analysis of numerical and statistical models, meteorological circulation patterns and trends, and confidence factors. Reference is usually made to the manually produced 6- to 10-day Northern Hemisphere prognoses for mean 500 millibar heights and mean 500 millibar height anomalies. Discussions may also refer to the method of operational ensemble predictions.

Progressive Derecho: They are characterized by a short curved squall line oriented nearly perpendicular to the mean wind direction with a bulge in the general direction of the mean flow. Downburst activity occurs along the bulging portion of the line. This type of derecho typically occurs in the warm season (May through August) and is most frequent in a zone extending from eastern South Dakota to the upper Ohio Valley. The severe wind storms typically begin during the afternoon and continue into the evening hours. Several hours typically pass between initial convection and the first wind damage report.

Typically, they are associated with a circular type mesoscale convective system (MCS) that moves along a quasi-stationary low-level thermal boundary (front or outflow boundary) in an environment characterized by high convective instability (Lifted Indices -8 or lower) and relatively strong mid tropospheric winds (500 mb winds greater than 41 knots). Typically, the 500 mb wind direction will be west or northwest. They tend to move in a direction that is 15 degrees to the right of the mean wind and often move into the warm sector before dying. The speed of movement is often faster than the mean wind speed due to propagation of cells along the gust front and the presence of very large quantities of low level moisture.

Propagation: The transmission of electromagnetic energy as waves through or along a medium.

Property Protection: Measures that are undertaken usually by property owners in order to prevent, or reduce flood damage. Property protection measures are often inexpensive for the community because they are implemented by or cost-shared with property owners. In many cases the buildings' appearance or use is unaffected, so these measurements are particularity appropriate for historical sites and landmarks. These measures include relocation and acquisition, flood proofing, and buying flood insurance.

Pseudo-Cold Front: A boundary between a supercell's inflow region and the rear-flank downdraft (or RFD). It extends outward from the mesocyclone center, usually toward the south or southwest (but occasionally bows outward to the east or southeast in the case of an occluded mesocyclone), and is characterized by advancing of the downdraft air toward the inflow region. It is a particular form of gust front. See also ***pseudo-warm front***.

Pseudo-Warm Front: A boundary between a supercell's inflow region and the forward-flank downdraft (or FFD). It extends outward from at or near the mesocyclone center, usually toward the east or southeast, and normally is either nearly stationary or moves northward or northeastward ahead of the mesocyclone. See ***pseudo-cold front*** and ***beaver tail***.

Psychrometer: An instrument used to measure the water vapor content of the air. It consists of two thermometers (dry and wet bulb). After whirling the instrument, the dew point and relative humidity can be obtained with the aid of tables.

Psychrophobia: The fear of the cold.

Public Information Statement (PNS): This narrative statement can be used for: 1) A current or expected nonhazardous event of general interest to the public that can usually be covered with a single message. This may include: unusual atmospheric phenomena such as sun dogs, halos, rainbows, aurora borealis, lenticular clouds, and stories about a long-term dry/cold/wet/warm spell. 2) Public educational information and activities, such as storm safety rules, awareness activities, storm drills, etc. 3) Information regarding service changes, service limitations, interruptions due to reduced or lost power or equipment outages, or special information clarifying interpretation of NWS data. For example, this product may be used to inform users of radar equipment outages or special information clarifying interpretation of radar data originating from an unusual source which may be mistaken for precipitation (such as chaff drops, smoke plumes, etc., that produces echoes on the radar display.

Public Severe Weather Outlook (PWO): These are issued when the Storm Prediction Center (SPC) in Norman, Oklahoma anticipates an especially significant and/or widespread outbreak of severe weather. This outlook will stress the seriousness of the situation, defines the threat area, and provides information on the timing of the outbreak. The lead time on this outlook is normally less than 36 hours prior to the severe weather event.

Puddle: 1) The act of compacting earth, soil clay, etc., by mixing them with water and rolling or tamping the mixture. 2) A compact mass of earth, soil, clay, or a mixture of material, which has been compacted through the addition of water, rolling and tamping. This makes the material less permeable. 3) A small pool of water, usually a few inches in depth and from several inches to several feet in it greatest dimension.

Puget Sound Convergence Zone: A situation where wind forced around the Olympic Mountains converges over the Puget Sound. Causes extreme variability in weather conditions around Seattle, Washington with some areas of sunshine and others in clouds and rain.

Pulse: A short burst of electromagnetic energy that a radar sends out in a straight line to detect a precipitation target. The straight line that this pulse travels along is called a ***radar beam***.

Pulse Duration: The time in which a radar pulse lasts. The pulse duration can be multiplied by the speed of light to determine the ***pulse length*** or ***pulse width***.

Pulse Length: The linear distance in range occupied by an individual pulse from a radar. h = c * t , where t is the duration of the transmitted pulse, c is the speed of light, h is the length of the pulse in space. Note, in the radar equation, the length h/2 is actually used for calculating pulse volume because we are only interested in signals that arrive back at the radar simultaneously. This is also called a ***pulse width***.

Pulse-Pair Processing: Nickname for the technique of mean velocity estimation by calculation of the signal complex covariance argument. The calculation requires two consecutive pulses, hence "pulse-pair".

Pulse Radar: A type of radar, designed to facilitate range (distance) measurements, in which are transmitted energy emitted in periodic, brief transmission.

Pulse Repetition Frequency (PRF): The number of pulses transmitted per second by a radar. Typical PRF's may range from 300-1200 Hz. See also ***Nyquist Frequency***.

Pulse Severe Thunderstorms: These are single cell thunderstorms which produce brief periods of severe weather (3/4 inch hail, wind gusts in the excess of 58 miles an hour, or a tornado).

Pulse Storm: A thunderstorm within which a brief period (pulse) of strong updraft occurs, during and immediately after which the storm produces a short episode of severe weather. These storms generally are not tornado producers, but often produce large hail and/or damaging winds. See ***overshooting top*** and ***cyclic storm***.

Pulse Repetition Time (PRT): The time elapsed between pulses by the radar. This is also called the ***pulse interval***.

Pulse Resolution Volume: A discrete radar sampling volume, of dimensions (horizontal beamwidth * vertical beamwidth * 1 range gate).

Pulse Width: The time occupied by an individual pulse broadcast from a radar.

Pumping Head: Energy given to a fluid by a pump, usually expressed in feet of fluid (foot pounds per pound).

PUP (Principle User Processor): This is where the WSR-88D radar operator will call up and look at the various products that the RPG produces. Some of the products that the radar operator will look at are in the last section of this report.

PVA (Positive Vorticity Advection): Advection of higher values of vorticity into an area, which often is associated with upward motion (lifting) of the air. PVA typically is found in advance of disturbances aloft (i.e., shortwaves), and is a property which often enhances the potential for thunderstorm development.

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Q

Q' or Quadrature: The component of the complex signal that is 90 degrees out of phase with the inphase component. This component lies along the imaginary axis the complex plane.

QG: An abbreviation for quasigeostrophic.

Q-Vectors: Like the thermal wind, these are not physical realities (they do not exist). However, they arise mathematically from the Omega Equation and they help explain the results of physical processes in the atmosphere. Thus, they are useful diagnostic tools to forecasters. The divergence of the Q-Vectors through a layer depicts the synoptic scale vertical motions. Moreover, Q-vectors themselves, when they point from cold to warm air (when overlaying the thermal field on the Q-Vector field), it infers a tightening of the thermal gradient. This causes frontogensis (the generation of a front). If this frontogensis is strong enough, a low pressure may form.

QPF Discussion (PFD): This Meteorological Operations Division (MOD) forecast discussion is directed completely to explaining manual forecasts of areas in the contiguous 48 states expected to receive 1/4 inch or more precipitation during a 24-hour period. The manual forecasts are explained in terms of initial conditions and differences and/or similarities in the numerical model forecasts. General confidence in the manual forecast is expressed where it is appropriate and possible alternatives may be offered. This product is issued 3 times a day as described below:

1) Around 2 AM EST (3 AM EDT), a preliminary message is issued with a 24-hour forecast discussion valid from 7 AM EST (8 AM EDT) to 7 AM EST (8 AM EDT) the next day. This forecast is a preliminary Day 1 QPF. This offers various field offices an opportunity to comment on or coordinate with Meteorological Operations Division (MOD) before the later QPF product is issued. The AFOS accompanying graphic is 94Q and is identified as PRELIM DAY 1 on the graphic label.

2) The next message is issued around 6 AM EST (7 AM EDT). This includes the DAY 1 QPF along with an updated 94Q graphic. In addition, this message also contains a forecast valid from 7:00 AM EST (8 AM EDT) the next day to 7:00 AM EST (8 AM EDT) the day after next (Day 2 QPF) along with the accompanying graphic 98Q. This narrative includes a coding of each forecast isohyet for both Day 1 and Day 2. The coded points are identified by degrees and tenths of latitude and longitude and are in a clockwise direction around each isohyet. For points west of 99.9 degrees west longitude, the leading 1 is omitted from the coding.

3) Around 2 PM EST (3 PM EDT), a message updating the Day 2 forecast is issued along with an updated 98Q. It is based on later data and numerical model runs. Again, this narrative includes the coded isohyets.

If for any reason the coded points are not available for the 7 AM EST (8 AM EDT) and the 2 PM EST (3 PM EDT) discussions, the message will be transmitted without them, and then retransmitted if they become available.

QPF (Quantitative Precipitation Forecast): A spatial and temporal precipitation forecast that will predict

Weather Safety
Storm Ready
Education
NOAA Weather Radio
Skywarn
Miscellaneous
Weather Now
Wireless Forecasts
Computer Guidance
Weather Stories
News Archive
Weather Links
Weather Glossary
Our Office
1953 Beecher
Tornado
Contact Us
w-dtx.webmaster
@noaa.gov

the potential amount of future precipitation for a specified region, or area.

QPFERD: NCEP Excessive Rainfall Discussion.

QPFHSD: NCEP Heavy Snow Discussion

QPFPFD: NCEP Precipitation Forecast Discussion

Quasi-stationary: Describes a low or high pressure area or a front that is nearly stationary.

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R

Radar Beam: The straight line that a radar pulse travels along. As the radar beam gets further away from the radar, it gets wider and wider. In order for a precipitation target to be detected by the radar, it must fill the entire radar beam; therefore, the radar will have a difficult time detecting small showers and thunderstorms at a great distance from the radar.

Radar Coded Message (RCM): This is an alphanumeric coded message which will be used in preparation of a national radar summary chart. It is automatically produced by the WSR-88D's Radar Product Generator (RPG) in 3 parts (reflectivities, storm motion, and echo tops).

Radar Cross Section: The area of a fictitious, perfect reflector of electromagnetic waves (e.g., metal sphere) that would reflect the same amount of energy back to the radar as the actual target (e.g., lumpy snowflake).

Radar Data Acquisition (RDA): The RDA is the origination point of the WSR-88D radar data that will be eventually used by the radar operator. This WSR-88D component group is made up of several subcomponents which generate and radiate radio frequency (RF) pulses, receive reflected energy from those pulses, and process this received energy into digital base data. The RDA is also the site of the first two of four data recording levels used by the WSR-88D to record and store radar data.

Radar Product Generator (RPG): It generates the various WSR-88D radar products that are used by the radar operator. All products generated are produced using the digital base data sent from the RDA. The RPG generates base products (base reflectivity, base velocity, and base spectrum width) as well as many other radar products.

Radar Reflectivity: The sum of all backscattering cross-sections (e.g., precipitation particles) in a pulse resolution volume divided by that volume. The radar reflectivity can be related to the radar reflectivity factor through the dielectric constant term |K|^2, and the radar wavelength.

Radar Reflectivity Factor (z): z = the sum (over i) of (N_i * D_i^6), where N_i is the number of drops of diameter D_i in a pulse resolution volume. Note that z may be expressed in linear or logarithmic units. The radar reflectivity factor is simply a more meteorologically meaningful way of expressing the radar reflectivity.

Radial Velocity: The component of motion toward or away from a given location. As "seen" by Doppler radar, it is the component of motion parallel to the radar beam. (The component of motion perpendicular to the beam cannot be seen by the radar. Therefore, strong winds blowing strictly from left to right or from right to left, relative to the radar, can not be detected.) Also known as **doppler velocity**.

Radiation Fog: Fog produced results from the air near the ground being cooled to saturation by contact with the cold ground. The cooling of the ground results from night time loss of heat from the Earth to space (terrestrial radiation). Favorable conditions for radiation fog are clear sky, little or no wind, and high relative humidity. It occurs in stable air and is primarily a night time or early morning phenomenon. As the Earth and the lower layers of the atmosphere warm during the day, air that was stable during the early morning hours may become unstable--at least in the lower levels. For this reason visibility usually improves as the

Weather Safety
Storm Ready
Education
NOAA Weather Radio
Skywarn
Miscellaneous
Weather Now
Wireless Forecasts
Computer Guidance
Weather Stories
News Archive
Weather Links
Weather Glossary
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temperature rises during the day. Mixing in the lower levels disperses the fog into a thicker layer, and eventually it evaporates into the warmer air. When cloud layers form aloft over a radiation fog and retard heating from the sun, visibility improvement is very slow. It is also known as *Ground Fog* and *Valley Fog*.

Radiation Inversion: It is a thermally produced, surface-based inversion formed by rapid radiational cooling of the Earth's surface at night. It does not usually extend above the lower few hundred feet. Conditions which are favorable for this type of inversion are: long nights, clear skies, dry air, little or no wind, and a cold or snow covered surface. It is also called a *Nocturnal Inversion*.

Radiational Cooling: The cooling of the Earth's surface. At night, the Earth suffers a net heat loss to space due to terrestrial cooling. This is more pronounced when you have a clear sky.

Radioisotope Snow Gage: A snow water equivalent gage based on the absorption of gamma radiation by snow; this gage can measure up to 55 inches water equivalent with a 2 to 5 percent error.

Radiosonde: A balloon-borne instrument that measures and transmits pressure, temperature, and humidity to a ground-based receiving station. These were originally tracked by theodolites, but they are now tracked by the Automatic Radiotheodolite Master Control Unit (ART).

RAFS: An acronym for Regional Analysis and Forecasting System.

Rain (RA): Precipitation, either in the form of drops larger than 0.02 inch (0.5 mm), or smaller drops, which in contrast to drizzle, are widely separated. The following table shows how rainfall intensity is determined:

Rainfall Intensity			
Rainfall Intensity	**Rate-of-fall in 6-minutes**	**Rate-of-fall in one hour**	**Visual Estimation**
Light	less than 0.01 inch	Up to 0.10 inch	From scattered drops that, regardless of duration, do **not** completely wet an exposed surface up to a condition where individual drops are easily seen.
Moderate	0.01 to 0.03 inches	0.11 to 0.30 inches	From scattered drops that, regardless of duration, do **not** completely wet an exposed surface up to a condition where individual drops are easily seen.
Heavy	more than 0.03 inches	more than 0.30 inch	Rain seemingly falls in sheets; individual drops are not identifiable; heavy spray to the height of several inches is observed over hard surfaces.

Rainbow: An arc that exhibits in concentric bands the colors of the spectrum and is formed opposite the sun by refraction and reflection of the sun's rays in rain drops.

Rain Foot: Slang for a horizontal bulging near the surface in a precipitation shaft, forming a foot-shaped prominence. It is a visual indication of a wet microburst.

Rain-Free Base: - A dark, horizontal cloud base with no visible precipitation beneath it. It typically marks the location of the thunderstorm updraft. Tornadoes may develop from wall clouds attached to the rain-free base, or from the rain-free base itself - especially when the rain-free base is on the south or southwest side of the main precipitation area. Note that the rain-free base may not actually be rain free; hail or large rain drops may be falling. For this reason, updraft base is more accurate.

Rain Induced Fog: When warm rain falls through cooler air, water evaporates from the warm rain. It subsequently condenses in the cool air forming fog. Such fog can be quite dense. It generally will persist as

long as the rain continues. Since temperature rises little during the day, there is little diurnal variation in rain induced fog. Improvement in visibility cannot be expected until the rain stops or moves out of the affected area.

Rain Shadow: Areas of the leeward side of a mountain or mountain range which often receive much less rain than the windward side.

Rain Shield: It is a solid or nearly solid area of rain that typically becomes heavier as one approaches the eye of the hurricane. The outer edge is well defined and its distance from the eye varies greatly from storm to storm. The wind, both sustained and peak gusts, keeps increasing as much as one moves through the rain shield toward the storm's eye.

RAMM Advanced Meteorological Satellite Demonstration and Interpretation System (RAMSDIS): Only a few NWSFOs have this type of satellite system. The data for this system is sent from Boulder, Colorado to Region Headquarters. This data is then sent onto these special NWSFOs (such as NWSFO Detroit/Pontiac and Milwaukee/Sullivan). New satellite enhancement curves are tested at these NWSFOs (such as the Fog Product). This data can be received anywhere from every 5 minutes to every hour.

Random Variable (Variate): A variable characterized by random behavior in assuming its different possible values. Mathematically, it is described by its probability distribution, which specifies the possible values of a random variable together with the probability associated (in an appropriate sense) with each value. A random variable is said to be continuous if its possible values extend over a continuum, discrete if its possible values are separated by finite intervals.

Range: Distance from the radar antenna. The WSR-88D radar has a range for velocity products out to 124 nm and reflectivity products out to 248 nm.

Range Folding: This occurs when the radar receives a signal return from a pulse other than the most recent pulse. In this case, the radar sends out a pulse (a short burst of energy). This pulse will continue to go in a straight line until it strikes a target. When it strikes the target, a portion of the pulse will be back scattered towards the radar. If the target it strikes is well beyond the normal range of the radar, it will take longer for the back scattered energy to arrive back at the radar. As a result, the radar will most likely have sent out another pulse in the same direction before the back scattered energy arrives back at the radar. Therefore, when the radar receives the back scattered energy, it will assume that it came from an object much closer to the radar and it will improperly locate the echo. A multiple-trip return appears at the difference of the true range and a multiple of the unambiguous range, i.e., R_displayed = R_true - n * R_max, where n = 0,1,2,...

Range Gate: The discrete point in range along a single radial of radar data at which the received signal is sampled. Range gates are typically spaced at 100-1000 meter intervals. A "radial" of radar data is composed of successive range gates, out to the maximum unambiguous range.

Range Normalization: A receiver gain function in the radar which compensates for the effect of range (distance) on the received power for an ***equivalent reflectivity***.

Range Resolution: The ability of the radar to distinguish two targets along the same radial, it is approximately ½ the ***pulse length***.

Range Unfolding: Process of removing range ambiguity in apparent range of a multitrip target on the radar.

Rankine Vortex: Velocity profile for a symmetric circulation in which the inner core is in solid rotation and tangential winds outside the core vary inversely with radial distance from the center.

RAOB: An acronym for Radiosonde Observation. See ***Radiosonde***.

Rapid Deepening: A decrease in the minimum sea-level pressure of a tropical cyclone of 1.75 mb/hr or 42 mb for 24 hours.

Rating Curve: A graph showing the relationship between the stage, usually plotted vertically (Y-axis) and the discharge, usually plotted horizontally (X-axis).

Rating Table: A table of stage values and the corresponding discharge for a river gaging site.

Rawinsonde Observation: A radiosonde observation which includes wind data.

Rayleigh Scattering: Changes in directions of electromagnetic energy by particles whose diameters are 1/16 wavelength or less. This type of scattering is responsible for the sky being blue.

Reach: The distance between two specific points outlining that portion of the stream, or river for which the forecast applies. This generally applies to the distance above and below the forecast point for which the forecast is valid.

Rear Flank Downdraft (or RFD): A region of dry air subsiding on the back side of, and wrapping around,

a mesocyclone. It often is visible as a clear slot wrapping around the wall cloud. Scattered large precipitation particles (rain and hail) at the interface between the clear slot and wall cloud may show up on radar as a hook or pendant; thus the presence of a hook or pendant may indicate the presence of an RFD. See ***supercell***.

Receiver: The electronic device which detects the backscattered radiation, amplifies it and converts it to a low-frequency signal which is related to the properties of the target.

Recession Constant: Constant used to reduce the API value daily in the API method of estimating runoff.

Record Report: This nonroutine narrative product is issued by the National Weather Service to report meteorological and hydrological events that equal or exceed existing records.

Recreation Report: This National Weather Service product is used to relay reports on conditions for resorts and recreational areas and/or events. This report may also contain forecast information. Reports for recreational areas and resorts are often routine products, typically for a season, but possibly year-round. NWFO Gaylord uses this product in the winter for the ski resorts in northern Michigan. It is called a "Ski Report".

Recurrence Interval: The average amount of time between events of a given magnitude. For example, there is a 1% chance that a 100-year flood will occur in any given year.

Red Flag: This a fire weather program which highlights the onset of critical weather conditions conducive to extensive wildfire occurrences.

Red Flag Warning: A term used by fire-weather forecasters to call attention to limited weather conditions of particular importance that may result in extreme burning conditions. It is issued when it is an on-going event or the fire weather forecaster has a high degree of confidence that Red Flag criteria will occur within 24 hours of issuance. Red Flag criteria occurs whenever a geographical area has been in a dry spell for a week or two, or for a shorter period , if before spring green-up or after fall color, and the National Fire Danger Rating System (NFDRS) is high to extreme and the following forecast weather parameters are forecasted to met: 1) a sustained wind average 15 mph or greater 2) relative humidity less than or equal to 25 percent and 3) a temperature of greater than 75 degrees F. In some states, dry lightning and unstable air are criteria. A ***Fire Weather Watch*** may be issued prior to the ***Red Flag Warning***. See ***Fire Weather Watch***.

Red Watch or Red Box: Slang for a tornado watch.

Reference Mark: A relatively permanent point of known elevation which is tied to a benchmark.

Reflection of Waves: The process whereby waves bounce off a steep shoreline or structure rather than refracting or breaking, as they would in shallower waters. Reflected waves interact with oncoming waves to create confused sea conditions. See ***Refraction of Waves***.

Reflectivity: The radar operator uses this radar product to determine the strength or the intensity of a precipitation target. In order for the radar to calculate the reflectivity, it sends out a small burst of energy. This energy strikes the small water particles located in the precipitation target. For simplification sake, it is assumed that these water particles are evenly spread throughout the precipitation target. The more of these particles located in the precipitation target, the greater the return of energy returned back to the radar. One will see a greater reflectivity return from heavy rain than light rain. Reflectivity is expressed in the units of dBZ where dB stands for decibels and the Z stands for reflectivity. See ***dBZ*** and ***VIP***.

Reflectivity Cross Section (RCS): This WSR-88D radar product displays a vertical cross section of reflectivity on a grid with heights up to 70,000 feet on the vertical axis and distance up to 124 nm on the horizontal axis. Cross Section is similar to the Range Height Indicator (RHI) slices observed on conventional radar, but it is not limited to alignments along the radar radials. Instead the 2 end points are operator selected anywhere within 124 nm of the radar that are less than 124 nm apart. It is used to: 1) Examine storm structure features such as overhang, tilt, Weak Echo Regions (WER), and Bounded Weak Echo Regions (BWER); 2) Estimate height of higher dBZ's and echo tops; and 3) Locate the bright band (where snow is melting and becoming rain).

Refraction: Changes in the direction of energy propagation as a result of density changes within the propagating medium. In weather terms, this is important on determining how a radar beam reacts in the atmosphere.

Refractive Index: A measure of the amount of refraction. Numerically equal to the ratio of wave velocity in a vacuum to a wave speed in the medium, i.e., $n = c / v$

where: v is actual speed, and c is speed of light in a vacuum.

Refractivity (N): $N = (n-1)*10^6$, where n is refractive index and N is a function of temperature, pressure and vapor pressure (in the atmosphere).

Refraction of Waves: The change in the direction of movement of waves which encounter shallow water. See ***Reflection of Waves***.

Regulatory Floodway: Some maps show an area where construction regulations require special provisions to account for this extra hazard. This is a regulatory floodway.

Relative Humidity: A dimensionless ratio, expressed in percent, of the amount of atmospheric moisture present relative to the amount that would be present if the air were saturated. Since the latter amount is dependent on temperature, relative humidity is a function of both moisture content and temperature. As such, relative humidity by itself does not directly indicate the actual amount of atmospheric moisture present. See ***dew point***.

Relocated: A term used in an advisory to indicate that a vector drawn from the preceding advisory position to the latest know position is not necessarily a reasonable representation of the cyclone's movement.

Reservoir: A manmade facility for the storage, regulation and controlled release of water.

Reservoir Surface Area: The surface area of a reservoir when filled to the normal pool or water level.

Reservoir Volume: The volume of a reservoir when filled to normal pool or water level.

Resolution: The degree to which a radar distinguishes detail in a spatial pattern.

Response Time: The amount of time in which it will take a watershed to react to a given rainfall event.

Retrogression (or Retrograde Motion): Movement of a weather system in a direction opposite to that of the basic flow in which it is embedded, usually referring to a closed low or a longwave trough which moves westward.

Return Flow: South winds on the back (west) side of an eastward-moving surface high pressure system. Return flow over the central and eastern United States typically results in a return of moist air from the Gulf of Mexico (or the Atlantic Ocean).

Rex Block: A blocking pattern where there is an upper level high located directly north of a closed low.

RFC (River Forecast Center): Centers that serve groups of Weather Service Forecast offices and Weather Forecast offices, in providing hydrologic guidance and is the first echelon office for the preparation of river and flood forecasts and warnings.

RHI: An acronym for Range-Height Indicator. An intensity-modulated display with height as the vertical axis and range as the horizontal axis. A "vertical cross section" in a plane passing through the radar.

Ribbon Lightning: Appears to be a broad stream of fire. A succession of strokes, each blown a bit to the side of the previous strokes by wind, but striking so fast that all the strokes are seen at once as a ribbon-like flash.

Ridge: 1) An elongated area of relatively high atmospheric pressure; the opposite of trough. 2) A line or wall of broken ice forced up by pressure. May be fresh or weathered.

Ridge Ice: Ice piled haphazardly one piece over another in the form of ridges or walls.

Right Entrance Region (or Right Rear Quadrant): The area upstream from and to the right of an upper-level jet max (as would be viewed looking along the direction of flow). Upward motion and severe thunderstorm potential sometimes are increased in this area relative to the wind speed maximum. Also, see ***exit region*** and ***left front quadrant***.

Right Mover: A thunderstorm that moves appreciably to the right relative to the main steering winds and to other nearby thunderstorms. Right movers typically are associated with a high potential for severe weather. (Supercells often are right movers.) See ***left mover*** and ***splitting storm***.

Right Rear Quadrant: see ***Right Entrance Region***.

Rime Ice: It is a rough, milky, opaque ice formed by the instantaneous freezing of small supercooled droplets as they strike the aircraft. The fact that droplets maintain their nearly spherical shape upon freezing and thus trap air between them gives the ice its opaque appearance and makes it porous and brittle.

Rip Current (Run Out): A strong, narrow current of surface water that flows seaward through the surf into deeper water. Waves approaching the shoreline create a water buildup which results in a return flow. This return flow (rip current) transports the excess water into deeper waters. Bubbles and debris usually float on the surface of the rip current. Although this current is extremely localized, they result in numerous deaths every year. These deaths are contributed to swimmers becoming exhausted by trying to swim against the rip current. If you are a swimmer caught in a rip current, wade sideways parallel to the beach until you are out of its pull. Another means of escape for those who are good swimmers is to ride the current out beyond the surf

zone where the rip current dissipates then swim to shore outside the effects of the narrow current. This phenomenon is sometimes mistakenly called an "undertow".

Riparian Zone: A stream and all the vegetation on its banks.

River Basin: Drainage area of a river and its tributaries.

River Flood Statement (FLS): This product is used by the local National Weather Service Forecast Office (NWFO) to update and expand the information in the ***River Flood Warning***. This statement may be used in lieu of a warning if flooding is forecasted, imminent, or existing and it presents no threat to life or property. The statement will also be used to terminate a ***River Flood Warning***.

River Flood Warning (FLW): This is product is issued by the local National Weather Service Forecast Office (NWFO) when forecast points (those that have formal gaging sites and established flood stages) at specific communities or areas along rivers where flooding has been forecasted, is imminent, or is in progress. Flooding is defined as the inundation of normally dry areas as a result of increased water levels in an established water course. The flood warning is based on the RVF product from the River Forecast Center (RFC) in Minneapolis, Minnesota. The flood warning normally specifies crest information. It usually occurs 6 hours or later after the causative event and it is usually associated with widespread heavy rain and/or snow melt or ice jams.

It will contain the forecast point covered by the warning, the current stage (if it is available), and the established flood stage. It will also contain the forecasted crest from the River Forecast Center (RFC) in Minneapolis, Minnesota. From this forecasted crest, the NWFO will be able to determine which areas will be affected by the river flooding. This information will be included in the warning. Finally, the statement will include a site/event specific call to action.

River Flooding: The rise of a river to an elevation such that the river overflows its natural banks causing or threatening damage.

River Forecast (RVF): An internal product issued by RFCs to other NWS offices. An RVF contains stage and/ or flow forecasts for specific locations based on existing, and forecasted hydrometeorologic conditions. The contents of these products are used by the HSA office to prepare Flood Warnings (FLW), Flood Statements (FLS), River Statements (RVS), as well as other products available to the public.

River Gage: A device for measuring the river stage.

River Gage Datum: The arbitrary zero datum elevation which all stage measurements are made from.

River Ice Statement (RVI): A public product issued by the RFC's containing narrative and numeric information on river ice conditions.

River Observing Station: An established location along a river designated for observing and measuring properties of the river.

River Recreation Statement (RVR): A statement released by the NWS to inform river users of current and forecast river and lake conditions. These statements are especially useful for planning purposes.

River Statement (RVS): A NWS product issued to communicate notable hydrologic conditions which do not involve flooding, i.e., within river bank rises, minor ice jams, etc.

River Summary (RVA): A NWS summary of river and/or crest stages for selected forecast points along the river. It may also contain ice information. They are issued by the local National Weather Service Forecast Office (NWFO) and River Forecast Centers (RFCs) with Hydrological Service Area responsibilities.

River System: All of the streams and channels draining a river basin.

Rockfill Dam: An embankment dam of earth or rock in which the material is placed in layers and compacted by using rollers or rolling equipment.

Rod: A graduated staff used in determining the difference in elevation between two points. The two most common types of rods are the Philadelphia Rod, graduated in feet and hundredths of a foot, and a California Rod, graduated in feet, inches, and eighths of an inch.

Roll Cloud: A low, horizontal tube-shaped arcus cloud associated with a thunderstorm gust front (or sometimes with a cold front). Roll clouds are relatively rare; they are completely detached from the thunderstorm base or other cloud features, thus differentiating them from the more familiar shelf clouds. Roll clouds usually appear to be "rolling" about a horizontal axis, but should not be confused with funnel clouds.

Rolled Filled Dam: An embankment dam of earth or rock in which the material is placed in layers and

compacted by using rollers or rolling equipment.

ROML: Regional Operations Manual Letter. These serve as updates to regional policy and procedure for the National Weather Service Operations Manual (WSOM).

Rope (or Rope Funnel): A narrow, often contorted condensation funnel usually associated with the decaying stage of a tornado. See ***rope stage***.

Rope Cloud: In satellite meteorology, a narrow, rope-like band of clouds sometimes seen on satellite images along a front or other boundary. The term sometimes is used synonymously with ***rope*** or ***rope funnel***.

Rope Stage: The dissipating stage of a tornado, characterized by thinning and shrinking of the condensation funnel into a rope (or rope funnel). Damage still is possible during this stage.

ROSA (Remote Observing System Automation): A type of automated data transmitter used by NWS Cooperative Program observers.

Rotten Ice: Ice in an advanced stage of disintegration.

Rotor Cloud: A turbulent cloud formation found in the lee of some large mountain barriers. The air in the cloud rotates around an axis parallel to the mountain range.

Routing: The methods of predicting the attenuation of a flood wave as it moves down the course of a river.

RUC - Rapid Update Cycle: A numerical model run at NCEP that focuses on short-term (up to 12 h) forecasts and small-scale (mesoscale) weather features. Forecasts are prepared every 3 hours for the contiguous United States.

Runoff: That part of precipitation that flows toward streams on the surface of the ground or within the ground. Runoff is composed of base flow and surface runoff.

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S

S-Band Radar: These were in use as network radars in the National Weather Service prior to the installation of the WSR 88-D radars. They were 10-centimeter wavelength radars.

Sacramento Soil Moisture Accounting Model (SACSMA): A model which simulates the movement and occurrence of water in and on top of the ground.

SafetyNET: A satellite based part of the ***Global Maritime Distress and Safety System (GMDSS)*** for automatically disseminating safety information, including weather warnings and forecasts, to mariners almost anywhere on the world's oceans.

Sample and Hold: The process of sampling (measuring) the signal strength at a particular point in space (i.e., at a range gate).

Sandstorm (SS): Particles of sand carried aloft by strong wind. The sand particles are mostly confined to the lowest ten feet, and rarely rise more than fifty feet above the ground.

Saffir-Simpson Hurricane Intensity Scale: This scale was developed in an effort to estimate the possible damage a hurricane's sustained winds and storm surge could do to a coastal area. The scale of numbers are based on actual conditions at some time during the life of the storm. As the hurricane intensifies or weakens, the scale number is reassessed accordingly. The following table shows the scale broken down by central pressure, winds, and storm surge:

Saffir-Simpson Hurricane Intensity Scale					
Scale Number (Category)	Central Pressure		Winds (MPH)	Storm Surge (Feet)	Damage
	Millibars	Inches			
1	greater than 980	greater than 28.94	74 - 95	4 - 5	Minimal
2	965 - 979	28.50 - 28.91	96 - 110	6 - 8	Moderate
3	945 - 964	27.91 - 28.47	111 - 130	9 - 12	Extensive
4	920 - 944	27.17 -27.88	131 - 155	13 - 18	Extreme
5	less than 920	less than 27.17	greater than 155	greater than 18	Catastrophic

Weather Safety
Storm Ready
Education
NOAA Weather Radio
Skywarn
Miscellaneous
Weather Now
Wireless Forecasts
Computer Guidance
Weather Stories
News Archive
Weather Links
Weather Glossary
Our Office
1953 Beecher
Tornado
Contact Us
w-dtx.webmaster
@noaa.gov

Damage Associated with the Saffir-Simpson Hurricane Intensity Scale	
Category	**Damage Description**
1	Damage mainly to trees, shrubbery, and unanchored mobile homes. There is no substantial damage to other structures. Some damage occurs to poorly constructed signs. Low lying coastal roads are inundated. There is some minor damage to piers. Some small craft in exposed anchorages are torn from their moorings.
2	There is considerable damage to shrubbery and to tree foliage, with some trees blown down. Major damage occurs to exposed mobile homes. There is extensive damage to poorly constructed signs and some damage to roofing materials of buildings, windows, and doors. No major destruction occurs to buildings. Coastal roads and low-lying escape routes inland are cutoff by rising water about 2 to 4 hours before the arrival of the hurricane center. There is considerable damage done to piers, and marinas are flooded. Small craft in unprotected anchorages are torn from their moorings. Evacuation of some shoreline residences and of low-lying areas is required.
3	Foliage removed from trees and large trees blown down. Nearly all poorly constructed signs are blown down. There is some damage to roofing materials of buildings, windows, and doors. Some structural damage occurs to small buildings. Mobile homes are destroyed. Serious flooding occurs at the coast and many smaller structures near the coast are damaged by battering waves and floating debris. Low-lying escape routes inland are cut by rising water about 3 to 5 hours before the hurricane center arrives. Flat terrain 5 feet or less above sea-level is flooded up to 8 or more miles inland. Evacuations of low-lying residences within several blocks of the shoreline may be required.
4	Shrubs, trees, and all signs are blown down. There is extensive damage to roofing materials, windows, and doors, with complete failure of roofs on many small residences. Mobile homes are demolished. Flat terrain which 10 feet or less above sea-level is flooded inland as far as 6 miles. The flooding and the battering by waves and floating debris cause major damage to the lower floors of structures near the shore. Low-lying escape routes inland are cut off by rising water about 3 to 5 hours before the arrival of the hurricane center. There is major erosion of beaches. Massive evacuation of all residences within 500 yards of the shore may be required, as well as of single-story residences on low ground within 2 miles of shore.
5	Trees, shrubs, and all signs are blown down. There is considerable damage to roofs of buildings, with very severe and extensive damage to windows and doors. Indeed, complete failure of roofs occur on many residences and industrial buildings. There is extensive shattering of glass in windows and doors. Some buildings are destroyed completely. Small buildings are overturned or blown away, and mobile homes are demolished. There is major damage to lower floors of all structures which are less than 15 feet above sea-level within 1,500 feet of the shore. Low-lying escape routes inland are cut off by rising water about 3 to 5 hours before the arrival of the hurricane center. Massive evacuations of residential areas on low ground within 5 to 10 miles of the shore may be required.

Santa Ana Wind: A strong, hot, dry foehn-like wind that blows from the north, northeast, or east into southern California.

Satellite Hydrology Program: A NOHRSC program that uses satellite data to generate areal extent of snow cover data over large areas of the western United States.

SAWRS (Supplementary Aviation Weather Reporting Station): The SAWRS program addresses the concerns of users who depend on weather observations for air operations. If the cooperator is collocated with a commissioned automated system, they ensure continuity during outage periods of the automated system. The requirement for a SAWRS arises from the FAA validated need for observations to satisfy FAR 121 or 135 operations or for the safe conduct of other aircraft. The classification of a SAWRS operation is directly related to the automated observing platforms. There are three distinct SAWRS classifications:

1) **SAWRS:** Indicates manual weather observations are the primary source of reporting the weather at the airport.

2) **Backup SAWRS:** Indicates automated observations taken by a commissioned version 3 of an Automated Weather Observing System (AWOS), better known as an AWOS III, is the primary source of reporting
the airport's weather. AWOS III systems may be FAA owned units or privately non-federal units owned by airports
or local governments.

3) **SAWRS-II:** Indicates automated observations taken by a commissioned Automated Surface Observing System
(ASOS), is the primary source of reporting the airport's weather. An ASOS unit is federally owned by the Federal
Aviation Administration (FAA) or the National Weather Service (NWS).

SBCAPE: CAPE calculated using a Surface based parcel. See ***Convective Available Potential Energy (CAPE)***.

SBLI: Lifted Index (LI) calculated using surfaced based parcel. See ***Lifted Index***.

Scattered (SCT): 1) An official sky cover classification for aviation weather observations, descriptive of a sky cover of 3/8 to 4/8. This is applied only when obscuring phenomenon aloft are present--that is, not when obscuring phenomenon are surface-based, such as fog. 2) A National Weather Service convective precipitation descriptor for a 30, 40, and 50 percent chance of measurable precipitation (0.01 inch). See ***Precipitation Probability (PoP)***.

Scattering: The change in direction, frequency, or polarization of electromagnetic waves. See also ***Back scatter***.

Scotophobia: The fear of the darkness. See ***Achluophobia***.

SCS: The Soil Conservation Service.

Scud (or Fractus): Small, ragged, low cloud fragments that are unattached to a larger cloud base and often seen with and behind cold fronts and thunderstorm gust fronts. Such clouds generally are associated with cool moist air, such as thunderstorm outflow.

SDM: an acronym for Station Duty Manual

Sea Breeze: A current of air flowing inland, associated with warmer surface temperatures inland than at sea. Often shows up as a long, thin radar feature as insects get caught up in the frontal region. Temperature and moisture gradients across the front may also contribute to its reflectivity.

Seas: This term is used in National Weather Service Marine Forecasts to describe the combination or interaction of wind waves and swells (***combined seas***) in which the spearate components are not distinguished. This includes the case when swells are negligible or are not considered in describing sea state.

Sea Level Pressure: The pressure value obtained by the theoretical reduction or increase of barometric pressure to sea-level.

Second-Day Feet (SDF): The volume of water represented by a flow of one cubic foot per second for 24 hours; equal to 86,400 cubic feet. This is used extensively as a unit of runoff volume.

Sector Visibility: The visibility in a specific direction that represents at least a 45º arc of a horizontal circle.

Sectorized Hybrid Scan: A single reflectivity scan composed of data from the lowest four elevation scans. Close to the radar, higher tilts are used to reduce clutter. At further ranges, either the maximum values from the lowest two scans are used or the second scan values are used alone.

Sediment Storage Capacity: The volume of a reservoir planned for the deposition of sediment.

Seepage: The interstitial movement of water that may take place through a dam, its foundation, or abutments.

Seiche: A standing wave oscillation in any enclosed lake which continues after the forcing mechanism has ceased. In the Great Lakes, this forcing mechanism may be either strong winds along the axis of a lake, a pressure jump, or down draft winds associated with fast moving squall lines over the lake. In either case, water is piled up at one end. The water sloshes from one end of the lake to the other causing fluctuations of perhaps several feet before damping out.

SELS - SEvere Local Storms Unit: The former name of the Operations Branch of the Storm Prediction Center (SPC) in Norman, OK (formerly in Kansas City, MO).

Serial Derecho: It consists of an extensive squall line which is oriented such that the angle between the mean

wind direction and the squall line axis is small. A series of LEWPs and bow echoes move along the line. The downburst activity is associated with the LEWPs and bows. A Serial Derecho tends to be more frequent toward the north end of the line during the late winter and spring months. It occurs less frequently than its cousin the "progressive derecho".

It is associated with a linear type mesoscale convective system that moves along and in advance of a cold front or dry line. These boundaries are often associated with a strong, migratory surface low pressure system and strong short wave trough at 500 mb (strong dynamic forcing). Lifted Indices are typically -6 or lower and the advection of dry air in the mid-troposphere (3-7 km above ground) by relatively strong winds leads to high convective instability and increased downdraft potential. The bow echoes move along the line in the direction of the mean flow, often southwest to northeast. These storms move at speeds exceeding 35 knots. Squall line movement is often less than 30 knots.

Service Hydrologist: The designated expert of the hydrology program at a WFO.

Set: The direction towards which a current is headed. For example, a current moving from west to east is said to be set to east.

Set-up: The process whereby strong winds blowing down the length of a lake cause water to "pile up" at the downwind end, raising water levels there and lowering them at the upwind end of the lake.

Severe Icing: The rate of ice accumulation on an aircraft is such that de-icing/anti-icing equipment fails to reduce or control the hazard. Immediate diversion is necessary. This standard of reporting this type of icing was based on a recommendation set forth by the subcommittee for Aviation Meterorological Services in the Office of the Federal Coordinator for Meteorology in November 1968. The convection has been to designate icing intensity in terms of its operational effect upon reciprocating engine, straight wing transport aircraft as used by commuter operators.

Severe Storm: A storm with a tornado, surface hail >= 3/4 inch, or wind gusts >= 50 knots, or all three.

Severe Supercell Thunderstorm: It is potentially the most dangerous of the convective storm types. Storms possessing this structure have been observed to generate the vast majority of long-lived strong and violent (F2-F5) tornadoes, as well as downburst damage and large hail. It is defined as a thunderstorm consisting of one quasi-steady to rotating updraft which may exist for several hours. Supercells usually move to the right of the mean wind. These are called "Right Movers" and they are favored with veering winds. Occasionally, these thunderstorms will move to the left of the mean wind. These thunderstorms are called "Left Movers". These supercells typically don't last as long as their "Right Mover" cousins and they usually only produce large hail (greater than 3/4 inch in diameter) and severe wind gusts in the excess of 58 miles an hour. Left Movers are favored when you have backing winds.

Radar will observe essentially one long-lived cell, but small perturbations to the cell structure may be evident. The stronger the updraft, the better the chance that the supercell will produce severe (hail greater than 3/4 inch in diameter, wind gusts greater than 58 miles an hour, and possibly a tornado) weather.

Severe supercell development is most likely in an environment possessing great buoyancy (CAPE) and large vertical wind shear. A Bulk Richardson Number of between 15 and 35 favor supercell development. Typically, the hodograph will look like a horse shoe. This is due to the wind speed increasing rapidly with height and the wind direction either veering or backing rapidly with height.

Severe Thunderstorm: A thunderstorm that produces either of the following: winds of 58 miles an hour or greater (these speeds can result in structural or tree damage), hail 3/4 of an inch in diameter or larger, or a tornado. Lightning frequency is not a warning criteria for issuing a severe thunderstorm warning. Severe thunderstorms can result in the loss of life and property. They can also produce a tornado with little or **no** advanced warning. A table of hail sizes can be found in this glossary, under the definition of hail. The following table shows an estimate of winds that meet Severe Thunderstorm criteria:

Estimated Winds that Meet Severe Thunderstorm Criteria	
Wind Speed	**Damage**
58-72 mph	Damage to chimneys and TV antennae; uproots shallow rooted trees and blows down limbs or branches.
73-112 mph	Peels surface off roofs; windows broken; mobile homes moved or overturned; moving automobiles pushed off roads
113-157 mph	Roofs torn off houses; weak buildings and mobile homes destroyed; large trees snapped or uprooted
158+ mph	Severe damage; vehicles lifted off ground

See ***approaching (severe)***.

Severe Thunderstorm Warning (SVR): This is issued when either a severe thunderstorm is indicated by the WSR-88D radar or a spotter reports a thunderstorm producing hail 3/4 inch or larger in diameter and/or winds equal or exceed 58 miles an hour; therefore, people in the affected area should seek safe shelter immediately. Severe thunderstorms can produce tornadoes with little or no advance warning. Lightning frequency is not a criteria for issuing a severe thunderstorm warning. They are usually issued for a duration of one hour. They can be issued without a Severe Thunderstorm Watch being already in effect.

Like a ***Tornado Warning***, the Severe Thunderstorm Warning is issued by your National Weather Service Forecast Office (NWFO). Severe Thunderstorm Warnings will include where the storm was located, what towns will be affected by the severe thunderstorm, and the primary threat associated with the severe thunderstorm warning. If the severe thunderstorm will affect the nearshore or coastal waters, it will be issued as the combined product--***Severe Thunderstorm Warning and Special Marine Warning***. If the severe thunderstorm is also causing torrential rains, this warning may also be combined with a ***Flash Flood Warning***. If there is an ampersand (&) symbol at the bottom of the warning, it indicates that the warning was issued as a result of a severe weather report.

After it has been issued, the affected NWFO will followed it up periodically with ***Severe Weather Statements***. These statements will contain updated information on the severe thunderstorm and they will also let the public know when warning is no longer in effect.

Severe weather reports will either be reported in one the following 3 products: 1) another severe weather warning (***Tornado*** or ***Severe Thunderstorm***), 2) in a ***Severe Weather Statement***, or 3) in a ***Local Storm Report***.

Severe Thunderstorm Watch (WWA): This is issued by the National Weather Service when conditions are favorable for the development of severe thunderstorms in and close to the watch area. A severe thunderstorm by definition is a thunderstorm that produces 3/4 inch hail or larger in diameter and/or winds equal or exceed 58 miles an hour. The size of the watch can vary depending on the weather situation. They are usually issued for a duration of 4 to 8 hours. They are normally issued well in advance of the actual occurrence of severe weather. During the watch, people should review severe thunderstorm safety rules and be prepared to move a place of safety if threatening weather approaches.

A Severe Thunderstorm Watch is issued by the Storm Prediction Center in Norman, Oklahoma. Prior to the issuance of a Severe Thunderstorm Watch, SPC will usually contact the affected local National Weather Service Forecast Office (NWFO) and they will discuss what their current thinking is on the weather situation. Afterwards, SPC will issue a preliminary Severe Thunderstorm Watch and then the affected NWFO will then adjust the watch (adding or eliminating counties/parishes) and then issue it to the public by way of a ***Watch Redefining Statement***. During the watch, the NWFO will keep the public informed on what is happening in the watch area and also let the public know when the watch has expired or been cancelled.

Severe Weather Analysis (SWA): This WSR-88D radar product provides 3 base products (***reflectivity (SWR)***, ***radial velocity (SWV)***, and ***spectrum width (SWW)***) at the highest resolution available along with radial shear (SWS). These products are mapped into a 27 nm by 27 nm region centered on a point which the operator can specify anywhere within a 124 nm radius of the radar. It is most effective when employed as an alert paired product with the product centered on alert at height that caused the alert. It is used to examine 3 base products simultaneously in a 4 quadrant display; and analyze reflectivity and velocity products at various heights to gain a comprehensive vertical analysis of the thunderstorm.

Severe Weather Probability (SWP): This WSR-88D radar product algorithm displays numerical values proportional to the probability that a storm will produce severe weather within 30 minutes. Values determined using a statistical regression equation which analyzes output from the VIL algorithm. It is used to quickly identify the most significant thunderstorms.

Severe Weather Potential Statement (SPS or HWO): This statement is issued designed to alert the public and state/local agencies to the potential for severe weather up to 24 hours in advance. It is issued the local National Weather Service office.

Severe Weather Statement (SWS): A National Weather Service product which provides follow up information on severe weather conditions (severe thunderstorm or tornadoes) which have occurred or are currently occurring.

Servo Loop: In radar meteorology, a generic description of hardware needed to remotely control the motion of the antenna dish.

Sferic: A transient electric or magnetic field generated by any feature of lightning discharge (entire flash).

Shear: Variation in wind speed (speed shear) and/or direction (directional shear) over a short distance. Shear usually refers to vertical wind shear, i.e., the change in wind with height, but the term also is used in Doppler radar to describe changes in radial velocity over short horizontal distances.

Sheet Flow: Flow that occurs overland in places where there are no defined channels, the flood water spreads out over a large area at a uniform depth. This also referred to as overland flow.

SHEF (Standard Hydrologic Exchange Format): A documented set of rules for coding data for operational day-to-day use in a form for both visual and computer recognition.

SHEFPARS: A software decoder for SHEF Data.

Shelf Cloud: A low, horizontal wedge-shaped arcus cloud, associated with a thunderstorm gust front (or occasionally with a cold front, even in the absence of thunderstorms). Unlike the roll cloud, the shelf cloud is attached to the base of the parent cloud above it (usually a thunderstorm). Rising cloud motion often can be seen in the leading (outer) part of the shelf cloud, while the underside often appears turbulent, boiling, and wind-torn. It is accompanied by gusty, straight-line winds and is followed by precipitation.

Shoaling: The process whereby waves coming into shallow waters are slowed by bottom friction and become closer together and steeper.

Shore Ice: An ice sheet in the form of a long border attached to the bank or shore. See ***border ice***.

Short-Fuse Warning: A warning issued by the NWS for a local weather hazard of relatively short duration. Short-fuse warnings include tornado warnings, severe thunderstorm warnings, and flash flood warnings. Tornado and severe thunderstorm warnings typically are issued for periods of an hour or less, flash flood warnings typically for three hours or less.

Short Term Forecast: This National Weather Service narrative summary describes the weather in the local area and includes a short-range forecast (usually not more than 6 hours). This product will be updated more frequently when it is used during active weather. This product is also sometimes referred to as a "NOWcast".

Shortwave (or Shortwave Trough): A disturbance in the mid or upper part of the atmosphere which induces upward motion ahead of it. If other conditions are favorable, the upward motion can contribute to thunderstorm development ahead of a shortwave.

Showalter Index (SWI): It is a stability index used to determine thunderstorm potential. The SWI is calculated by lifting an air parcel adiabatically from 850 mb to 500 mb. The algebraic difference between the air parcel and the environmental temperature at 500 mb represents the SWI. It is especially useful when you have a shallow cool airmass below 850 mb concealing greater convective potential aloft. However, the SWI will underestimate the convective potential for cool layers extending above 850 mb. It also does not take in account diurnal heating or moisture below 850 mb. As a result, one must be very careful when using this index. The following table shows what the SWI value means:

Showalter Index (SWI) vs. Thunderstorm Consideration	
Showalter Index (SWI)	**Thunderstorm Consideration**
3 to 1	Thunderstorm possible - strong trigger needed
0 to -3	Unstable - thunderstorms probable
-4 to -6	Very unstable - good heavy thunderstorm potential
less than -6	Extremely unstable - good strong thunderstorm potential

Shower (SH): It implies short duration, intermittent, and scattered precipitation (rain, snow, ice pellet) of a more unstable, convective nature.

Shortwave: A small wave that moves around long waves in the same direction as the air flow in the middle and upper troposphere. Shortwaves are also called shortwave troughs.

Sidelobe: A secondary energy maximum located outside the main radar beam. Typically, it contains a small percentage of energy compared to the main lobe, but it may produce erroneous echoes.

Significant Wave Height: The average height (trough to crest distance) of the one-third highest waves. An experienced observer will most frequently report heights equivalent to the average of the highest one-third of all waves observed.

Single Cell Thunderstorm: This type of thunderstorm develops in weak vertical wind shear environments. On a hodograph, this would appear as a closely grouped set of random dots around the center of the graph. They are characterized by a single updraft core and a single downdraft that descends into the same area as the updraft. The downdraft and its outflow boundary then cut off the thunderstorm inflow. This causes the updraft and the thunderstorm to dissipate. Single cell thunderstorms are short-lived. They only last about 1/2 hour to an hour. These thunderstorms will occasionally become severe (3/4 inch hail, wind gusts in the excess

of 58 miles an hour, or a tornado), but only briefly. In this case, they are called: "***Pulse Severe Thunderstorms***".

Site-Specific: Term used in conjunction with "forecast" or "warning" to convey the fact that a hydrologic (stream) forecast is produced for an individual stream gage location as opposed to a general area (e.g., a city, zone, or county) as is commonly done in many types of weather forecasts.

Site Specific Hydrologic Prediction System (SSHP): The WFO hydrologic forecast model for small rivers and streams that uses RFC soil moisture state variables, stage and precipitation data. Routing capabilities may be added to future builds.

Skew-T Hodograph Analysis and Research Program (SHARP): This computer program is used by forecasters to interpret soundings. From this program, they are able to calculate the stability of the atmosphere, which way a thunderstorm will move once it forms, and what type of thunderstorm it will be (single cell, multicell, or supercell).

Signal-to-Noise Ratio (SNR): A ratio that measures the comprehensibility of data, usually expressed as the signal power divided by the noise power, usually expressed in decibels (dB).

Sky Condition: Used in a forecast to describes the predominant/average sky condition based upon octants (eighths) of the sky covered by opaque (not transparent) clouds.

Sky Condition	Cloud Coverage
Clear or Sunny	0/8
Mostly Clear, or Mostly Sunny	1/8 to 2/8
Partly Cloudy, or Partly Sunny	3/8 to 4/8
Mostly Cloudy, or Considerable Cloudiness	5/8 to 7/8
Cloudy	8/8
Fair (used mostly for nighttime periods)	Less than 4/10 opaque clouds, no precipitation, no extremes of visibility, temperature or winds. Describes generally pleasant weather conditions.

Sleet (PL): Describes solid grains of ice formed by the freezing of raindrops or the refreezing of largely melted snowflakes. These grains usually bounce upon impact with the ground or pavement. Heavy sleet is a relatively rare event defined as an accumulation of ice pellets covering the ground to a depth of 1/2 inch or more. See ***Ice Pellets***.

Slight Chance: A National Weather Service precipitation descriptor for a 20 percent chance of measurable precipitation (0.01 inch). When the precipitation is convective in nature, the term widely scattered is used. See ***Precipitation Probability (PoP)***.

Slight Risk of Severe Thunderstorms: Severe thunderstorms are expected to affect between 2 and 5 percent of the area. A slight risk generally implies that severe weather events are expected to be isolated. See high risk, moderate risk, convective outlook.

SMA: The Soil Moisture Accounting Model.

Small Craft Advisory: This is issued by the National Weather Service to alert small boats to sustained (more than 2 hours) hazardous weather or sea conditions. These conditions may be either present or forecasted. The threshold conditions for it are usually sustained winds of 18 knots (21 mph) (less than 18 knots in some dangerous waters) to 33 knots (38 mph) inclusive or hazardous wave conditions (such as 4 feet or greater). In the Great Lakes, this advisory relates to conditions within 5 nautical miles of shore. As a result, these will be only issued in the ***Nearshore Forecast***. Along the coastal regions of the East Coast, Gulf of Mexico, and West Coast, this advisory relates to conditions out to as much as 100 nautical miles of shore (coastal waters). As a result, these will be only issued in the ***Coastal Marine Forecast***. Mariners learning of this advisory are urged to determine immediately the reason by turning their radios to the latest marine broadcast. Decisions as to the degree of the hazard will be left to the boater, based on experience and size and type of boat. There is no legal definition for a "small craft".

Small Stream Flooding: Flooding of small creeks, streams, or runs.

Smog: Originally smog meant a mixture of smoke and fog. Now, it means air that has restricted visibility due to pollution or pollution formed in the presence of sunlight--photochemical smog.

Smoke (FU): A suspension in the air of small particles produced by combustion. A transition to haze may

occur when smoke particles have traveled a great distance (25 to 100 miles or more) and when the larger particles have settled out and the remaining particles have become widely scattered through the atmosphere.

Smoke Management: Conducting a prescribed fire or slash burn with firing techniques and meteorological conditions that keep the smoke's impact on the environment with acceptable limits.

SMPDBK: The Simplified Dam Break (DAMBRK) Model

Snow (SN): Precipitation of snow crystals, mostly branched in the form of six-pointed stars. It usually falls steadily for several hours or more. Qualifiers, such as occasional or intermittent, are used when a steady, prolonged (for several hours or more) fall is **not** expected. Like drizzle, its intensity is based on visibility. The following table shows snow intensity versus visibility:

Snow Intensity versus Visibility	
Snow Intensity	**Visibility**
Light	greater than ½ statue mile
Moderate	1/4 to ½ statue mile
Heavy	less 1/4 statue mile

The amount of snow that falls is highly dependent upon temperature. For example, at 10 degrees F, one inch of precipitation will produce 30 inches of snow. At 20 degrees F, one inch of precipitation will produce 20 inches of snow. At 30 degrees F, one inch of precipitation produces 10 inches of snow. At freezing, one inch precipitation will produce approximately 6 inches of snow.

Snow Accumulation and Ablation Model: A model which simulates snow pack accumulation, heat exchange at the air-snow interface, areal extent of snow cover, heat storage within the snow pack, liquid water retention, and transmission and heat exchange at the ground-snow interface.

Snow Advisory: This product is issued by the National Weather Service when a low pressure system produces snow that may cause significant inconveniences, but do not meet warning criteria and if caution is not exercised could lead to life threatening situations. The advisory criteria varies from area to area. In Michigan, the criteria for its issuance is a snow event that is forecasted to produce snow (average of forecast range) greater than 3 inches, but less than warning criteria (6 inches in Lower Michigan and 8 inches in Upper Michigan) in 12 hours. If the forecaster feels that it is warranted, he or she can issued it for amounts less than the minimum criteria. For example, it may be issued for the first snow of the season or when snow has not fallen in long while.

Snow and Blowing Snow Advisory: This product is issued by the National Weather Service during situations that cause significant inconveniences, but do not meet warning criteria and if caution is not exercised could lead to life threatening situations. The warning criteria in this definition varies from area to area. For example, in Lower Michigan, it refers to a snow of greater than or equal to 6 inches in a 12 hour period; or greater than or equal to 8 inches in a 24 hour period. Meanwhile, in Upper Michigan, it refers to a snow of greater than or equal to 8 inches in a 12 hour period; or greater than or equal to 10 inches in a 24 hour period.

Snow Core: A sample of either freshly fallen snow, or the combined old and new snow on the ground. This is obtained by pushing a cylinder down through the snow layer and extracting it.

Snow Density: The mass of snow per unit volume which is equal to the water content of the snow divided by its depth.

Snow Depth: The combined total depth of both the old and new snow on the ground.

Snow Flurries: They are intermittent light snowfalls of short duration (generally light snow showers) with **no** measurable accumulation.

Snow Grains (SG): Precipitation of very small, white, and opaque grains of ice. They can be distinguished from ice pellets, because ice pellets bounce and snow grains do **not** bounce at all.

Snow Pack: The combined layers of snow and ice on the ground at any one time. It is also called ***snowcover***.

Snow Pillow: An instrument used to measure snow water equivalents. Snow pillows typically have flat stainless steel surface areas. The pillow below this flat surface is filled with antifreeze solution and the pressure in the pillow is related to the water-equivalent depth of the snow on the platform. One great advantage of snow pillows over a snow survey is the frequency of observations, which can be as high as

twice per day.

Snow Pellets (GS): Precipitation of white, opaque grains of ice. The grains are round or sometimes conical. Diameters range from about 0.08 to 0.2 inch (2 to 5 mm). This is also referred to as ***Small Hail***.

Snow Shower (SHSN): It is a moderate snowfall of short duration. Some accumulation is possible.

Snow Squalls (SQSN): They are intense, but limited duration, periods of moderate to heavy snowfall. They are accompanied by strong, gusty surface winds, and possibly lightning (generally moderate to heavy snow showers). Snow accumulations may be significant.

Snow Stake: A 1-3/4 inch square, semi-permanent stake, marked in inch increments to measure snow depth.

Snow Stick: A portable rod used to measure snow depth.

SNOw TELemetry (SNOTEL): An automated network of snowpack data collection sites. The Natural Resources Conservation Service (NRCS), formerly the Soil Conservation Service (SCS), has operated the Federal-State-Private Cooperative Snow Survey Program in the western United States since 1935. A standard SNOTEL site consists of a snow pillow, a storage type precipitation gage, air temperature sensor and a small shelter for housing electronics.

Snow Water Equivalent: The water content obtained from melting accumulated snow.

Snowboard: A flat, solid, white material, such as painted plywood, approximately two feet square, which is laid on the ground, or snow surface by weather observers to obtain more accurate measurements of snowfall and water content.

Snowmelt Flooding: Flooding caused primarily by the melting of snow.

Snowpack: The total snow and ice on the ground, including both the new snow and the previous snow and ice which has not melted.

Soil Conservation Service: The former name of a branch of the United States Department of Agriculture, renamed the Natural Resources Conservation Service (NRCS). NRCS has responsibilities in soil and water conservation, and flood prevention.

Soil Moisture: Water contained in the upper part of the soil mantle. This moisture evaporates from the soil and is the used and transpired by vegetation.

Sounding: A plot of the vertical profile of temperature and dew point (and often winds) above a fixed location. Soundings are used extensively in severe weather forecasting, e.g., to determine instability, locate temperature inversions, measure the strength of the cap, obtain the convective temperature, etc.

Southern Oscillation (SO): A "see-saw" in surface pressure in the tropical Pacific characterized by simultaneously opposite sea level pressure anomalies at Tahiti, in the eastern tropical Pacific and Darwin, on the northwest coast of Australia. The ***SO*** was discovered by Sir Gilbert Walker in the early 1920's. Walker was among the first meteorologists to use the statistical techniques to analyze and predict meteorological phenomena. Later, the three-dimensional east-west circulation related to the ***SO*** was discovered and named the "Walker Circulation". The ***SO*** oscillates with a period of 2-5 years. During one phase, when the sea level pressure is low at Tahiti and High at Darwin, the El Nino occurs. The cold phase of the ***SO***, called "La Nina" by some, is characterized by high pressure in the eastern equatorial Pacific, low in the west, and by anomalously cold sea surface temperature (SST) in the central and eastern Pacific. This is called ***El Nino Southern Oscillation*** or ***ENSO***. For additional information see ***El Nino***.

Space Environment Center (SEC): This center provides real-time monitoring and forecasting of solar and geophysical events, conducts research in solar-terrestrial physics, and develops techniques for forecasting solar and geophysical disturbances. SEC's parent organization is the National Oceanic and Atmospheric Administration (NOAA). SEC is one of NOAA's 12 Environmental Research Laboratories (ERL) and one of NOAA's 9 National Centers for Environmental Prediction (NCEP). SEC's Space Weather Operations is jointly operated by NOAA and the U.S. Air Force and is the national and world warning center for disturbances that can affect people and equipment working in the space environment.

SPC - Storm Prediction Center: A national forecast center in Norman, Oklahoma, which is part of NCEP. The SPC is responsible for providing short-term forecast guidance for severe convection, excessive rainfall (flash flooding) and severe winter weather over the contiguous United States.

SPC Mesoscale Discussions (SWO): A mesoscale discussion issued by the Storm Prediction Center (SPC) in Norman, Oklahoma as a routine/daily, but nonscheduled, short-term (0-6 hours) product to communicate the current judgment of the SPC to the user community. It also provides guidance on other short-term mesoscale phenomenon that may be of significance (for example heavy snow potential, the formation of

dense fog, etc.).

Spearhead Echo: A radar echo associated with a Down burst with a pointed appendage extending toward the direction of the echo motion. The appendage moves much faster than the parent echo, which is drawn into the appendage. During it's mature stage, the appendage turns into a major echo and the parent echo loses its identity.

Special Avalanche Warning: Issued by the National Weather Service when avalanches are imminent or occurring in the mountains. It is usually issued for a 24 hour period.

Special Fire Weather: Meteorological services uniquely required by user agencies which cannot be provided at an NWS office during normal working hours. Examples are on-site support, weather observer training, and participation in user agency training activities.

Special Marine Warning (SMW): This is issued by the National Weather Service for hazardous weather conditions (thunderstorms over water, thunderstorms that will move over water, cold air funnels over water, or waterspouts) usually of short duration (2 hours or less) and producing sustained winds or frequent gusts of 34 knots or more that is not covered by existing marine warnings. These are tone alerted on NOAA Weather Radio. Boaters will also be able to get this information by tuning into Coast Guard and commercial radio stations that transmit marine weather information.

Special Tropical Disturbance Statement (DSA): This statement issued by the National Hurricane Center furnishes information on strong and formative non-depression systems. This statement focuses on the major threat(s) of the disturbance, such as the potential for torrential rainfall on an island or inland area. The statement is coordinated with the appropriate forecast office(s).

Special Weather Statement (SPS): This is used by the National Weather Service to provide additional information about expected or ongoing significant weather changes not covered in other statements. This would include non-severe convective, winter weather, and non-precipitation events.

Specific Humidity: In a system of moist air, the ratio of the mass of water vapor to the total mass of the system.

Specific Yield: The ratio of the water which will drain freely from the material to the total volume of the aquifer formation. This value will always be less than the porosity.

Spectral Density: A radar term for the distribution of power by frequency.

Spectrum Width (SW): This WSR-88D radar product depicts a full 360 degree sweep of spectrum width data indicating a measure of velocity dispersion within the radar sample volume. It is available for every elevation angle sampled, it provides a measure of the variability of the mean radial velocity estimates due to wind shear, turbulence, and/or the quality of the velocity samples. It is used to estimate turbulence associated with boundaries, thunderstorms, and mesocyclones; check the reliability of the velocity estimates; and locate boundaries (cold front, outflow, lake breeze, etc.).

Spectrum Width Cross Section (SCS): This WSR-88D radar product displays a vertical cross section of spectrum width on a grid with heights up to 70,000 feet on the vertical axis and distance up to 124 nm on the horizontal axis. Two end points to create cross section are radar operator selected along a radial or from one AZRAN to another AZRAN within 124 nm of the radar that are less than 124 nm apart. It is used to: 1) Verify features on the Reflectivity Cross Section (RCS) and Velocity Cross Section (VCS) and to evaluate the quality of the velocity data and 2) Estimate vertical extent of turbulence (aviation use).

Speed Shear: The component of wind shear which is due to a change in wind speed with height, e.g., southwesterly winds of 20 mph at 10,000 feet increasing to 50 mph at 20,000 feet. Speed shear is an important factor in severe weather development, especially in the middle and upper levels of the atmosphere.

SPENES: An acronym for NESDIS Satellite Precipitation Estimates.

Sphere Calibration: Reflectivity calibration of a radar by pointing the dish at a metal sphere of (theoretically) known reflectivity. The sphere is often tethered to a balloon. Here's an image of a sphere calibration at sea. The sphere is visible just above the horizon.

Spillway: A structure over or through which excess or flood flows are discharged. If the flow is controlled by gates, it is a controlled spillway, if the elevation of the spillway crest is the only control, it is an uncontrolled spillway. Some various types of spillways include:

> **Auxiliary or Emergency Spillway:** A secondary spillway designed to operate only during exceptionally large flood flows. Allows inflows from large storms to be released from the reservoir before the water level raises high enough to overtop the dam.
>
> **Fuse Plug Spillway:** An auxiliary or emergency spillway comprising a low embankment or a natural

saddle designed to be overtopped and eroded away during flood flows.

Primary (or Principal) Spillway: The spillway which would be used first during normal inflow and flood flows.

Shaft or Morning Glory Spillway: A vertical or inclined shaft into which flood water spills and then is conducted through, under, or around a dam by means of a conduit or tunnel. If the upper part of the shaft is splayed out and terminates in a circular horizontal weir, it is termed a "bellmouth" or "morning glory" spillway.

Side Channel Spillway: A spillway whose crest is roughly parallel to the channel immediately downstream of the spillway.

Siphon Spillway: A spillway with one or more siphons built at crest level. This type of spillway is sometimes used for providing automatic surface-level regulation within narrow limits or when considerable discharge capacity is necessary within a short period of time.

Spillway Crest: The elevation of the highest point of a spillway.

Spin-up: Slang for a small-scale vortex initiation, such as what may be seen when a gustnado, landspout, or suction vortex forms.

Splitting Storm: A thunderstorm which splits into two storms which follow diverging paths (a left mover and a right mover). The left mover typically moves faster than the original storm, the right mover, slower. Of the two, the left mover is most likely to weaken and dissipate (but on rare occasions can become a very severe anticyclonic-rotating storm), while the right mover is the one most likely to reach supercell status.

Spot Forecasts: These are NWS site-specific fire weather forecasts. They are issued upon request of User Agencies for wildfires, prescribed burns, or special projects.

Spray (PY): An ensemble of water droplets torn by the wind from the surface of the of an extensive body of water, generally from crests of waves, and carried a short distance into the air.

Spring: An issue of water from the earth; a natural fountain; a source of a reservoir of water.

Spring Tide: A tide higher than normal which occurs around the time of the new and full moon.

Squall (SQ): A strong wind characterized by a sudden onset in which the wind speed increases at least 16 knots and is sustained more than 22 knots or more for at least one minute.

Squall Line: A line or narrow band of active thunderstorms. The line may extend across several hundred miles. It forms along and ahead of an advancing cold front.

SRH: An acronym for Storm-relative Helicity.

Stability Index: The overall stability or instability of a sounding is sometimes conveniently expressed in the form of a single numerical value. Used alone, it can be quite misleading, and at times, is apt to be worthless. The greatest value of an index lies in alerting the forecaster to those soundings which should be examined more closely.

Stable: An atmospheric state with warm air above cold air which inhibits the vertical movement of air.

Staccato Lightning: A Cloud to Ground (CG) lightning discharge which appears as a single very bright, short-duration stroke, often with considerable branching.

Staff Gage: A vertical staff graduated in appropriate units which is placed so that a portion of the gage is in the water at all times. Observers read the river stage off the staff gage.

Stage: The level of the water surface above a given datum at a given location along a river or stream.

Stage I Precipitation Processing: The first level of precipitation processing, occurring within the WSR-88D computer and performance for each volume scan of the radar. Base reflectivity data are converted to a precipitation estimate for each grid in the radar umbrella using a complex algorithm that includes quality control procedures, a Z/R relationship, and a bias adjustment using data from a ground-based precipitation gage network. Several graphical and digital products are produced for Weather Forecast Offices (WFO) operations and subsequent processing.

Stage II Precipitation Processing: The second level of precipitation processing, occurring within the WFO Advanced Weather Interactive Processing System (AWIPS) and performed on an hourly basis. Stage I precipitation estimates are further refined using data from additional precipitation gages and other sources

such as rain/no rain determinations from satellite imagery. Stage II may also be executed at RFCs for backup purposes.

Stage III Precipitation Processing: The third level of precipitation processing, performed interactively at RFCs. Stage II precipitation estimates from multiple radars are mosaicked into an RFC area-wide product for use in river basin hydrologic modeling operations. RFC forecasters can review the mosaicked product, interactively edit areas of bad data, and substitute gage-only fields into portions of the mosaicked radar based product.

Stage IV Precipitation Processing: The fourth level of precipitation processing, performed automatically and/or interactively at NCEP. Stage III precipitation estimates from RFCs are mosaicked into a Nation-wide product for use in various real-time forecast activities and forecast verification operations.

Stair Stepping: The process of continually updating river forecasts for the purpose of incorporating the effects rain that has fallen since the previous forecast was prepared. The goal of using QPF is to minimize "stair-stepping."

Standard Deviation: The positive square root of the signal variance. The velocity standard deviation is often called spectrum width.

State Forecast Discussion (SFD): This National Weather Service product is intended to provide a well-reasoned discussion of the meteorological thinking which went into the preparation of the ***Zone Forecast Product***. The forecaster will try to focus on the most particular challenges of the forecast. The text will be written in plain language or in proper contractions. At the end of the discussion, there will be a list of all advisories, non-convective watches, and non-convective warnings. The term non-convective refers to weather that is not caused by thunderstorms. Intermediate State Forecast Discussion will be issued when either significant forecast updates are being made or if interesting weather is expected to occur. Most states are going away from this product and more toward the ***Area Forecast Discussion (AFD)***.

State Forecast Product (SFP): This National Weather Service product is intended to give a good general picture of what weather may be expected in the state during the next 5 days. The first 2 days of the forecast is much more specific than the last 3 days. In comparison with the ***Zone Forecast Product***, this product will be much more general.

State Maximum/Minimum Temperature and Precipitation Table (STP): This tabular product is issued by the National Weather Service once in the morning and evening. The morning product will contain the current weather conditions, yesterday's daytime high temperature (in Fahrenheit), the 12-hour low temperature (in Fahrenheit) ending at a specified time, and 24-hour precipitation (in inches) ending at a specified time from available reporting stations within the state or NWFO forecast area. The evening product will contain the same information; however, the daytime high temperature will be today's high temperature instead of yesterday's high temperature. In the winter time, this product will contain the snow depth in inches if it is available. In the state of Michigan, this product is prepared by NWFO Grand Rapids. They issue this product twice daily--usually somewhere between 7:00 and 8:00 AM/PM EST.

State Weather Roundup (SWR): This is a National Weather Service tabular product which provides routine hourly observations within the state through the National Weather Wire Service (NWWS). It gives the current weather condition in one word (cloudy, rain, snow, fog, etc.), the temperature and dew point in Fahrenheit, the relative humidity, wind speed and direction, and finally additional information (wind chill, heat index, a secondary weather condition). These reports are broken up regionally. When the complementary satellite product is not available, reports from unaugmented ASOS stations will report "fair" in the sky/weather column when there are few or no clouds (i.e., scattered or less) below 12,000 feet with no significant weather and/or obstructions to visibility. In the state of Michigan, this product is done automatically at NWFO Detroit/Pontiac about 10 minutes past the hour.

Stationary Front: A front that barely moves with winds blowing in almost parallel, but in opposite directions on each side of the front. Occasionally, these fronts can cause widespread flooding, because showers and thunderstorms moving along them will continue to move across the same area. This weather situation is called "Train Echoing".

Steam Fog: It forms as cold air moves over warm water. Water evaporates from the warm water surface and immediately condenses in the cold air above. Heat from the water warms the lower levels of the air creating a shallow layer of instability. It rises like smoke from the warm surface. The low level convection can become quite turbulent. Steam fog is most common in Arctic regions where it is called "Arctic Sea Smoke", but it can and does occur occasionally at all latitudes.

Steering Winds (or Steering Currents): A prevailing synoptic scale flow which governs the movement of smaller features embedded within it.

Stepped Leader: A leader which initiates the very first stroke and establishes the channel for all subsequent

streamers of a lightning discharge.

Stilling Basin: A basin constructed to dissipate the energy of fast-flowing water (e.g., from a spillway or bottom outlet), and to protect the streambed from erosion.

Stoplogs: Large logs, timbers or steel beams placed on top of each other with their ends held in guides on each side of a channel or conduit providing a temporary closure versus a permanent bulkhead gate.

Storage: 1) Water artificially impounded in surface or underground reservoirs for future use. 2) Water naturally detained in a drainage basin, such as ground water, channel storage, and depression storage.

Storage Equation: The equation for the conservation of mass.

Storm: Any disturbed state of the atmosphere, especially affecting the Earth's surface, and strongly implying destructive and otherwise unpleasant weather. Storms range in scale from tornadoes and thunderstorms through tropical cyclones to widespread extratropical cyclones.

Storm Data (SD): This National Climatic Data Center (NCDC) monthly publication documents a chronological listing, by states, of occurrences of storms and unusual weather phenomena. Reports contain information on storm paths, deaths, injuries, and property damage. An "Outstanding storms of the month" section highlights severe weather events with photographs, illustrations, and narratives. The December issue includes annual tornado, lightning, flash flood, and tropical cyclone summaries.

Storm Hydrograph: A hydrograph representing the flow or discharge of water past a point on a river.

Storm Motion: The speed and direction at which a thunderstorm travels.

Storm Relative: Measured relative to a moving thunderstorm, usually referring to winds, wind shear, or helicity.

Storm Relative Mean Radial Velocity Map (SRM): This WSR-88D radar product depicts a full 360 degree sweep of radial velocity data with the average motion of all identified storms subtracted out. It is available for every elevation angle sampled. It is used to aid in displaying shear and rotation in storms and storm top divergence that might otherwise be obscured by the storm's motion, investigate the 3-D velocity structure of a storm, and help with determining rotational features in fast and uniform moving storms.

Storm Relative Mean Radial Velocity Region (SRR): This WSR-88D radar product depicts a 27 nm by 27 nm region of storm relative mean radial velocity centered on a point which the operator can specify anywhere within a 124 nm radius of the radar. The storm motion subtracted defaults to the motion of the storm closest to the product center, or can be input by the operator. It is used to examine the 3-dimensional storm relative flow of a specific thunderstorm (radar operator centers product on a specific thunderstorm; aid in displaying shear and rotation in thunderstorms and storm top divergence that might otherwise be obscured by storm motion; and gain higher resolution velocity product

Storm Scale: Referring to weather systems with sizes on the order of individual thunderstorms. See ***synoptic scale*** and ***mesoscale***.

Storm Surge: A rise above the normal water level along a shore caused by strong onshore winds and/or reduced atmospheric pressure. The surge height is the difference of the observed water level minus the predicted tide. Most hurricane deaths are caused by the storm surge. It can be 50 or more miles wide and sweeps across the coastline around where the hurricane makes landfall. The maximum rises in sea-level move from under the storm to the right of the storm's track, reaching a maximum amplitude of 10 to 30 feet at the coast. The storm surge may even double or more in height when the hurricane's track causes it to funnel water into a bay. The storm surge increases substantially as it approaches the land because the normal water depth decreases rapidly as it approaches the beaches. The moving water contains the same amount of energy; thus, resulting in an increase of storm surge. Typically, the stronger the hurricane, the greater the storm surge.

Storm Tide: The actual sea level resulting from astronomical tide combined with the storm surge. This term is used interchangeably with ***"hurricane tide"***.

Storm Total Precipitation (STP): This WSR-88D radar product displays the total precipitation (in inches) as a graphical image. It displays hourly precipitation total (in inches) as a graphical image. Currently , this product is done in a polar format with resolution 1.1 nm by 1 degree. It will reset after one hour of no precipitation. It is used to monitor total precipitation accumulation; observe short term trends of precipitation tracks with time lapse of this product; and estimate total basin runoff and ground saturation.

Storm Tracking Information (STI): This WSR-88D radar product displays the previous, current, and projected locations of storm centroids (forecast and past positions are limited to one hour or less). Forecast tracks are based upon linear extrapolation of past storm centroid positions, and they are intended for application to individual thunderstorms not lines or clusters. It is used to provide storm movement: low track variance and/or 2 or more plotted past positions signify reliable thunderstorm movement.

Stormwater Discharge: Precipitation that does not infiltrate into the ground or evaporate due to impervious land surfaces, but instead flows onto adjacent land or water areas and is routed into drain/sewer systems.

Storm Warning: A warning of 1-minute sustained surface winds of 48 kt (55 mph or 88 kph) or greater, either predicted or occurring, not directly associated with tropical cyclones.

Straight-Line Hodograph: The name pretty well describes what it looks like on the hodograph. What causes this shape is a steady increase of winds with height (vertical wind shear). This shape of hodograph favors multicell thunderstorms.

Straight Line Winds: Generally, any wind that is not associated with rotation, used mainly to differentiate them from tornadic winds.

Stratiform: Descriptive of clouds of extensive horizontal development, as contrasted to the more narrow and vertically developed cumuliform type. Stratiform clouds cover large areas but show relatively little vertical development. Stratiform precipitation, in general, is relatively continuous and uniform in intensity (i.e., steady rain versus rain showers).

Stratiform Rain: Horizontally widespread rain, uniform in character, typically associated with macroscale fronts and pressure systems.

Stratiform Rings and Bands: These occur between the active convective bands of a hurricane outside of the eye wall. Inner stratiform bands often exhibit the *bright band* aloft, a *VIP* Level 2, and in the lower layers typically show a *VIP* Level 1.

Stratiform Snow: Same as for stratiform rain except precipitation is in the form of snow.

Stratocumulus (Sc): It has globular masses or rolls unlike the flat, sometimes definite, base of stratus. This cloud often forms from stratus as the stratus is breaking up or from spreading out of cumulus clouds. They usually consist of mainly water vapor and are located between the ground and 6,500 feet. Stratocumulus often reveals the depth of the moist air at low levels, while the speed of the cloud elements can reveal the strength of the low-level jet.

Stratus (St): It is a low, uniform sheet-like cloud. Stratus may appear in the form of ragged patches, but otherwise does not exhibit individual cloud elements as do cumulus and stratocumulus clouds. It usually is located between the ground and 6,500 feet. It usually consist of mainly water vapor. Fog is a stratus cloud with its base located at the ground.

Stream Gage: A site along a stream where the stage (water level) is read either by eye or measured with recording equipment.

Stream Segment: Refers to the surface waters of an approved planning area exhibiting common hydrological, natural, physical, biological, or chemical processes. Segments will normally exhibit common reactions to external stresses such as discharge or pollutants.

Streamer: A channel of very high ion density which propagates through the air by the continual establishment of an electron avalanche ahead of its tip.

Streamflow: Water flowing in the stream channel. It is often used interchangeably with discharge.

Striations: Grooves or channels in cloud formations, arranged parallel to the flow of air and therefore depicting the airflow relative to the parent cloud. Striations often reveal the presence of rotation, as in the barber pole or "corkscrew" effect often observed with the rotating updraft of an Low Precipitation (LP) storm.

Subrefraction: The bending of the radar beam in the vertical which is less than under standard refractive conditions. This causes the beam to be higher than indicated, and lead to the underestimation of cloud heights.

Subsidence: 1) The slow sinking of air usually associated with high pressure areas. It is usually over a broad area. 2) Sinking down of part of the earth's crust due to underground excavation, such as the removal of groundwater

Subsidence Inversion: It is produced by adiabatic heating of air as it sinks and is associated with anticyclones (high pressure) and/or stable air masses. These inversions form between sinking heated air and air below and they are characterized by temperature increase with height through the inversion, while above the inversion, the temperature cools almost dry adiabatically. The dew point temperature, relative humidity, and mixing ratio values all decrease with height through the inversion.

Subsurface Storm Flow: The lateral motion of water through the upper layers until it enters a stream channel. This usually takes longer to reach stream channels than runoff. This also called ***interflow***.

Substation: A location where observations are taken or other services are furnished by people not located at NWS offices who do not need to be certified to take observations.

Sub-Synoptic Low: Essentially the same as mesolow.

Subtle Heavy Rainfall Signature ("SHARS"): This heavy rain signature is often difficult to detect on satellite. These warm top thunderstorms are often embedded in a synoptic-scale cyclonic circulation. Normally, they occur when the 500 mb cyclonic circulation is quasi-stationary or moves slowly to the east or northeast (about 2 degrees per 12 hours). The average surface temperature is 68ºF with northeasterly winds. The average precipitable water (P) value is equal to or greater than 1.34 inches and the winds veer with height, but they are relatively light. The heavy rain often occurs north and east of the vorticity maximum across the lower portion of the comma head about 2 to 3 degrees north or northeast of the 850 mb low.

Subtropical Cyclone: A low pressure system that develops over subtropical waters that initially has a non-tropical circulation, but in which some elements of tropical cyclone cloud structure are present. Subtropical cyclones can evolve into tropical cyclones. Subtropical cyclones are generally of two types:

> **1) Cold Low Type**: This type has a circulation extending from the surface to the upper troposphere, with the maximum sustained low-level winds typically extending to a radius of 100 miles or more from the center.
>
> **2) Mesoscale (Sub-Synoptic Scale) Cyclone Type:** This type develops in or near a dying frontal zone with horizontal wind shear. This low is compact and develops a tight pressure gradient with the maximum sustained low-level winds, which can reach hurricane intensity, typically located less than 30 miles from the center. The whole storm circulation may initially be no more than 100 miles in diameter. These lows are typically short- lived and spend their lives usually over water. They may be cold core or warm core. This strange hybrid was once referred to as a "neutercane" after being discovered by satellite imagery.

Subtropical Depression: A subtropical cyclone in which the maximum sustained surface wind speed (using the U.S. 1-minute average) is 33 kt (38 mph or 62 kph) or less.

Subtropical Storm: A subtropical cyclone in which the maximum sustained surface wind speed (using the U.S. 1-minute average) is 34 kt (39 mph or 63 kph) or more.

Subtropical Jet: This jet stream is usually found between 20º and 30º latitude at altitudes between 12 and 14 km.

Suction Vortex (sometimes Suction Spot): A small but very intense vortex within a tornado circulation. Several suction vortices typically are present in a multiple-vortex tornado. Much of the extreme damage associated with violent tornadoes (F4 and F5 on the Fujita scale) is attributed to suction vortices.

Sun Pointing: Alignment of the radar antenna by locating the position of the sun in the sky, which has an exactly known position given the radar's location and the present time. This may be necessary to verify that when we think we're pointing "north", we actually are! The sun's signal is usually several dB above the background noise, and this technique is also sometimes used to examine the receiver sensitivity.

Supercell: A thunderstorm with a persistent rotating updraft. Supercells are rare, but are responsible for a remarkably high percentage of severe weather events - especially tornadoes, extremely large hail and damaging straight-line winds. They frequently travel to the right of the main environmental winds (i.e., they are right movers). Radar characteristics often (but not always) include a hook or pendant, bounded weak echo region (BWER), V-notch, mesocyclone, and sometimes a TVS. Visual characteristics often include a rain-free base (with or without a wall cloud), tail cloud, flanking line, overshooting top, and back-sheared anvil, all of which normally are observed in or near the right rear or southwest part of the storm. Storms exhibiting these characteristics often are called classic supercells; however HP (High Precipitation) storms and LP (Low Precipitation) storms also are supercell varieties.

Supercooled Liquid Water: In the atmosphere, liquid water can survive at temperatures colder than 0 degrees Celsius; many vigorous storms contain large amounts of supercooled liquid water at cold temperatures. Important in the formation of graupel and hail.

Superrefraction: Bending of the radar beam in the vertical which is greater than sub-standard refractive conditions. This causes the beam to be lower than indicated, and often results in extensive ground clutter as well as an overestimation of cloud top heights.

Surcharge Capacity: The volume of a reservoir between the maximum water surface elevation for which the dam is designed and the crest of an uncontrolled spillway, or the normal full-pool elevation of the reservoir with the crest gates in the normal closed position.

Surface Based Convection: Convection occurring within a surface-based layer, i.e., a layer in which the lowest portion is based at or very near the earth's surface. Compare with elevated convection.

Surface Impoundment: An indented area in the land's surface, such as a pit, pond, or lagoon.

Surface Runoff: The part of runoff, caused by precipitation and/or snowmelt, that moves over the soil surface to the nearest stream channel. Rain that falls on the stream channel is often lumped with this quantity.

Surface Water: Water that flows in streams and rivers and in natural lakes, in wetlands, and in reservoirs constructed by humans.

Sustained Wind: Wind speed determined by averaging observed values over a 2-minute period.

Severe WEAther Threat Index (SWEAT Index): A stability index developed by the Air Force which incorporates instability, wind shear, and wind speeds. The index combines the effects of low-level moisture (850 mb dew point), convective instability (*Total Totals (TT) Index*), jet maxima (850 mb and 500 mb wind speed), and warm air advection (veering directional shear between 850 mb and 500 mb). It was designed to discriminate between ordinary and severe convection by incorporating thermodynamic information (850 mb dew point and *Total Totals Index*) and kinematic information (low and mid level flow characteristics showing strong wind fields and veering directional shear). SWEAT Index - Severe Weather ThrEAT index as follows:

SWEAT = (12 Td 850) + (20 [TT-49]) +(2 f 850) + f 500 + (125 [s+0.2]) where

Td 850 is the dew point temperature at 850 mb,
TT is the total-totals index,
f 850 is the 850-mb wind speed (in knots),
f 500 is the 500-mb wind speed (in knots), and
s is the sine of the angle between the wind directions at 500 mb and 850 mb (thus representing the directional shear in this layer).

SWEAT values of about 250-300 or more indicate a greater potential for severe weather, but as with all stability indices, there are no magic numbers. The SWEAT index has the advantage (and disadvantage) of using only mandatory-level data (i.e., 500 mb and 850 mb), but has fallen into relative disuse with the advent of more detailed sounding analysis programs.

Sunny: When there are no opaque (not transparent) clouds. Same as ***Clear***.

Surge: A rise in water level caused by strong wind or fluctuations in the atmospheric pressure. This term is usually applied to a sharp set-up effect at the downwind end of the lake, but thunderstorms can cause brief local storm surges in bays and harbours. See ***Set-up***.

Sustained Overdraft: Long-term withdrawal from the aquifer of more water than is being recharged.

SWE: Snow Water Equivalent

Swell: Wind-generated waves that have travelled out of their generating area. Swells characteristically exhibit smoother, more regular and uniform crests and a longer period than wind waves.

SWODY1 (sometimes pronounced swoe-dee): The Day-1 Convective Outlook, sometimes called the "AC" is a guidance product issued by the Operational Guidance Branch (OGB) unit of the Storm Prediction Center (SPC) in Norman, Oklahoma. The Day 1 outlook outlines areas in the continental United States where severe thunderstorms may develop during the next 6 to 30 hours. The Convective Outlook is issued 5 times daily: at 06Z (the initial day-1 outlook, valid 12Z that day until 12Z the following day), 11Z (the "two-part outlook"), 15Z (the "morning update," valid until 12Z the next day), 19Z (the "afternoon update, " valid until 12Z the next day), and the 02Z (the "evening update," valid until 12Z the following day).

SWODY2 (sometimes pronounced swoe-dee): The Day 2 Convective Outlook is very similar to the Day 1 Outlook. It is issued only twice a day, at 08Z and 18Z, and covers the period from 12Z the following day to 12Z the day after that. For example, if today is Monday then the Day 2 Outlook will cover the period 12Z Tuesday to 12Z Wednesday. The outlook issued at 08Z now qualifies the degree of risk like the Day 1 has (i.e. SLGT, MDT, and HIGH risk areas). The Day 2 Outlook has also includes a general thunderstorm outline.

Symmetric Double Eye: A concentrated ring of convection that develops outside the eye wall in symmetric, mature hurricanes. The ring then propagates inward and leads to a double-eye. Eventually, the inner eye wall dissipates while the outer intensifies and moves inward.

Synchronous Detection: Radar processing that retains the received signal amplitude and phase but that removes the intermediate frequency carrier.

Synoptic Scale (or Large Scale): The typical weather map scale that shows features such as high and low pressure areas and fronts over a distance spanning a continent. Also called cyclonic scale. Compare with ***mesoscale*** and ***storm-scale***.

Synoptic Track: Weather reconnaissance mission flown to provide vital meteorological information in data sparse ocean areas as a supplement to existing surface, radar, and satellite data. Synoptic flights better define the upper atmosphere and aid in the prediction of tropical cyclone development and movement.

Syzygy: The instance (new moon or full moon) when the earth, sun, and moon are all in a straight line.

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T

TAF (Terminal Aerodrome Forecast): This NWS aviation product is a concise statement of the expected meteorological conditions at an airport during a specified period (usually 24 hours). Each country is allowed to make modifications or exceptions to the code for use in each particular country. TAFs use the same weather code found in METAR weather reports.

Tail Cloud: A horizontal, tail-shaped cloud (not a funnel cloud) at low levels extending from the precipitation cascade region of a supercell toward the wall cloud (i.e., it usually is observed extending from the wall cloud toward the north or northeast). The base of the tail cloud is about the same as that of the wall cloud. Cloud motion in the tail cloud is away from the precipitation and toward the wall cloud, with rapid upward motion often observed near the junction of the tail and wall clouds. Compare with beaver tail, which is a form of inflow band that normally attaches to the storm's main updraft (not to the wall cloud) and has a base at about the same level as the updraft base (not the wall cloud). See ***supercell***.

Tail-End Charlie: Slang for the thunderstorm at the southernmost end of a squall line or other line or band of thunderstorms. Since low-level southerly inflow of warm, moist air into this storm is relatively unimpeded, such a storm often has a higher probability of strengthening to severe levels than the other storms in the line.

Tailwater Height: Height of water immediately downstream of the dam. (Various datums may be used.)

Target: Precipitation or other phenomena which produces echoes on a radar display.

TCU: An acronym for Towering Cumulus. See ***Towering Cumulus***.

T. D.: An acronym for Tropical Depression. See ***Tropical Depression***.

TDWR: An acronym for Terminal Doppler Weather Radar.

Technical Support Branch (TSB): One of three branches of the ***Tropical Prediction Center (TPC)***. TSB provides support for TPC computer and communications systems, including the McIDAS satellite data processing systems, the N-AWIPS workstations, and the WSR-88D computer systems. TSB also maintains a small applied research unit which develops tools for hurricane and tropical weather analysis and prediction. TSB also has a storm surge group which provides information for developing evacuation procedures for coastal areas, and an oceanography unit that produces ocean current and sea surface temperature analyses.

Temperature: A measure of the warmth of the ambient air measured by a suitable instrument such as a thermometer.

Texas Hooker: Low pressure systems that originate in the panhandle region of Texas and Oklahoma. The lows initially move east and then "hook" or recurve more northeast toward the upper Midwest or Great Lakes region. In winter these systems usually deposit heavy snows north of their surface track. Thunderstorms may be found south of the track. This is also called a "***Pan Handle Hook***".

Thalweg: The line of maximum depth in a stream. The thalweg is the part that has the maximum velocity

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and causes cutbanks and channel migration.

Theodolite: An instrument used in surveying to measure horizontal and vertical angles with a small telescope that can move in the horizontal and vertical planes. It used to track the movements of either a ceiling balloon or a radiosonde.

Thermal: A relatively small-scale, rising air current produced when the Earth's surface is heated. Thermals are a common source of low level turbulence for aircraft.

Thermal Highs: Areas of high pressure that are shallow in vertical extent and are produced primarily by cold surface temperatures.

Thermal Lows: Areas of low pressure that are shallow in vertical extent and are produced primarily by warm surface temperatures.

Thermal Wind: It is a theoretical wind that blows parallel to the thickness lines, for the layer considered, analogous to how the *geostrophic wind* blows parallel to the height contours. The closer the thickness isopleths, the stronger the thermal wind. Cold air is always located to the left of the thermal wind (as you face downstream) and the warm air is located on the right. Since thickness contours are tighter on the cold side of thermal wind, your lower thickness values will be found on the left side of the thermal wind. The speed and direction of the thermal wind are determined by vector geometry where the *geostrophic wind* at the upper level is subtracted from the *geostrophic wind* at the lower level.

Thermistor: An electrical resistance device used in the measurement of temperature.

Thermodynamic Chart (or Thermodynamic Diagram): A chart containing contours of pressure, temperature, moisture, and potential temperature, all drawn relative to each other such that basic thermodynamic laws are satisfied. Such a chart typically is used to plot atmospheric soundings, and to estimate potential changes in temperature, moisture, etc. if air were displaced vertically from a given level. A thermodynamic chart thus is a useful tool in diagnosing atmospheric instability.

Thermodynamics: In general, the relationships between heat and other properties (such as temperature, pressure, density, etc.) In forecast discussions, thermodynamics usually refers to the distribution of temperature and moisture (both vertical and horizontal) as related to the diagnosis of atmospheric instability.

Thermograph: An instrument that measures and records air temperature.

Thermometer: An instrument for measuring temperature.

Theta-e (or Equivalent Potential Temperature): The temperature a parcel of air would have if a) it was lifted until it became saturated, b) all water vapor was condensed out, and c) it was returned adiabatically (i.e., without transfer of heat or mass) to a pressure of 1000 millibars. Theta-e, which typically is expressed in degrees Kelvin, is directly related to the amount of heat present in an air parcel. Thus, it is useful in diagnosing atmospheric instability.

Theta-e Index (TEN): It represents the greatest decrease in equivalent potential temperature measured in a layer beginning at or below 700 mb. Consequently, this stability index evaluates the potential for elevated convection, and adds insight where surface-based indices fail. It also provides useful information for diagnosing the potential for short-fused flooding events, especially when warm, moist, unstable air south of a warm or stationary front is forced isentropically over the frontal boundary by significant low level winds (greater than 20-30 knots). A TEN equal to or exceeding 5-10 ^{o} C indicates a potential for elevated convection, especially when isentropic lift is probable.

Theta-e Ridge: An axis of relatively high values of theta-e. Severe weather and excessive rainfall often occur near or just upstream from a theta-e ridge.

Three-Hour Rainfall Rate (THP): This WSR-88D Radar product displays precipitation total (in inches) of the current and past two clock hours as a graphical image. It displays hourly precipitation total (in inches) as a graphical image (polar format with resolution 1.1 nm by 1 degree). It is updated once an hour. It is used to: 1) Assess rainfall intensities and amounts over a longer viewing interval; and 2) Possibly adjust flash flood guidance values since the product corresponds to the timing of Flash Flood Guidance values.

Threshold Runoff: The runoff in inches from a rain of specified duration that causes a small stream to slightly exceed bankfull. When available, flood stage is used instead of slightly over bankfull.

Thin Line Echo: A narrow, elongated, non-precipitating echo. It is usually associated with thunderstorm outflows, fronts, or other density discontinuities. It is also known as a Fine Line.

Thunder: The sound emitted by the rapidly expanding gases along the channel of a lightning discharge. Thunder is seldom heard farther than about 15 miles from the lightning discharge, with 25 miles an approximate upper limit and 10 miles a typical value.

Thunderstorm (TS): A local storm produced by cumulonimbus clouds. It is always accompanied by lightning and thunder. It is estimated that nearly 2,000 thunderstorms occur simultaneously around the Earth at any given instant. There are 3 types of thunderstorms. They are the following: 1) Single Cell Thunderstorms, 2) Multicell Thunderstorms, and 3) Severe Supercell Thunderstorm.

Tidal Anomaly: Actual water level minus the tide table predictions.

Tidal Cycle: The periodic changes in the intensity of tides caused primarily by the varying relations between the earth, moon, and sun.

Tidal Piling: Abnormally high water levels caused by the accumulation of successive incoming tides that do not completely drain due to opposing strong winds and/or waves.

Tides: They are the periodic (occurring at regular intervals) variations in the surface water level of the oceans, bays, gulfs, and inlets. Tides are the result of the gravitiational attraction of the sun and the moon on the earth. The attraction of the moon is far greater than the attraction of the sun due to the close proximity of the earth and the moon. The sun is 360 times further from the earth than the moon. Therefore, the moon plays a larger role than the sun in producing tides. Every 27.3 days, the earth and the moon revolve around a common point. This means that the oceans and other water bodies which are affected by the earth-moon system experience a new tidal cycle every 27.3 days. Because of the physical processes which occur to produce the tidal system, there are two high tides and two low tides each day. Because of the angle of the moon with respect to the earth, the two high tides each day do not have to be of equal height. The same holds true for the two low tides each day. Tides also differ in height on a daily basis. The daily differences between tidal heights is due to the changing distance between the earth and the moon. Scientists use measurements of the height of the water level to examine tides and the various phenomena which influence tides, such as hurricanes and winter storms.

Tilt: It describes a storm in which a line connecting the centroid of a mid level storm component to the centroid of the lowest storm component is to the right or the rear of the direction of motion.

Tilt Sequence: Radar term indicating that the radar antenna is scanning through a series of antenna elevations in order to obtain a volume scan.

Tilted Storm or Tilted Updraft: A thunderstorm or cloud tower which is not purely vertical but instead exhibits a slanted or tilted character. It is a sign of vertical wind shear, a favorable condition for severe storm development.

Time-Height Display: An intensity-modulated display which has height as the vertical coordinate and time as the horizontal coordinate; usually used for vertically-pointing antennas only.

Time Lag: The time necessary for a fuel particle to lose approximately 63 percent of the difference between its initial moisture content and its equilibrium moisture content.

Tipping-Bucket Rain Gage: A precipitation gage where collected water is funneled into a two compartment bucket; 0.01, 0.1 mm, or some other designed quantity of rain will fill one compartment and overbalance the bucket so that it tips, emptying into a reservoir and moving the second compartment into place beneath the funnel. As the bucket is tipped, it actuates an electric circuit.

Toe Drain (or Outfall): A drain which carries seepage away from the dam and can allow seepage quantities to be measured.

Toe of Dam (Upstream and Downstream): The junction of the face of a dam with the ground surface.

Tonitrophobia: The fear of thunder. See ***Astraphobia, Astrapophobia, Brontophobia, Ceraunophobia,*** and ***Keraunophobia.***

Topography: The shape of the land.

Tornado (+FC): A violently rotating column of air in contact with the ground and extending from the base of a thunderstorm. A condensation funnel does not need to reach to the ground for a tornado to be present; a debris cloud beneath a thunderstorm is all that is needed to confirm the presence of a tornado, even in the total absence of a condensation funnel.It nearly always starts as a funnel cloud and may be accompanied by a loud roaring noise. Tornadoes are classified by the amount of damage that they cause. See ***Fujita Scale***.

Tornado Family: A series of tornadoes produced by a single supercell, resulting in damage path segments along the same general line.

Tornado Warning (TOR): This is issued when a tornado is indicated by the WSR-88D radar or sighted by spotters; therefore, people in the affected area should seek safe shelter immediately. They can be issued without a Tornado Watch being already in effect. They are usually issued for a duration of around 30

minutes.

A Tornado Warning is issued by your local National Weather Service office (NWFO). It will include where the tornado was located and what towns will be in its path. If the tornado will affect the nearshore or coastal waters, it will be issued as the combined product--***Tornado Warning and Special Marine Warning***. If the thunderstorm which is causing the tornado is also producing torrential rains, this warning may also be combined with a ***Flash Flood Warning***. If there is an ampersand (&) symbol at the bottom of the warning, it indicates that the warning was issued as a result of a severe weather report.

After it has been issued, the affected NWFO will followed it up periodically with ***Severe Weather Statements***. These statements will contain updated information on the tornado and they will also let the public know when warning is no longer in effect.

Severe weather reports will either be reported in one the following 3 products: 1) another severe weather warning (***Tornado*** or ***Severe Thunderstorm***), 2) in a ***Severe Weather Statement***, or 3) in a ***Local Storm Report***.

Tornado Watch (SEL): This is issued by the National Weather Service when conditions are favorable for the development of tornadoes in and close to the watch area. Their size can vary depending on the weather situation. They are usually issued for a duration of 4 to 8 hours. They normally are issued well in advance of the actual occurrence of severe weather. During the watch, people should review tornado safety rules and be prepared to move a place of safety if threatening weather approaches.

A Tornado Watch is issued by the Storm Prediction Center (SPC) in Norman, Oklahoma. Prior to the issuance of a Tornado Watch, SPC will usually contact the affected local National Weather Forecast Office (NWFO) and they will discuss what their current thinking is on the weather situation. Afterwards, SPC will issue a preliminary Tornado Watch and then the affected NWFO will then adjust the watch (adding or eliminating counties/parishes) and then issue it to the public. After adjusting the watch, the NWFO will let the public know which counties are included by way of a ***Watch Redefining Statement***. During the watch, the NWFO will keep the public informed on what is happening in the watch area and also let the public know when the watch has expired or been cancelled.

Total Gross Reservoir Capacity: The total amount of storage capacity available in a reservoir for all purposes from the streambed to the normal water or normal water or normal pool surface level. It does not include surcharge, but does include dead storage.

Total Totals (TT): This index estimates the potential for severe convection. It combines the effects of vertical temperature lapse rate (Vertical Totals or VT) and low level moisture (Cross Totals or CT) in a given environment. The following formulas are used to create the Total Totals index:

Vertical Totals (VT) = 850 mb temperature - 500 mb temperature

Cross Totals (CT) = 850 mb dew point - 500 mb temperature

When the two are combined, you have the following formula:

Total Totals (TT) = Vertical Totals (VT) + Cross Totals (CT)

The following table shows what these relationships typically mean east of the Rockies:

What Different Total Totals Values Mean East of the Rockies?			
Cross Totals (CT)	**Vertical Totals (VT)**	**Total Totals (TT)**	**Forecast**
18-19	26 or more	44	Isolated or few thunderstorms
20-21	26 or more	46	Scattered thunderstorms
22-23	26 or more	48	Scattered thunderstorms, isolated severe
24-25	26 or more	50	Scattered thunderstorms, few severe, isolated tornadoes
26-29	26 or more	52	Scattered to numerous thunderstorms, few to scattered severe, few tornadoes
30	26 or more	56	Numerous thunderstorms, scattered severe, scattered tornadoes

High lapse rates or a source of low level moisture will yield large values of TT. However, high lapse rates can produce large TT, with little supporting low level moisture. The sounding must be examined carefully to ascertain the validity of the TT for a given environment. Also as with any index, you must carefully examine your environment.

Tower: Short for towering cumulus. A cloud element showing appreciable upward vertical development.

Towering Cumulus (TCU): It signifies a relatively deep layer of unstable air. The bases are flat and usually appear darker than the bases of fair weather cumulus. They show considerable vertical development and have billowing "cauliflower" tops. Showers can result from these clouds. Same as ***cumulus congestus***.

TPC: An acronym for the Tropical Prediction Center. See ***Tropical Prediction Center (TPC)***.

Trace: 1) A rainfall amount less than 0.01 of an inch. 2) A hydrograph or similar plot for an extended-range time horizon showing one of many scenarios generated through an ensemble forecast process.

Trace of Icing: Ice becomes perceptible on an aircraft. The rate of ice accumulation is slightly greater than the rate of sublimation. It is not hazardous even though de-icing/anti-icing equipment is not utilized, unless encountered for an extended period of time--over one hour. This standard of reporting this type of icing was based on a recommendation set forth by the subcommittee for Aviation Meterorological Services in the Office of the Federal Coordinator for Meteorology in November 1968. The convetion has been to designate icing intensity in terms of its operational effect upon reciprocating engine, straight wing transport aircraft as used by commuter operators.

Track: The path that a storm or weather system follows.

Trade Winds: The winds that occupy most of the tropics and blow from subtropical highs to the equatorial low.

Transmitter: The radar equipment used for generating and amplifying a radio frequency (RF) carrier signal, modulating the carrier signal with intelligence, and feeding the modulated carrier to an antenna for radiation into space as electromagnetic waves. Weather radar transmitters are usually magnetrons or klystrons.

Transpiration: Water discharged into the atmosphere from plant surfaces.

Transport Wind: The average wind over a specified period of time within a mixed layer near the surface of the earth.

Transverse Bands: Bands of clouds oriented perpendicular to the flow in which they are embedded. They often are seen best on satellite photographs. When observed at high levels (i.e., in cirrus formations), they may indicate severe or extreme turbulence. Transverse bands observed at low levels (called ***transverse rolls*** or ***T rolls***) often indicate the presence of a temperature inversion (or cap) as well as directional shear in the low- to mid-level winds. These conditions often favor the development of strong to severe thunderstorms.

Transverse Rolls: Elongated low-level clouds, arranged in parallel bands and aligned parallel to the low-level winds but perpendicular to the mid-level flow. Transverse rolls are one type of transverse band, and often indicate an environment favorable for the subsequent development of supercells. Since they are aligned parallel to the low-level inflow, they may point toward the region most likely for later storm development.

Trash Rack: A screen located at an intake to prevent debris from entering.

Travel Time: The time required for a flood wave to travel from one location to a subsequent location downstream.

T Rolls: Slang term for transverse rolls.

Triple Doppler: Since any wind has three components (say, in the x, y and z directions), and a single radar measures in only one direction (radial), a single radar cannot give the 3D winds everywhere it samples. However, if three different radars view a storm from three different locations, the 3 measured radial velocities can be transformed into the actual 3D wind field.

Triple Point: The intersection point between two boundaries (dry line, outflow boundary, cold front, etc.), often a focus for thunderstorm development. Triple point also may refer to a point on the gust front of a supercell, where the warm moist inflow, the rain-cooled outflow from the forward flank downdraft, and the rear flank downdraft all intersect; this point is a favored location for tornado development (or redevelopment).

Tropical Advisories: Official information issued by the Tropical Prediction Centers describing all tropical cyclone watches and warnings in effect along with details concerning tropical cyclone locations, intensity and movement, and precautions that should be taken. Advisories are issued to describe (a) tropical cyclones prior to issuance of watches and warnings and (b) subtropica cyclones.

1) Scheduled Public Tropical Cyclone Advisory (TCP): This is one of the most prominent products issued by the hurricane centers. It summarizes all watches or warnings in effect. It includes the location of the storm center in latitude and longitude and in distance from a well known point. The current movement is given to 16 points of the compass. Also, included in this advisory are the maximum sustained wind, pressure, storm tide or storm surge and the radius of both hurricane force and tropical storm force winds (just tropical storm force winds for a tropical storm) and an intensity forcast. If it is going to affect land, inland effects will also be highlighted in this advisory. They are issued for all tropical storms and hurricanes in the Atlantic (which includes the Caribbean Sea and the Gulf of Mexico) and central Pacific. In the eastern Pacific, they are issued for all tropical cyclones that are expected to affect land within 48 hours.

The initial advisory is issued when there are data (satellite, ship, aircraft, etc.) that confirm a tropical cyclone has developed. The title of the advisory will depend upon the strength of the tropical cyclone. A tropical depression advisory will be issued for a tropical cyclone with 1-minute sustained winds up to 38 mph (33 knots). A tropical storm advisory will be used for tropical cyclones with 1-minute sustained surface winds 39 to 73 mph (34 to 63 knots). A hurricane/typhoon advisory is used for tropical cyclones with winds 74 mph (64 knots) or greater.

These products are numbered consecutively, starting with each new named storm. Once numbering begins, it is continued as long as advisories are being issued, even if the storm decreases to tropical depression strength. They are issued at 0500, 1100, 1700, and 2300 Eastern Daylight Time (EDT) with vaid position times corresponding to the advisory time.

They will cease to be issued when the tropical cyclone becomes extratopical (the storm no longer has tropical characteristics), drops below depression stage, or move inland over large land areas, such as the United States, Mexico, Canada, or Central America.

2) Intermediate Public Tropical Cyclone Advisory (TCP): They are issued to ensure a more continuous flow of information to the public whenever a tropical cyclone affects a coast or is forecast to affect a coast. Intermediate advisories will not be used to issue tropical cyclone watches or warnings, but it may be used to clear all or portion of a watch or warning area. The content will be similar to that of the scheduled advisory. However, since the content may be less formal and less complete. In the Atlantic, they will be issued either every 2 hours or every 3 hours. The 2 hour issuances will occur at: 0100, 0300, 0700, 0900, 1300, 1500, 1900, and 2100 Eastern Daylight Time (EDT). The 3 hour issuances will occur at 0200, 0800, 1400, 2000 Eastern Daylight Time (EDT). When these advisories are being issued, the Tropical Cyclone Center will tell when the next advisory will be issued at the end of the advisory.

3) Special Public Tropical Cyclone Advisory: These will be issued whenever one or more of the following criteria are met:

1) When conditions require a hurricane/typhoon or tropical storm watch or warning to be issued.

2) A significant change has occurred, requiring the issuance of a revised forecast package.

The content of special advisories should generally be similar to that of th scheduled advisory. The meteorological condition that requires the issuance of the special advisory is normally highlighted. However, since special advisories are designed to update earlier scheduled advisories, their format and content will be less rigid.

4) Scheduled Tropical Cyclone Forecasts/Advisory (TCM): This is one of the most prominent products issued by the hurricane centers. They are prepared for all tropical cyclones within a Tropical Cyclone Center's area of responsibility. They provide invaluable wind field information to emergency managers, local decision makers, and other users who must make preparations and take responseactions for inland wind effects of tropical cyclones. This product along with the public advisories should be used for decision making purposes. They will be issued at the same time as the Scheduled Public Tropical Cyclone Advisory. Like public advisories, these are sequentially numbered beginning with the first one issued. All advisories will contain 12-, 24-, 36-, 48- and 72-hour forecast positions. A standard statement indicating the uncertainty associated with the 48- and 72-hour forecast positions will precede these forecasts. They will cease to be issued when the tropical cyclone becomes either extratopical (the storm no longer has tropical characteristics) or drop below depression stage.

5) Special Tropical Cyclone Forecast/Advisory (TCM): This product is issued as needed for conditions that either change abruptly or significantly prior to the next regularly scheduled Tropical Cyclone Forecast/Advisory. They will contain generally the same information as the Tropical Cyclone Forecast/Advisory; however, their format is less stringent.

6) Subtropical Cyclone Public Advisory (SPA): These advisories are issued when a subtropical storm is affecting or is forecasted to affect the U.S., our territories, or our installations. Each subtropical storm is assigned a storm number to keep track of the sequence of occurrences such storms in that area. The contents of the advisory are the same as advisories on depressions; however, subtropical storms are referred to as plain "storms". Thus, they are entitled as storm advisories. They are issued at the same scheduled times as hurricane and tropical storm advisories. They are updated as needed for significant changes such as a change in course, a threat of tornadoes being added, or a major change in intensity. For each storm, the advisories are numbered consecutively for the life of the storm.

7) Intermediate Subtropical Cyclone Public Advisory (SPA): These advisories function in the same manner as public intermediate advisories. Whenever a subtropical cyclone affects or is forecasted to affect a coast, they will be issued on a 2 to 3 hourly interval between scheduled advisories. For clarity, whenever the National Hurricane Center is issuing intermediates, a statement will be included at the end of the scheduled public subtropical advisory telling the user that an intermediate advisory will be issued.

8) Special Subtropical Cyclone Public Advisory (SPA): These advisories are issued to update the previously scheduled advisory whenever a significant change in the cyclone has occurred. The change or conditions that require the issuance of the special advisory normally are highlighted.

9) Scheduled Subtropical Forecast/Advisory (SMA): These advisories are issued when a subtropical storm is affecting or is forecasted to affect the U.S., our territories, or our installations. Each subtropical storm is assigned a storm number to keep track of the sequence of occurrences such storms in that area. The contents of the advisory are the same as advisories on depressions; however, subtropical storms are referred to as plain "storms". Thus, they are entitled as storm advisories. They are issued at the same scheduled times as hurricane and tropical storm advisories.

10) Special Subtropical Cyclone Forecast/Advisory (SMA): These advisories will be issued to update any abrupt or significant change that may have occurred with the subtropical cyclone. The format is the same as the scheduled advisory that is being replaced.

Tropical Analysis and Forecast Branch (TAFB): One of three branches of the ***Tropical Prediction Center (TPC)***. It provides year-round products involving marine forecasting, aviation forecasts and warnings (SIGMETs), and surface analyses. The unit also provides satellite interpretation and satellite rainfall estimates for the international community. In addition, TAFB provides support to NHC through manpower and tropical cyclone intensity estimates from the Dvorak technique.

Tropical Cyclone: It is a warm-core low pressure system which is non-frontal. It originates over tropical and subtropical waters and a has a organized cyclonic (counter-clockwise) surface wind circulation.

Tropical Cyclone Plan of the Day: A coordinated mission plan that tasks operational weather reconnaissance requirements during the next 1100 to 1100 UTC day or as required, describes reconnaissance flights committed to satisfy both operational and research requirements, and identifies possible reconnaissance requirements for the succeeding 24-hour period.

Tropical Cyclone Position Estimate (TCE): The National Hurricane Center issues a position estimate between scheduled advisories whenever the storm center is within 200 nautical miles of U.S. land-based weather radar and if sufficient and regular radar reports are available to the hurricane center. As far as is possible, the position estimate is issued hourly near the beginning of the hour. The location of the eye or storm center is given in map coordinates and distance and direction from a well-known point.

Tropical Cyclone Update (TCU): This brief statement is issued by the National Hurricane Center in lieu of or preceding special advisories to inform of significant changes in a tropical cyclone or the posting or cancellation of watches and warnings.

Tropical Depression: Cyclones that have maximum sustained winds of surface wind speed (using the U.S. 1-minute average) is 33 kt (38 mph or 62 kph) or less. They are either located in the tropics or subtropics. They characteristically have one or more closed isobars. They usually intensify slowly and may dissipate before reaching Tropical Storm intensity.

Tropical Disturbance: A discrete tropical weather system of apparently organized convection--generally 100 to 300 nautical miles in diameter---originating in the tropics or subtropics, having a nonfrontal migratory character, and maintaining its identity for 24 hours or more. It may or may not be associated with a detectable perturbation of the wind field.In successive stages of intensification, it may be subsequently classified as a tropical wave, tropical depression, tropical storm, or hurricane.

Tropical Prediction Center (TPC): One of NOAA's 9 National Centers for Environmental Prediction (NCEP). The mission of the Tropical Prediction Center (TPC) is to save lives and protect property by issuing watches, warnings, forecasts, and analyses of hazardous weather conditions in the tropics. TPC products are generated for use in both the domestic and international communities. To fulfill its mission, the TPC is

comprised of the following branches: The National Hurricane Center, Tropical Analysis and Forecast Branch (TAFB), and Technical Support Branch (TSB).

Tropical Storm: It is a warm-core tropical cyclone that has maximum sustained surface wind speed (using the U.S. 1-minute average) ranges from 34 kt (39 mph or 63 kph) to 63 kt (73 mph or 118 kph).

Tropical Storm Summaries (SCC): These are written by the Hydrometeorological Prediction Center* (HPC) after subtropical and names tropical cyclones have moved inland and advisories have been discontinued. These advisories will be terminated when the threat of flash flooding has ended or when the remnants of these storms can no longer be distinguished from other synoptic features capable of producing flash floods. Storm summaries will not be issued for storms that enter the coast of Mexico and do not pose an immediate flash flood threat to the coterminous United States. They will be initiated when and if flash flood watches are posted in the United States because of an approaching system. Storm summaries will continue to be numbered in sequence with tropical cyclone advisories and will reference the former storm's name in the text. Summaries will be issued at 0100, 0700, 1300, and 1900 Eastern Daylight Time (EDT). The only exception will be the first one in the series may be issued at a nonscheduled time.

***Note:** HPC was formerly called the National Meteorological Center (NMC) and it is located in Washington DC.

Tropical Storm Warning: A warning for tropical storm conditions including sustained winds within the range of 34 to 63 kt (39 to 73 mph or 63 to 118 kph) that are expected in a specified coastal area within 24 hours or less.

Tropical Storm Watch: An announcement that a tropical storm poses or tropical storm conditions pose a threat to coastal areas generally within 36 hours. A tropical storm watch should normally not be issued if the system is forecast to attain hurricane strength.

Tropical Wave: A trough or cyclonic curvature maximum in the trade wind easterlies and it is not classified as a tropical cyclone. The wave may reach maximum amplitude in the lower middle troposphere.

Tropical Weather Discussion (TWD): These messages are issued 4 times daily by the Tropical Analysis and Forecast Branch (TAFB) to describe significant synoptic weather features in the tropics. One message will cover the Gulf of Mexico, the Caribbean, and the Atlantic between the equator and 32 degrees North and east of 140 degrees West. Plain language is used in these discussions.

Tropical Weather Outlook (TWO): This outlook normally covers the tropical and subtropical waters, discussing the weather conditions, emphasizing any disturbed and suspicious areas which may become favorable for tropical cyclone development within the next day to two. In the Atlantic, the outlook is transmitted daily at 0530, 1130, 1730, and 2230 Eastern local time. In the eastern Pacific, it is transmitted daily at 0100, 0700, 1300, and 1900 Eastern local time. For the Central Pacific, transmission times are 1000 and 2200 UTC. Existing tropical and subtropical cyclones are mentioned, as are depressions not threatening land. Given for each system are its location, size, intensity, and movement. For the first 24 hours of a depression or tropical cyclone, the outlook includes a statement identifying the AFOS and World Meteorological Organization (WMO) headers for the advisory on it.

Tropical Weather Summary (TWS): The National Hurricane Center issues a monthly summary of tropical weather is included at the end of the month or as soon as feasible thereafter, to describe briefly the past activity or lack thereof and the reasons why.

Tropics: Areas of the Earth within 20º North and South of the Equator.

Tropopause: The upper boundary of the troposphere, usually characterized by an abrupt change in lapse rate from positive (decreasing temperature with height) to neutral or negative (temperature constant or increasing with height). It is also the boundary between the troposphere and the stratosphere.

Troposphere: The layer of the atmosphere from the earth's surface up to the tropopause, characterized by decreasing temperature with height (except, perhaps, in thin layers - see inversion, cap), vertical wind motion, appreciable water vapor content, and sensible weather (clouds, rain, etc.).

Tropopause Jets: Jet streams found near the tropopause. Examples of these types of jets are the subtropical and polar fronts.

Trough: An elongated area of relatively low atmospheric pressure, usually not associated with a closed circulation, and thus used to distinguish from a
closed low. The opposite of ridge.

T.S.: An abbreviation for Tropical Storm. See ***Tropical Storm***.

Tsunami: An ocean wave produced by a sub-marine earthquake, landslide, or volcanic eruption. These waves may reach enormous dimensions and have sufficient energy to travel across entire oceans.

Turbidity: The thickness or opaqueness of water caused by the suspension of matter. The turbidity of rivers and lakes increases after a rainfall.

Turkey Tower: Slang for a narrow, individual cloud tower that develops and falls apart rapidly. The sudden development of turkey towers from small cumulus clouds may signify the breaking of a cap.

Turning Point: A temporary point whose elevation is determined by additions and subtractions of backsights and foresights respectively.

TVS (Tornado Vortex Signature): An image of a tornado on the Doppler radar screen that shows up as a small region of rapidly changing wind speeds inside a mesocyclone. The following velocity criteria is normally required for recognition: velocity difference between maximum inbound and outbound (shear) is greater than or equal to 90 knots at less than 30 nmi and is greater than or equal to 70 knots between 30 and 55 nmi. It shows up as a red upside down triangle on the Storm Relative Velocity Display. Existence of a TVS strongly increases the probability of tornado occurrence, but does not guarantee it; therefore, the feature triggering it must be examined closely by the radar operator. A TVS is not a visually observable feature.

TWEB (Transcribed Weather Broadcasts) Route Forecast: This NWS aviation product is similar to the Area Forecast (FA) except information is contained in a route format. Forecast sky cover (height and amount of cloud bases), cloud tops, visibility (including vertical visibility), weather, and obstructions to vision are described for a corridor 25 miles either side of the route. Cloud bases and tops are always Mean Sea Level (MSL) unless noted. Ceilings are always above ground level.

The Synopsis is a brief statement of frontal and pressure systems affecting the route during the forecast valid period.

The TWEB route forecasts are prepared by National Weather Service Forecast Offices (WFOs) for more than 300 selected short-leg and cross-country routes over the contiguous U.S. WFOs prepare synopses for the routes in their areas.

The TWEB route forecasts and synopses are issued by the WFOs three times per day. Route forecasts are valid for 15 hours. This schedule provides 24-hour coverage with most frequent updating during the hours of greatest aviation activity.

Twilight: The intervals of incomplete darkness following sunset and preceding sunrise. The time at which evening twilight ends or morning twilight begins is determined by arbitrary convention, and several kinds of twilight have been defined and used; most commonly civil, nautical, and astronomical twilight.

1) Civil Twilight: The period of time before sunrise and after sunset when the sun is not more than 6 degrees below the horizon.

2) Nautical Twilight: The period of time before sunrise and after sunset when the sun is not more than 12 degrees below the horizon.

3) Astronomical Twilight: The period of time before sunrise and sunset when the sun is not more than 18 degrees below the horizon.

Twister: In the United States, a colloquial terms for a tornado.

Typhoon: A tropical cyclone of hurricane strength in the Eastern Hemisphere.

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Forecasts
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Weather Planner

Climate
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U

UCP (Unit Control Position): The WSR-88D radar operator uses this to control the entire radar system. One of the main things that the radar operator will do at the UCP is change volume scan strategies of the antenna. These volume scan strategies tell the radar how many elevation angles will be used during a single volume scan (a volume scan is the completion of a sequence of elevation angles), and the amount of time it will take to complete that sequence of elevation cuts, each one being a single rotation of the antenna's 1 degree beam at selected elevation angles. The WSR-88D uses 3 scan strategies. They are the following: 14 elevation angles in 5 minutes (this is used during severe weather situations), 9 elevation angles in 6 minutes (this is used when there is precipitation within 248 nautical miles of the radar), and 5 elevation angles in 10 minutes (this is used when there is no precipitation within 248 nautical miles). The radar operator at the UCP can also adjust the radar products and help the users out with their communication problems.

UKMET: A medium-range (3 to 7 day) numerical weather prediction model operated by the United Kingdom METeorological Agency. It has a resolution of 75 kilometers and covers the entire northern hemisphere. Forecasters use this model along with the ***European*** and ***MRF*** in making their extended forecasts (3 to 7 days).

ULJ: An acronym for Upper Level Jet. See ***Jet Stream***.

Unambiguous Range: See maximum unambiguous range.

Undercurrent: A current below the upper currents or surface of a fluid body.

Underflow: The lateral motion of water through the upper layers until it enters a stream channel. This usually takes longer to reach stream channels than runoff. This also called subsurface storm flow.

Unimodal: A distribution having only one localized maximum, i.e., only one peak.

Unit Hydrograph: The discharge hydrograph from one inch of surface runoff is distributed uniformly over the entire basin for a given time period. It is also known as a "***Unitgraph***".

Unit Hydrograph Duration: The time over which one inch of surface runoff is distributed for unit hydrograph theory.

Unit Hydrograph Theory: Unit Hydrograph Theory states that surface runoff hydrographs for storm events of the same duration will have the same shape, and the ordinates of the hydrograph will be proportional to the ordinates of the unit hydrograph. For example, the hydrograph from one-half inch of runoff will be half of that from the unit hydrograph.

Universal Type Weighting and Recording Gage: A gage which collects precipitation and then converts the weight onto an inked pen movement which traces on graph paper fixed to a clock driven drum.

Unstable: An atmospheric state warm air below cold air. Since warm air naturally rises above cold air (due to warm air being less dense than cold air), vertical movement and mixing of air layers can occur.

Weather Safety
Storm Ready
Education
NOAA Weather Radio
Skywarn
Miscellaneous
Weather Now
Wireless Forecasts
Computer Guidance
Weather Stories
News Archive
Weather Links
Weather Glossary
Our Office
1953 Beecher
Tornado
Contact Us
w-dtx.webmaster
@noaa.gov

Updraft: Current(s) of air with marked vertical upward motion. If the air is sufficiently moist, then the moisture condenses to become a cumulus cloud or an individual tower of a towering cumulus or cumulonimbus.

Updraft Base: Alternate term for a rain-free base.

Upper-Level Disturbance: A disturbance in the upper atmospheric flow pattern which is usually associated with clouds and precipitation. This disturbance is characterized by distinct cyclonic flow, a pocket of cold air, and sometimes a jet streak. These features make the air aloft more unstable and conducive to clouds and precipitation.

Upper Level System: A general term for any large-scale or mesoscale disturbance capable of producing upward motion (lift) in the middle or upper parts of the atmosphere. This term sometimes is used interchangeably with impulse or shortwave.

Upslope Flow: Air that flows toward higher terrain, and hence is forced to rise. The added lift often results in widespread low cloudiness and stratiform precipitation if the air is stable, or an increased chance of thunderstorm development if the air is unstable.

Upslope Fog: It forms as air is cooled adiabatically by blowing up sloping terrain. The upslope cooling may form clouds concurrently with the fog. As is the case with advection fog, upslope fog can form with moderate to strong winds under cloudy skies. In stable air, upslope fog will form as soon as the air is cooled to the surface dew point. Temperature and dew point close at about 4ºF for each 1,000 feet rise in altitude. When air is unstable, convective clouds may form; fog forms at the surface where the ground level is at or above the condensation level.

Upstream: Toward the source of the flow, or located in the area from which the flow is coming.

Upstream Slope: The part of the dam which is in contact with the reservoir water. On earthen dams, this slope must be protected from the erosive action of waves by rock riprap or concrete.

Upwelling: The process by which cold waters from the depths of a lake or ocean rise to the surface.

Urban & Small Stream Flood Advisory (FFW): This advisory alerts the public to flooding which is generally only an inconvenience (not life-threatening) to those living in the affected area. Issued when heavy rain will cause flooding of streets and low-lying places in urban areas. Also used if small rural or urban streams are expected to reach or exceed bankfull. Some damage to homes or roads could occur. This advisory is rarely used in the state of Michigan. The reason for this is that we do not have the observational resolution necessary to determine whether flooding is an inconvenience or not. As a result, we will usually go with a Flood Warning instead of a Urban and Small Stream Flood Advisory.

Urban Flash Flood Guidance: A specific type of flash flood guidance which estimates the average amount of rain needed over an urban area during a specified period of time to initiate flooding on small, ungaged streams in the urban area.

Urban Flooding: Flooding of streets, underpasses, low lying areas, or storm drains. This type of flooding is mainly an inconvenience and is generally not life threatening.

Urban Heat Island: The increased air temperatures in urban areas in contrast to cooler surrounding rural areas.

Urban/Small Stream Flooding: Flooding that occurs after heavy rains of relatively short duration, and it is generally not life threatening. It causes ponding of water in urban areas, especially in low places, and results in minor flooding of small streams and creeks.

U.S. Army Corps of Engineers (USACE): As part of the Department of the Army, the Corps has responsibilities in civil and military areas. In civil works, the USACE has authority for approval of dredge and fill permits in navigable waters and tributaries there of; the USACE enforces wetlands regulations, and constructs and operates a variety of water resources projects, mostly notably levee, dams and locks.

U.S. Bureau of Reclamation (USBR): The Federal agency whose mandate was to reclaim the arid west of the United States. Operating in 17 western states, this agency builds, operates and maintains a variety of irrigation, power, and flood control projects.

User Agency: A public fire service or wildlands management agency, Federal or non-Federal, which regularly requires and uses NWS fire and forestry meteorological services.

USFS: The U.S. Forest Service

U.S. Geological Survey (USGS): The Federal Agency chartered in 1879 by congress to classify public lands, and to examine the geologic structure, mineral resources, and products of the national domain. As part

of its mission, the USGS provides information and data on the Nation's rivers and streams that are useful for mitigation of hazards associated with floods and droughts.

UV (Ultraviolet) Index: This index provides important information to help you plan your outdoor activities in ways that prevent overexposure to the sun's rays. It was designed by the National Weather Service (NWS) and the Environmental Protection Agency (EPA). Unlike some countries' indices, the United States UV Index is not based upon surface observations. Rather, it is computed using forecasted ozone levels, a computer model that relates ozone levels to UV incidence on the ground, forecasted cloud amounts, and the elevation of the forecast cities. The calculation starts with measurements of current total ozone amounts for the entire globe, obtained via two satellites operated by the National Oceanic and Atmospheric Administration (NOAA). These data are then used to produce a forecast of ozone levels for the next day at various points around the country. A radiative transfer model is then used to determine the amount of UV radiation reaching the ground from 290 to 400 nm in wavelength, using the time of day (solar noon), day of year, and latitude. As an example, assume the following UV levels for each wavelength are predicted for a given location (these are totally made up numbers, and not even the ratios represent reality):

Wavelength	Incidence
290nm	10
350nm	20
400nm	50

This information is then weighted according to how human skin responds to each wavelength; it is more important to protect people from wavelengths that harm skin than from wavelengths that do not damage people's skin. The weighting function is called the McKinlay-Diffey Erythema action spectrum. For illustration purposes only (these numbers are not correct), assume 290nm radiation causes three times as much damage as 350nm radiation and five times as much damage as 400 nm radiation. Then, if in some unit 290nm UV radiation did 15 units of damage, 350nm radiation would do 5 units and 400 nm radiation would do 3 units. At each wavelength, multiply the actual incoming radiation level by the weighting:

Wavelength	Incidence	Weight	Result
290nm	10	15	150
350nm	20	5	100
400nm	50	3	150

These weighted irradiances are summed up, or integrated, over the 290 to 400 nm range resulting in a value representing the total effect a given day's UV radiation will have on skin. For our example, the total is 400. These estimates are then adjusted for the effects of elevation and clouds. UV at the surface increases about 6% per kilometer above sea level. Clear skies allow 100% of the incoming UV radiation from the sun to reach the surface, whereas scattered clouds transmit 89%, broken clouds transmit 73%, and overcast conditions transmit 31%. If we assume that the example location is at 1 kilometer in elevation, and that there will be broken clouds, then the calculation is:

400 x 1.06 x 0.73 = 309.5

Once adjusted for elevation and clouds, this value is then scaled (divided) by a conversion factor of 25 and rounded to the nearest whole number. This results in a number that usually ranges from 0 (where there is no sun light) to the mid teens. This value is the UV Index. Thus, the UV Index for the example city would be:

309.5 / 25 = 12.4, rounded to 12

Currently, the computation of the UV Index does not include the effects of variable surface reflection (e.g., sand, water, or snow), atmospheric pollutants or haze.

By following the few simple precautions in the table below, you can greatly reduce your risk of sun related injuries (blistering sunburns, as well as longer-term problems like skin cancer and cataracts).

What does the UV Index Mean?			
Exposure Category	**UV Index Value**	**Time to Burn***	**Actions to take at noon**
Minimal	0-2	60 minutes	Apply SPF sunscreen
Low	3-4	45 minutes	Apply SPF sunscreen, wear a hat.
Moderate	5-6	30 minutes	Apply SPF 15, wear a hat
High	7-9	15-24 minutes	Apply SPF 15 to 30 sunscreen, wear a hat and sunglasses. Limit midday exposure

Very High	10+	10 minutes	Apply SPF 30 sunscreen. Wear a hat, sunglasses, and protective clothing.
* "Time to burn" and "actions" apply to people with a Type II, fair skin that sometimes tans and usually burns. People with lighter skin need be more cautious. People with darker skin may be able to tolerate more exposure. But even dark skin can burn.			

When the Index is High or Very High, try to minimize your outdoor activities between the peak hours of 10 AM and 4 PM when the sun is most intense. When the Index is 10 or higher, stay indoors if possible, otherwise be sure to take all the other necessary precautions. Watch closely for the UV Index reports in your local newspapers and on television, and remember to Be Sun Wise!

UVM: An acronym for Upward Vertical Motion.

UVV: An acronym for Upward Vertical Velocity

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- Detroit Radar
- Nationwide

Forecasts
- Text Forecasts
- Graphical
- Aviation
- Marine
- Fire Weather
- Weather Planner

Climate
- Local Climate
- Climate Prediction

V

VAD (Velocity-Azimuth Display): It is a WSR 88-D product which shows the radar derived wind speeds at various heights. This radar product shows the wind speeds from 2,000 to 55,000 feet above the ground. VAD and EVAD (Extended VAD) are methods of guessing the large scale two-dimensional winds from one-dimensional radial velocity data. They are essentially multivariate regressions which fit a simple, large scale wind model to the observed winds. EVAD also estimates the large scale horizontal divergence and particle fall speed. See ***VWP***.

Vadose Zone: The locus of points just above the water table where soil pores may either contain air or water. This is also called the ***zone of aeration***.

Valley Winds: Valley winds encompass several effects, the first of which is the tendency of wind wind to funnel down a pronounced valley. The term also refers to the movement of airdown the slopes of a valley at night (katabatic winds) or up the slopes of valley during the day (anabatic winds).

Valve: A device fitted to a pipeline or orifice in which the closure member is either rotated or moved in some way as to control or stop flow.

Vapor Pressure: The partial pressure of water vapor in an air-water system.

Variable Wind Direction: A condition when (1) the wind direction fluctuates by 60º or more during the 2-minute evaluation period and the wind speed is greater than 6 knots; or (2) the direction is variable and the wind speed is less than 6 knots.

Variance: A measure of variability.

Vault: Same as ***BWER***.

Veering Wind: It is the clockwise turning of the wind direction as we move up through the atmosphere. For example, a wind changing in height from south near the ground to southwest at 5,000 feet and finally to west at 10,000 feet. This is indicative of warm air advection. Compare with ***backing winds***.

Velocity Aliasing (folding): Ambiguous detection of radial velocities outside the Nyquist co-interval. On a radial velocity display, this shows up as regions where the radial velocity suddenly switches from one extreme to its opposite (e.g., max towards to max away).

Velocity Azimuth Display (VAD): This WSR-88D radar product displays a graphical plot of mean radial velocity versus azimuth angle for a particular altitude. A best fit sine wave is overlaid on the plot of velocity points if a sufficient number (25) of data points exists. This wave is used to compute wind speed and direction for a specific height is symmetry and root mean square error thresholds are not exceeded. It is used to: 1) Check suspicious or missing wind data on the VAD Wind Profile (VWP); 2) Determine the potential strength of wind gusts; 3) Identify jets (low/mid/high level); and 4) Identify thermal advection patterns, vertical wind shear, depths of frontal surfaces, and the development of isentropic lift situations. The usefulness of this radar product is sometimes limited by lack of scatters at times.

Weather Safety
Storm Ready
Education
NOAA Weather Radio
Skywarn
Miscellaneous
Weather Now
Wireless Forecasts
Computer Guidance
Weather Stories
News Archive
Weather Links
Weather Glossary
Our Office
1953 Beecher
Tornado
Contact Us
w-dtx.webmaster
@noaa.gov

Velocity Azimuth Display Wind Profile (VWP): This WSR-88D radar product displays mean horizontal winds on a time versus height chart. Wind data is available at a maximum of 30 altitudes up to 70,000 feet. The latest wind/height displayed with the 10 most recent profiles (5 to 10 minute intervals depending on the Volume Coverage Pattern). It is used to: 1) Identify jets (low/mid/high level); and 2) Identify thermal advection patterns, vertical wind shear, depths of frontal surfaces, and the development of isentropic lift situations. The usefulness of this radar product is sometimes limited by lack of scatters at times.

Velocity Cross Section (VCS): This WSR-88D radar product displays a vertical cross section of velocity on a grid with heights up to 70,000 feet on the vertical axis and distance up to 124 nm on the horizontal axis. The two end points to create cross section are radar operator selected along a radial or from one AZRAN to another AZRAN within 124 nm of the radar that are less than 124 nm apart. It is used to: 1) Examine storm structure features such as location of updrafts/downdrafts, strength of storm top divergence, and the depth of mesocyclones; 2) Locate areas of convergence/divergence (when generated along a radial; and 3) Analyze areas of rotation (when generated from one AZRAN to another).

Very Severe Thunderstorm Warning: It is issued for sustained winds over 75 mph in the 7-county Minneapolis/St. Paul area.

Very Windy: 30 to 40 mph winds

Vicinity (VC): A proximity qualifier used to indicate weather phenomena observed between 5 and 10 statue miles of the usual point of observation, but not at the station.

VIL (Vertically Integrated Liquid Water): This WSR-88D product displays reflectivity data converted into liquid water equivalent via an empirically-derived relationship which assumes that all reflectivity returns are from liquid water. VIL values are derived for each 2.2 nm by 2 nm grid box for each elevation angle within 124 nm radius of the radar then vertically integrated. It is used to: 1) indicate presence and approximate size of hail (used in conjunction with spotter reports); 2) locate the most significant thunderstorms or areas of possible heavy rainfall; and 3) rapid decrease in VIL values may signify the onset of wind damage.

VIL Of the Moment In Time (VOMIT): This computer program is used by the forecaster to predict the VIL in which hail will be produced by a thunderstorm. This computer program was designed by several forecasters at the National Weather Service Office in Detroit/Pontiac Michigan. It uses the freezing levels of various sites and interpolates between them the critical VIL for hail for each grid point.

Velocity Zones: Areas within the floodplain subject to potential high damage from waves. These sometimes appear on flood insurance rate maps.

Vertical Wind Shear: It is the change in the wind's direction and speed with height. This is a critical factor in determining whether severe thunderstorms will develop.

Vertically Stacked System: A low-pressure system, usually a closed low or cutoff low, which is not tilted with height, i.e., located similarly at all levels of the atmosphere. Such systems typically are weakening and are slow-moving, and are less likely to produce severe weather than tilted systems. However, cold pools aloft associated with vertically-stacked systems may enhance instability enough to produce severe weather.

VIL - Vertically-Integrated Liquid water: A property computed by the WSR-88D that takes into account the three-dimensional reflectivity of an echo. The maximum VIL of a storm is useful in determining its potential severity, especially in terms of maximum hail size.

VIP: An acronym for Video Integrator and Processor. This processor was used on the WSR-57 and WSR-74C radars to indicate rainfall rates. It is still used occasionally on WSR-88D radar products. This processor contours radar reflectivity (in dBZ) into six VIP levels.

VIP Levels: Categorized intervals of reflectivity which are computer processed by a Digital Video Integrator Processor (D/VIP). These intervals were very important before the installation of the 88-D Radar network. Some of the 88-D Radar products still have these intervals on them. The following table illustrates the various rainfall rates associated with VIPs:

VIP Level	Precipitation Description
VIP 1 (Level 1, 18-30 dBZ)	Light precipitation
VIP 2 (Level 2, 30-38 dBZ)	Light to moderate rain.
VIP 3 (Level 3, 38-44 dBZ)	Moderate to heavy rain.
VIP 4 (Level 4, 44-50 dBZ)	Heavy rain
VIP 5 (Level 5, 50-57 dBZ)	Very heavy rain; hail possible.
VIP 6 (Level 6, >57 dBZ)	Very heavy rain and hail; large hail possible.

The following table shows how the VIP Levels were related to ***Equivalent Reflectivity (dBZ)*** and Rainfall Rate:

Reflectivity Rainfall Rates			
VIP Level	**Equivalent Reflectivity (dBZ)**	**Rainfall Rate (inches/hour)**	
		Stratiform	**Convective**
1	18 - 30	0 - 0.10	0.05 - 0.20
2	30 - 41	0.10 - 0.50	0.20 - 1.10
3	41 - 46	0.50 - 1.00	1.10 - 2.20
4	46 - 50		2.20 - 4.50
5	50 - 57		4.50 - 7.10
6	57 or more		7.10 or more

Virga: It is a patch of precipitation that evaporates before it reaches the ground. It appears as wisps or streaks of rain or snow falling out of a cloud. As the precipitation evaporates, it cools the air and starts a down draft. In certain cases, shafts of virga may precede a microburst; see ***dry microburst***.

Visible (VIS) Satellite Imagery: This type of satellite imagery uses reflected sunlight (this is actually reflected solar radiation) to see things in the atmosphere and on the Earth's surface. Clouds and fresh snow are excellent reflectors, so they appear white on the imagery. Clouds can be distinguished from snow, because clouds move and snow does **not** move. Meanwhile, the ground reflects less sunlight, so it appears black on the imagery. The satellite uses its 0.55 to 0.75 micrometer (um) channel to detect this reflected sunlight. Since this imagery relies on reflected imagery, it cannot be used during night.

Visibility: The greatest distance an observer can see and identify prominent objects.

V Notch: A radar reflectivity signature seen as a V-shaped notch in the downwind part of a thunderstorm echo. The V-notch often is seen on supercells, and is thought to be a sign of diverging flow around the main storm updraft (and hence a very strong updraft). This term should not be confused with inflow notch or with enhanced V, although the latter is believed to form by a similar process. See ***supercell***.

Volcanic Ash: Fine particles of mineral matter from a volcanic eruption which can be dispersed long distances by winds aloft. The chemical composition and abrasiveness of the particles can seriously affect aircraft and also machinery on the ground. If it is blown into the stratosphere and it is thick enough, it can decrease the global temperature.

Volume Scan: A radar scanning strategy in which sweeps are made at successive antenna elevations (i.e., a tilt sequence), and then combined to obtain the three-dimensional structure of the echoes. Volume scans are necessary to determine thunderstorm type, and to detect features such as WERs, BWERs, and overhang.

Vortex: In its most general use, any flow possessing vorticity. More often the term refers to a flow with closed streamlines.

Vorticity: A vector measure of the local rotation in a fluid flow. In weather analysis and forecasting, it usually refers to the vertical component of rotation (i.e., rotation about a vertical axis) and is used most often in reference to synoptic scale or mesoscale weather systems. By convention, positive values indicate cyclonic rotation.

Vort Max: This short for vorticity maximum. It is a center, or maximum, in the vorticity field of a fluid.

VSB: An acronym for visible satellite imagery.

VVP: Volume Velocity Processing. A way to guess the large-scale 2-dimensional winds, divergence and fall speeds from one-dimensional radial velocity data. Essentially a multivariate regression which fits a simple wind model to the observed radial velocities. Very similar to VAD and EVAD, except it uses different functions for the fit.

VWP - VAD Wind Profile: A radar plot of horizontal winds, derived from VAD data, as a function of height above a Doppler Radar. The display is plotted with height as the vertical axis and time as the horizontal axis (a so-called time-height display), which then depicts the change in wind with time at various heights. This display is useful for observing local changes in vertical wind shear, such as backing of low-level winds, increases in speed shear, and development or evolution of nearby jet streams (including

low-level jets). This product often is referred to erroneously as a VAD.

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W

WAA: An acronym for Warm Air Advection. See ***Warm Air Advection***.

Wall Cloud: It is formed in a supercell thunderstorm. A localized, persistent, often abrupt lowering from a 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. Even though this cloud is lowering, it remains attached to the rain free cloud base of the thunderstorm. It is usually located south or southwest of the visible precipitation area, and marks the strongest updraft in the thunderstorm. The wall cloud develops as the strong updraft draws in surface moisture from several miles away. Eventually, this updraft will pull air from the rain cooled area of the thunderstorm. Since the rain cooled air is very humid, it will quickly condense in the updraft at a lower altitude than the rain free cloud base. 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. Wall clouds should be monitored visually for signs of persistent, sustained rotation and/or rapid vertical motion. See ***supercell***. "Wall cloud" also is used occasionally in tropical meteorology to describe the inner cloud wall surrounding the eye of a tropical cyclone, but the proper term for this feature is ***eyewall***.

Wave Steepness: The ratio of wave heights to wave length.

Warm Air Advection: Transport of warm air into an area by horizontal winds. Low-level warm advection sometimes is referred to (erroneously) as overrunning. Although the two terms are not properly interchangeable, both imply the presence of lifting in low levels.

Warm Core Low: A low pressure area which is warmer at its center than at its periphery. Tropical cyclones exhibit this temperature pattern. Unlike cold core lows, these lows produce much of their cloud cover and precipitation during the nighttime.

Warm Front: A front that moves in such a way that warm air replaces cold air.

Warning: A product issued by NWS local offices indicating that a particular weather hazard is either imminent or has been reported. A warning indicates the need to take action to protect life and property. The type of hazard is reflected in the type of warning (e.g., tornado warning, blizzard warning). See ***short-fuse warning***.

Watch: An NWS product indicating that a particular hazard is possible, i.e., that conditions are more favorable than usual for its occurrence. A watch is a recommendation for planning, preparation, and increased awareness (i.e., to be alert for changing weather, listen for further information, and think about what to do if the danger materializes).

Watch Box (or Box): Slang for a ***severe thunderstorm*** or ***tornado watch***.

Watch Cancellation (SEL): This product will be issued to let the public know when either a ***Tornado Watch*** or ***Severe Thunderstorm Watch*** has been canceled early. It is issued by the Storm Prediction Center (SPC) in Norman, Oklahoma. In the text of the statement it will specify the severe weather watch number

Weather Safety
Storm Ready
Education
NOAA Weather Radio
Skywarn
Miscellaneous
Weather Now
Wireless Forecasts
Computer Guidance
Weather Stories
News Archive
Weather Links
Weather Glossary
Our Office
1953 Beecher
Tornado
Contact Us
w-dtx.webmaster
@noaa.gov

and the area which the watch covered.

Watch Redefining Statement (SLS): This product tells the public which counties/parishes are included in the watch. This is done not only by writing them all out, but by using the county FIPS codes in the Header of the product. It is issued by the local National Weather Service Forecast Office (NWFO).

Watch Status Reports (WWA): This product lets the NWFO know of the status of the current severe weather watch (Tornado or Severe Thunderstorm). During the severe weather watch, the Storm Prediction Center (SPC) will issue these reports periodically. These reports will describe, in plain language, the current evaluation of the severe weather situation and whether the watch will expire or be reissued. A status report is not issued if a cancellation or replacement has been issued at least 1 hour prior to the expiration time of the original watch.

Water Equivalent: The liquid content of solid precipitation that has accumulated on the ground (snow depth). The accumulation may consist of snow, ice formed by freezing precipitation, freezing liquid precipitation, or ice formed by the refreezing of melted snow.

Water Pollution: The alteration of the constituents of a body of water by man to such a degree that the water loses its value as a natural resource.

Watershed: The total area drained by a river and its tributaries. Sometimes called a basin.

Water Supply Outlook: A seasonal volume forecast, generally for a period centered around the time of spring snowmelt (e.g., April-July). The outlooks are in units of acre-feet and represent the expected volume of water to pass by a given point during a snowmelt season. The outlook categories include Most Probable, Reasonable Maximum, and Reasonable Minimum.

Water Supply Outlook (ESS) Product: A public product issued by a Forecast Office which contains narrative and numeric information on current and extended water supply conditions.

Water Table: The level below the earth's surface at which the ground becomes saturated with water. The water table is set where hydrostatic pressure equals atmospheric pressure.

Water Vapor (WV) Satellite Imagery: This satellite imagery uses the 6.7 micrometer (um) channel to detect moisture between 700 and 200 mb; therefore, it is good for determining mid and upper level moisture in the atmosphere. Abundant water vapor appears white in this imagery. Meanwhile, dry air appears black in this satellite imagery. This satellite imagery can be used both day and night.

Water Vapor Plume: This appear in the water vapor satellite imagery. It is a plume-like object that extends from the Intertropical Convergence Zone (ITCZ) northward or southward into the higher latitudes. It is usually located over a 850 to 700 mb theta-e ridge axis. As a result, it is a favored location for the development of a Mesoscale Convective Complex (MCC). Researchers have found it to be a favored region for very heavy rain. It is thought that the ice crystals located in this plume help thunderstorms to become highly efficient rainfall producers. In North America, this is sometimes called the "***Mexican Connection***".

Water Year: The time Period form October 1 through September 30.

Watercourse: Any surface flow such as a river, stream, tributary.

Watershed: Land area from which water drains toward a common watercourse in a natural basin. They range in size from a few acres to large areas of the country.

Waterspout: A violently rotating column of air, usually a pendant to a cumulus or cumulonimbus cloud, over a body of water with its circulation reaching the water. In the summer and spring, these phenomena are usually "tornadoes over water" that have been generated by thunderstorms. In the fall months, these most often begin as "cold air funnels", being generated by a cold air mass passing over much warmer waters. Such waterspouts are generally much less intense than tornadoes and usually dissipate upon approaching shore. Waterspouts are most common over tropical or subtropical waters.
The exact definition of waterspout is debatable. In most cases the term is reserved for small vortices over water that are not associated with storm-scale rotation (i.e., they are the water-based equivalent of landspouts). But there is sufficient justification for calling virtually any rotating column of air a waterspout if it is in contact with a water surface.

Watt: The unit of power in the MKS system of units; energy per unit time, one Joule/second.

Wave: An identifiable, periodic disturbance or motion in a medium that shows displacement. The most commonly referred medium is water, followed by the atmosphere. The forecasted heights of waves on the Great Lakes or in the oceans are those heights expected at the end of the fetch for that body of water.

Waveguide: A hollow conductor, usually rectangular or round in cross-section, used to carry radar waves between various components of a radar.

Wavelength: The distance a wave will travel in the time required to generate one cycle. The distance between two consecutive wave peaks (or other reference points) in space. Weather radar wavelengths typically range from 1 mm to 50 cm.

Wave Spectrum: The distribution of wave energy with respect to wave frequency or period. Wave spectra assist in differentiating between wind waves and swells.

Weather Forecast Office (WFO): This National Weather Service office is responsible for issuing advisories, warnings, statements, and short term forecasts for its county warning area.

Wedge (or Wedge Tornado): Slang for a large tornado with a condensation funnel that is at least as wide (horizontally) at the ground as it is tall (vertically) from the ground to cloud base. The term "wedge" often is used somewhat loosely to describe any large tornado. However, not every large tornado is a wedge. A true wedge tornado, with a funnel at least as wide at the ground as it is tall, is very rare.
Wedges often appear with violent tornadoes (F4 or F5 on the Fujita Scale), but many documented wedges have been rated lower. And some violent tornadoes may not appear as wedges (e.g., Xenia, OH on 3 April 1974, which was rated F5 but appeared only as a series of suction vortices without a central condensation funnel). Whether or not a tornado achieves "wedge" status depends on several factors other than intensity - in particular, the height of the environmental cloud base and the availability of moisture below cloud base. Therefore, spotters should not estimate wind speeds or F-scale ratings based on visual appearance alone. However, it generally is safe to assume that most (if not all) wedges have the potential to produce strong (F2/F3) or violent (F4/F5) damage.

Weekly Weather and Crop Bulletin: This bulletin is jointly prepared by the U.S. Department of Commerce, National Oceanic and Atmospheric Administration, and the U.S. Department of Agriculture. The bulletin is published weekly on Tuesday.

Weighing-Type Precipitation Gage: A rain gage that weighs the rain or snow which falls into a bucket set on a platform of a spring or lever balance. The increasing weight of its contents plus the bucket are recorded on a chart. The record thus shows the accumulation of precipitation.

Weir: a) A low dam built across a stream to raise the upstream water level (fixed-crest weir when uncontrolled); b) A structure built across a stream or channel for the purpose of measuring flow (measuring or gaging weir).

WER - Weak Echo Region: 1) Radar term for a region of relatively weak (reflectivity at low levels on the inflow side of a thunderstorm echo, topped by stronger reflectivity in the form of an echo overhang directly above it (see Fig. 2). The WER is a sign of a strong updraft on the inflow side of a storm, within which precipitation is held aloft. When the area of low reflectivity extends upward into, and is surrounded by, the higher reflectivity aloft, it becomes a ***BWER***. 2) An WSR-88D radar product which displays reflectivity for up to 8 elevation angles for a radar operator selected location as a set presentation of a storm. The plains in this product are presented in an ascending order, lowest plain is lowest elevation angle selected. It is used to depict storm tilt and to identify Weak Echo Regions (WER) and Bounded Weak Echo Regions (BWER) in thunderstorms.

West African Disturbance Line (WADL): It is a line of convection about 300 miles long, similar to a squall line. It forms over west Africa north of the equator and south of 15 degrees North latitude. It moves faster than an *Easterly Wave* between 20 and 40 mph. They move off the African coast every 4 to 5 days mainly in the summer. Some reach the American tropics and a few develop into tropical cyclones.

Wet-Bulb Temperature: The lowest temperature that can be obtained by evaporating water into air.

Wet-Bulb Zero (WBZ): It is the height where the ***wet-bulb temperature*** goes below 0 º F. It is important because WBZ heights between 7000 ft and 10,500 ft (above ground level) correlate well with large hail at the surface when storms develop in an airmass primed for strong convection. Higher values infer mid and upper level stability and also indicate a large melting area for falling hail. Lower WBZ heights indicate that the low level atmosphere is often too cool and stable to support large hail.

Wet Floodproofing: An approach to floodproofing which usually is a last resort. Flood waters are intentionally allowed into the building to minimize water pressure on the structure. Wet Floodproofing can include moving a few valuable items to a higher place or completely rebuilding the floodable area. Wet floodproofing has an advantage over other approaches: not matter how little is done, flood damage will be reduced. Thousands of dollars in damage can be avoided just by moving furniture and appliances out of the flood-prone area.

Wet Microburst: A microburst accompanied by heavy precipitation at the surface. A rain foot may be a visible sign of a wet microburst. See ***dry microburst***.

Wetland: An area that is regularly wet or flooded and has a water table that stands at or above the land surface for at least part of the year.

WFO: A National Weather Service Weather Forecast Office.

Whirlwind: A small, rotating column of air; may be visible as a dust devil.

Wideband Communications: The high speed (1.54 megabits per second of data) communication lines between the Radar Data Acquisition (RDA) and the Radar Product Generator (RPG) on the WSR-88D radar. There are 4 ways that this data is transmitted from the RDA to the RPG:

1) **Wire:** It is used for distances between 0 and 400 feet.

2) **Fiber Optics:** It is used between 400 feet and 11 miles.

3) **Microwave Line-Of-Site (MLOS):** It is used between from 3,280 feet to 25 miles. The problem with this type of link is that it will experience loss of data from thunderstorms. Only 4 sites in the entire country have this due to the possibility of the loss of data.

4) **T1:** A contract service provided by a telecommunications company. This will be used in place of MLOS.

Widely Scattered: A National Weather Service convective precipitation descriptor for a 20 percent chance of measurable precipitation (0.01 inch). See ***Precipitation Probability (PoP)***.

Wildfire: Any free burning uncontainable wildland fire not prescribed for the area which consumes the natural fuels and spreads in response to its environment.

Wildfire Prevention Advisory: This product is issued through the National Weather Service whenever either the Department of Natural Resources (DNR) or United State Forest Service (USFS) requests one due to a high fire danger. In the state of Michigan, this product will be issued by NWFO Gaylord and NWFO Marquette.

Wildlands: Any nonurbanized land not under extensive agricultural cultivation, e.g., forests, grasslands, rangelands.

Willy-Willy: A tropical cyclone of hurricane strength near Australia.

Wind: The horizontal motion of the air past a given point. Winds begin with differences in air pressures. Pressure that's higher at one place than another sets up a force pushing from the high toward the low pressure. The greater the difference in pressures, the stronger the force. The distance between the area of high pressure and the area of low pressure also determines how fast the moving air is accelerated. Meteorologists refer to the force that starts the wind flowing as the "pressure gradient force." High and low pressure are relative. There's no set number that divides high and low pressure. Wind is used to describe the prevailing direction from which the wind is blowing with the speed given usually in miles per hour or knots. The following table gives descriptions of winds used in National Weather Service forecasts.

Sustained Wind Speed	Descriptive Term
0-5 mph	Light or light and variable wind
5-15 mph or 10-20 mph	None
15-25 mph	Breezy, Brisk, or Blustery
20-30 mph	Windy
30-40 mph	Very Windy
40 mph or greater	Strong, dangerous, or damaging

Wind Chill: It is based on the rate of heat loss from exposed skin caused by the combined effect of wind and cold. As the wind increase, heat is carried away from the body at an accelerated rate, driving down the body temperature. Animals are also affected by wind chill. The term **wind chill** was coined by Paul Siple. He was a pioneer in determining the relationship between heat loss to wind and temperature. During the 2nd Byrd Expedition to Antarctica in 1939-40, Siple exposed water-filled plastic cylinders to various temperatures and wind speeds. He then recorded the time that it took for the water to freeze in the cylinders. With this data and the assistance of his colleague Charles Passel, he developed a formula for calculating wind chill.

The wind chill equation was updated in 2001 by an international group of governmental and academic organizations. The new equation makes use of advances in science, technology, and computer modeling to provide a more accurate, understandable, and useful formula for calculating the dangers from winter winds and freezing temperatures. In addition, clinical trials have been conducted and the results of those trials have been used to verify and improve the accuracy of the new formula. The National Weather Service began using the new wind chill equation in November, 2001. The new equation is:

Wind Chill (°F) = 35.74 + 0.6215T - 35.75($V^{0.16}$) + 0.4275T($V^{0.16}$)

where: T = air temperature is in degrees Fahrenheit (°F) and
V = wind speed in miles per hour (MPH)

Wind Chill Index

		Temperature (°F)																	
		40	35	30	25	20	15	10	5	0	-5	-10	-15	-20	-25	-30	-35	-40	-45
	5	36	31	25	19	13	7	1	-5	-11	-16	-22	-28	-34	-40	-46	-52	-57	-63
	10	34	27	21	15	9	3	-4	-10	-16	-22	-28	-35	-41	-47	-53	-59	-66	-72
W	15	32	25	19	13	6	0	-7	-13	-19	-26	-32	-39	-45	-51	-58	-64	-71	-77
i	20	30	24	17	11	4	-2	-9	-15	-22	-29	-35	-42	-48	-55	-61	-68	-74	-81
n	25	29	23	16	9	3	-4	-11	-17	-24	-31	-37	-44	-51	-58	-64	-71	-78	-84
d	30	28	22	15	8	1	-5	-12	-19	-26	-33	-39	-46	-53	-60	-67	-73	-80	-87
	35	28	21	14	7	0	-7	-14	-21	-27	-34	-41	-48	-55	-62	-69	-76	-82	-89
(m	40	27	20	13	6	-1	-8	-15	-22	-29	-36	-43	-50	-57	-64	-71	-78	-84	-91
p	45	26	19	12	5	-2	-9	-16	-23	-30	-37	-44	-51	-58	-65	-72	-79	-86	-93
h)	50	26	19	12	4	-3	-10	-17	-24	-31	-38	-45	-52	-60	-67	-74	-81	-88	-95
	55	25	18	11	4	-3	-11	-18	-25	-32	-39	-46	-54	-61	-68	-75	-82	-89	-97
	60	25	17	10	3	-4	-11	-19	-26	-33	-40	-48	-55	-62	-69	-76	-84	-91	-98

Frostbite times: 30 minutes | 10 minutes | 5 minutes

Wind Chill Advisory: The National Weather Service issues this product when the wind chill could be life threatening if action is not taken. The criteria for this warning varies from state to state. In Michigan, the criteria is a 10 mph or greater wind and a wind chill forecasted between minus 20 degrees F and minus 29 degrees F.

Wind Chill Warning: The National Weather Service issues this product when the wind chill is life threatening. The criteria for this warning varies from state to state. In Michigan, the criteria is a 10 mph or greater wind and a wind chill forecasted of being less than 30 degrees F below zero.

Wind Couplet: It is an area on the radar display where you have two maximum wind speeds which are blowing in opposite directions.

Wind Direction: The true direction from which the wind is moving at a given location. It is normally measured in tens of degrees from 0 to 360.

Wind Gust: They are rapid fluctuations in the wind speed with a variation of 10 knots or more between peaks and lulls. The speed of the gust will be the maximum instantaneous wind speed.

Wind Rose: A diagram that shows the percent of time that the wind blows from different directions at a given location over a given time.

Wind Shear: The rate of change of wind speed and/or direction over a given distance. Also, see ***shear***.

Wind Shift: A change in wind direction of 45 degrees or more in less than 15 minutes with sustained wind speeds of 10 knots or more throughout the wind shift.

Wind Shift Line: A long, but narrow axis across which the winds change direction (usually veer).

Wind Sock: A tapered fabric shaped like a cone that indicates wind direction by pointing away from the wind. It is also called a "wind cone".

Wind Speed: The rate at which air is moving horizontally past a given point. It may be a 2-minute average speed (reported as wind speed) or an instantaneous speed (reported as a peak wind speed, wind gust, or squall). The following table is a way of estimating wind speed:

Beaufort Wind Speed Estimations on Land and Water

Knots*	Visual Appearance	Knots*	Visual Appearance
<1	**Calm:** smoke rises vertically; sea like a mirror	22-27	**Strong Breeze:** Large branches in motion; whistling heard in overhead wires; umbrellas used with difficulty; large waves begin to form; the white foam crest are more extensive everywhere (probably some spray).
1-3	**Light Air:** Direction of wind shown by smoke drift not by wind vanes. Ripples resembling scales are formed on water, but without foam crests.	28-33	**Near Gale:** Whole trees in motion; inconveniences felt against wind; sea heaps up and white foam from breaking waves begins to be blown in streaks along the direction of the wind.
4-6	**Light Breeze:** Wind felt on face; leaves rustle; wind vanes moved by wind; small wavelets form on water, still short, but more pronounced; crests have glassy appearance.	34-40	**Gale:** Breaks twigs off trees; impedes progress; moderately high waves of greater length; edges of crests begin to break into spindrift; foam on water surface is blown in well-marked streaks along wind.
7-10	**Gentle Breeze:** Leaves and small twigs in constant motion; wind extends light flag; large wavelets on water; waves crests begin to break; water has a foam of glassy appearance; scattered whitecaps appear on lakes.	41-47	**Strong Gale:** Slight structural damage occurs; high waves; dense streaks of foam on water surface along wind; crest of waves begin to roll over; spray may affect visibility.
11-16	**Moderate Breeze:** Raises dust, loose paper; small branches moved; small waves, becoming longer; fairly frequent white caps appear on lakes.	48-55	**Storm:** Trees uprooted; considerable damage occurs; very high waves with long overhanging crests; foam on water, in great patches, is blown in dense white streaks along wind; sea takes on a white appearance; tumbling of sea becomes heavy and shocklike; visibility affected over water.
17-21	**Fresh Breeze:** Small trees in leaf begin to sway; crested wavelets from on inland waters; moderate waves, taking a more pronounced long form; many whitecaps appear on lakes.	56-63	**Violent Storm:** Widespread damage; exceptionally high waves (small and medium-sized ships might be for a time lost to view behind waves); the sea is completely covered with long white patches of foam lying along the direction of the wind; everywhere the edges of the wave crests are blown into froth; visibility affected.
*__Note:__ MPH equals approximately 1.15 x Knots			

Wind Waves: Local, short period waves generated from the action of wind on the water surface (as opposed to ***swell***). Commonly referred to as waves. In a National Weather Service ***Coastal Marine Forecast*** or ***Offshore Forecast***, wind waves are used when swells are described in the forecast.

Winds and Temperatures Aloft: This NWS aviation product contains winds aloft which are computer prepared and contain forecast wind direction and speed as well at forecast temperatures. Forecast winds and temperatures aloft are prepared for:

6,000 feet
9,000 feet
12,000 feet
18,000 feet
24,000 feet
30,000 feet
34,000 feet
39,000 feet

All heights are above Mean Sea Level. Forecast winds are also prepared for 3,000 feet. Wind directions are true directions.

Windy: 20 to 30 mph winds

Winter Storm Warning: This product is issued by the National Weather Service when a winter storm is producing very heavy snow. The criteria for this warning can vary from place to place. For example, in Lower Michigan, a Winter Storm Warning is issued when winter storm is producing snow greater than or equal to 6 inches in 12 hours; or greater than or equal 8 inches in 24 hours. In cases of mixed precipitation or blowing, these snowfall amounts may be less. Meanwhile, in Upper Michigan, a Winter Storm Warning is

issued when a winter storm is producing snow greater than or equal to 8 inches in 12 hours; or greater than or equal 10 inches in 24 hours. Like in Lower Michigan, these snowfall amounts may be less in situations where you have mixed precipitation and/or blowing.

Winter Storm Watch: This product is issued by the National Weather Service when there is a potential of very heavy snow. The criteria for this watch can vary from place to place. For example, in Lower Michigan, a Winter Storm Watch is issued for the potential of a winter storm producing snow greater than or equal to 6 inches in 12 hours; or greater than or equal 8 inches in 24 hours. In cases of mixed precipitation or blowing, these snowfall amounts may be less. Meanwhile, in Upper Michigan, a Winter Storm Watch is issued for the potential of a winter storm producing snow greater than or equal to 8 inches in 12 hours; or greater than or equal 10 inches in 24 hours. Like in Lower Michigan, these snowfall amounts may be less in situations where you have mixed precipitation and/or blowing.

Winter Weather Advisory: This product is issued by the National Weather Service when a low pressure system produces a combination of winter weather (snow, freezing rain, sleet, etc.) that present a hazard, but does **not** meet warning criteria. In this case, snowfall does **not** have to reach Snow Advisory Criteria. The Snow Advisory criteria can vary from area to area. In Michigan, the criteria for its issuance is a snow event that is forecasted to produce snow (average of forecast range) greater than 3 inches, but less than warning criteria (6 inches in Lower Michigan and 8 inches in Upper Michigan) in
12 hours.

Wire Weight Gage: A river gage comprised of a weight which is lowered to the water level. The weight is attached to a cable; and as the weight is lowered, a counter indicates the length of cable released. The stage is determined from the length of cable required to reach the water level.

Wrapping Gust Front: A gust front which wraps around a mesocyclone, cutting off the inflow of warm moist air to the mesocyclone circulation and resulting in an occluded mesocyclone.

WSR-57: A NWS Weather Surveillance Radar designed in 1957. It used to be part of weather radar network. It was replaced by WSR-88D units.

WSR-74: A NWS Weather Surveillance Radar designed in 1974. It used to be part of weather radar network. It was replaced by WSR-88D units.

WSR-88D: Weather Surveillance Radar - 1988 Doppler; NEXRAD unit.

WSR-88D System: The summation of all hardware, software, facilities, communications, logistics, staffing, training, operations, and procedures specifically associated with the collection, processing, analysis, dissemination and application of data from the WSR-88D unit.

WSR-88D unit: Weather Service Radar, commissioned in 1988. Includes the associated displays, product generators, archiving facilities and communications services.

WW: Severe Thunderstorm Watch or Tornado Watch

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X

XBT: Abbreviation for expendable bathythermograph.

X-Rays: Very energetic electromagnetic radiation with wavelengths intermediate between 0.01 and 10 nanometers (0.1-100 Angstroms) or between gamma rays and ultraviolet radiation. Essentially all X-Rays from space are absorbed in the Earth's upper atmosphere.

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Y

Year: 1) The period during which the Earth completes one revolution around the sun. This has several interpretations. a) ***Sidereal Year*:** Time of true revolution around the sun--that is, the time it takes the Earth (as seen from the sun) to reappear at the same fixed star, equal to 365.2564 mean solar days or 365 days, 6 hours, 9 minutes, 10 seconds. b) ***Tropical Year*:** The time measured from one vernal equinox to the next--that is, the apparent revolution of the sun through the zodiac, equal to 365.2422 mean solar days or 365 days, 5 hours, 48 minutes, 46 seconds. This is not a constant, but only decreases by 5 seconds in every one thousand years. This is also called ***mean solar year*** or ***ordinary year***. c) ***Calendar Year*:** Fixed by the Gregorian calendar of 365 days in an ordinary year and 366 days in leap year. 2) Any arbitrary 12-month period selected for a special purpose, such as the ***water year***.

Yellow Snow: Snow given a golden or yellow appearance by the presence in it of pine, cypress pollen, or anthropogenic material or animal-produced material. Compare with ***Brown Snow***.

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Z

Z dr: See ***differential reflectivity***.

Z/R Relationship: An empirical relationship between radar reflectivity factor z (in mm^6 / m^3) and rain rate (in mm / hr), usually expressed as Z = A R^b; A and b are empirical constants.

Zero Datum: A reference "zero" elevation for a stream or river gage. This "zero" can be referenced (usually within ten feet of the bottom of the channel) to mean sea level, or to any other recognized datum.

Zone Forecast Product (ZFP): This National Weather Service product will provide the general public with a clear statement of the expected weather conditions within a given county or set of counties. The forecast will include: sky condition, temperature, type of precipitation and its probability, and wind direction and speed (this is normally given only during the first 2 periods of the forecast).

Zone of Aeration: The locus of points just above the water table where soil pores may either contain air or water. This is also called the ***vadose zone***.

Zone of Saturation: The locus of points below the water table where soil pores are filled with water. This is also called the ***phreatic zone***.

Zonal Wind: Large-scale atmospheric flow in which the east-west component (i.e., latitudinal) is dominant. The accompanying meridional (north-south) component often is weaker than normal. Compare with meridional flow.

Zoned Embankment Dam: An embankment dam which is comprised of zones of selected materials having different degrees of porosity, permeability and density.

"Zulu" (Z) Time: For practical purposes, the same as ***Coordinated Universal Time (UTC)***. The notation formerly used to identify time ***Greenwich MeanTime***. The word "Zulu" is notation in the phonetic alphabet corresponding to the letter "Z" assigned to the time zone on the Greenwich Prime Meridian.

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National Weather Service

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NATIONAL WEATHER SERVICE

When Seconds Count, StormReady Communities are Prepared

---------- Community/County Counter: 707----------

Vermont Joins StormReady Program. Just 3 States to Go!

Americans live in the most severe weather-prone country on Earth. Each year, Americans cope with an average of 10,000 thunderstorms, 2,500 floods, 1,000 tornadoes, as well as an average of 6 deadly hurricanes. Potentially deadly weather impacts every American. Communities can now rely on the National Weather Service's StormReady program to help them guard against the ravages of Mother Nature.

Some 90% of all presidentially declared disasters are weather related, leading to around 500 deaths per year and nearly $14 billion in damage. StormReady, a program started in 1999 in Tulsa, OK, helps arm America's communities with the communication and safety skills needed to save lives and property– before and during the event. StormReady helps community leaders and emergency managers strengthen local safety programs.

StormReady communities are better prepared to save lives from the onslaught of severe weather through better planning, education, and awareness. No community is storm proof, but StormReady can help communities save lives. Does StormReady make a difference? See how it saved more than 50 movie goers in Ohio.

Find out more by selecting one of the links to the left or on the bottom of this page.

February 2004, **Monongalia County**, WV, from left: Ron Kyle, County Emergency Management Director, Asel Kennedy, County Commissioner, Theresa Rossi MIC, NWS Pittsburgh, PA

February 2004, **Suwannee County, F**L. From left: County EMA Program Coordinator Kimberly Thomas, NWS Jacksonville Meteorologist in Charge, Steve Letro and County EMA Staff Assistant Sharon Hingson.

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National Weather Service
Office of Climate, Water, & Weather Services
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Webmaster:

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http://www.stormready.noaa.gov/index.html
Last Updated: February 26, 2004

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Welcome to the Weather Education section of the World Wide Web Homepage from the National Weather Service Office at White Lake, Michigan. Our parent organization, NOAA, has a comprehensive Education Resources Webpage. This has quite of bit of information aimed at both educators and students. In addition, the NWS Office of Climate, Water and Weather Services has an excellent resource for weather education.

Want to know how to make a "Tornado-in-a-Box"? Then check out this web site.

Check out the *2002* Severe Weather Awareness Poster Winners.

The White Lake Forecast Office has developed a "*Shadow*" program. This program will allow secondary students to come into the National Weather Service office on a regular basis, and "shadow" a forecaster or an electronic technician for the day or part of the day. More information can be found here.

Is your school prepared for Tornadoes? The Michigan Committee for Severe Weather Awareness has put together an informational guide on tornado safety. This is a guide to Developing a Tornado Emergency Plan for Schools. It includes steps for Tornado Safety and offer tips for schools needing information on practicing and planning for tornadoes and tornado drills.

GLOBE (Global Learning and Observations to Benefit the Environment) is a worldwide hands-on, primary and secondary school-based science and education program.

All about lightning safety including lesson plans, interactive activities and resources.

Additional NOAA Research, Education and Outreach for both teachers and students are available here

Safety Information and Tips

Thunderstorm Safety Information	Thunderstorm Safety Tips
Tornado Safety Information	Tornado Safety Tips

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NOAA Weather Radio

- Have you recently bought a new weather radio and need the FIPS codes? The following tables give the FIPS codes for Michigan and for the rest of the U.S.

Public Service Announcement from the Oak Ridge Boys!

About NOAA Weather Radio...

NOAA Weather Radio broadcasts National Weather Service warnings, watches, forecasts, and other hazard information 24 hours a day. Known as the voice of the National Weather Service, NOAA Weather Radio is provided as a public service by the Department of Commerce's National Oceanic and Atmospheric Administration (NOAA).

The NOAA Weather Radio network has more than 425 stations in the 50 states and near adjacent coastal waters, Puerto Rico, the U.S. Virgin Islands, and U.S. Pacific Territories. In southeast Michigan, broadcasts originating from the White Lake office are transmitted on two NOAA Weather Radio stations. Station KIH-29 broadcasts on a frequency of 162.475MHz from a transmitter located in Clio. This station serves the counties of Midland, Bay, Huron, Saginaw, Tuscola, Sanilac, Shiawassee, Genesee, and Lapeer. The other station, KEC-63, broadcasts on a frequency of 162.550MHz from a transmitter located in Southfield. KEC-63 serves the counties of Livingston, Oakland, Macomb, St. Clair, Washtenaw, Wayne, Lenawee, and Monroe. For other stations across Michigan, including general transmitter coverage areas, **click here**.

Thanks to NOAA Weather Radio, you'll always have the answer to the question, "What's the weather?", and access to potentially life-saving emergency information whenever you need it.

When you purchase a NOAA Weather Radio receiver, you are purchasing part of the National Weather Service network. The network is constantly upgrading its technology to provide the best weather reporting service possible for the nation. One way the National Weather Service is doing this is through the NOAA Weather Radio Console Replacement System (CRS). CRS

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will automatically translate written National Weather Service products into synthesized-voice recordings and schedule them for broadcast over NOAA Weather Radio. The automated system results in faster broadcasts of information over NOAA Weather Radio, and replaces 20-year old, 8-track tape technology with a newer, more reliable system.

The automated broadcasts of many National Weather Service products allow for faster updates of forecasts and statements, and allow broadcasters to spend more time assisting customers, preparing forecasts, and helping perform critical work during significant weather events. Also, the newer, more reliable system will result in less down-time because the Console Replacement System features a redundant setup. This means that the computer processors have backups so if one part of the system goes bad, another computer is ready to take over in its place.

For a picture of the NOAA Weather Radio Console Replacement System, **click here**.

There are some concerns about the voice quality of the radio. The voice is computerized using state-of-the-art voice synthesis. At White Lake, we constantly monitor voice quality so that the broadcasts are as understandable as possible. We can change the speaking rate, the inflection of the voice, and make minor adjustments to pronunciation of words to improve voice quality. However, we cannot correct the fact that it sounds computerized, because it is. The National Weather Service is committed to making improvements to the system's voice quality as improvements become available. In the meantime, we will strive to make the voices we have sound as good as possible.

Other NOAA Weather Radio Links

A schedule for NOAA Weather Radio Stations KEC - 63(Detroit) and KIH - 29 (Flint) can be found here.

For information on weather radio receiver recalls, go to the U.S. Consumer Product Safety Commission (CPSC) web site and choose "Radios (Weather)" in the product Type list.

General information on NOAA Weather Radio.

To look at a copy of the joint NOAA/FEMA/American Red Cross publication ***NOAA Weather Radio***, as well as other publications, **click here**.

To find out how a NOAA Weather Radio warning is disseminated, **click here**.

For frequently asked questions about NOAA Weather Radio, **click here**.

A listing of FIPS codes in Michigan for use with NOAA Weather Radios with SAME capability.

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NWS White Lake Spotters' Page

Send us your Spotter Reports here.

NEW Preliminary 2004 Spotter Seminar schedule.

Severe Weather Outlooks, including the **Hazardous Weather Outlook for Southeast Lower Michigan**

NEW Severe weather statistics for Southeast Michigan (1995-2003)

NEW Historical tornado statistics updated through November 2003.

NWS Excessive Heat Outlook product now available online.

Is your community StormReady? The NWS has designed a program to help cities, towns, and counties implement procedures to reduce the potential for disastrous, weather-related events. By participating in the StormReady program, local agencies can earn recognition for their jurisdiction by meeting criteria established by the NWS in partnership with federal, state, and local emergency management professionals. Details are available here.

Check out these photos of **MICON** (Michigan Inter-County Organizational Network) in action.

The National Weather Service is *seeking rainfall spotters* to fill in our data network. We have spotters in about half of the townships in Southeast Lower Michigan. Our target is 100 percent of all townships. If interested, check here to see a list of locations currently not served by a spotter, and some guidelines on being a rainfall spotter.

The National Weather Service has introduced three products designed to provide the public with important information on significant weather, water, and climate events. The three products are

1. NWS Hazards Assessment
2. NWS and USDA U.S. Drought Monitor Product
3. El Nino and La Nina

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NWS AwareNow publication. AwareNow is issued by the National Weather Service to keep communications lines open within the Agency and with the natural hazards community.

Other links of interest:

- 1999 Tornado Surveys, 2000 Tornado Survey, 2001 Tornado Surveys
- Severe Weather Spotter Seminar Training schedule (updated when training is scheduled).
- Review severe weather events, including radar images and discussion
- Safety and other NWS Publications
- Tornado Statistics for southeast lower Michigan (updated to now include "F" values)
- MICON (Michigan Inter-County Operational Network), amateur radio group of Southeast Lower Michigan
- What is Skywarn, and how can I become a spotter?
- Michigan Committee for Severe Weather Awareness

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The following links are to pages that should be updated every time a new product is issued. The pages are presently set up to cover most of the Great Lakes Region and will keep links on them to cover approximately the last 24 hours.

> These web pages were created for educational use and are not meant for operational or professional use. Every effort has been taken to provide the most recent and reliable information available. However, there are occasions when the data are not current. The National Weather Service Products on these web pages should not be relied on in lieu of officially disseminated weather forecasts and warnings. The NWS has no control over the timeliness and availability of products on the Internet.

We hope that you find these pages very useful.

- Tornado Warnings, Severe Thunderstorm Warnings, Severe Weather Statements. and Local Storm Reports
- Special Weather Statements
- Special Marine Warnings and Marine Weather Statements
- Winter Weather
- Flood Potential Statements and Flood Watches
- River Flood Warnings and Statements
- Flash Flood Warnings and Statements
- Current River Stages
- Area Forecast Discussions
- Revised Digital Forecasts
- Point Forecast Matrices NEW
- State, Zone and Short-Term Forecasts for Great Lakes Region
- Great Lakes Forecasts and Nearshore Forecasts
- Non - Precipitation Weather Products
- Public Information Statements
- Daily and Monthly Climate Summaries from across Michigan
- Record Reports, Regional Temperature and Precipitation tables, and State Temperature and Precipitation tables.

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Mobile Access to Official NWS Forecasts and Warnings

The National Weather Service has developed a website for wireless access to official NWS forecasts and warnings from mobile devices such as PDA's, cell phones, and pagers. The products available are identical to ones available on our standard internet site (http://www.crh.noaa.gov/dtx/?page=wxnow); however they are formatted for use with mobile devices using the industry standard wireless markup language (WML). In order to access the wireless version of our site, you will need a mobile device equipped with a wireless applications protocol (WAP) browser and a wireless internet service provider.

The internet address for our wireless site is the same as for our regular site:

http://www.crh.noaa.gov/dtx/

When you load our site from a wireless device, you will automatically be directed to the wireless version. If you have any problems with this redirection, or you think you have a wireless browser that is not being detected, you can link directly to the wireless version:

http://www.crh.noaa.gov/dtx/wml/

This wireless site is a new undertaking, and should be considered a work in progress. Your feedback about this new service will be very helpful. Please send any comments to w-dtx.webmaster@noaa.gov.

Disclaimer: The National Weather Service provides access to forecasts and warnings via WAP-enabled devices as part of our core mission to protect life and property and enhance the national economy. This site in no way constitutes an endorsement of any particular equipment vendor or wireless service provider.

Our standard disclaimer and privacy policy also apply to the wireless version of our site.

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Computer Model Output

Graphics

- AVN and ETA - 12 to 48 hour 4 panel charts
- Medium Range - 0 to 72 4 panel charts
- NCEP Ensemble Forecast Products

ETA Meteograms from the Mesoscale Modeling Branch of NCEP's Environmental Modeling Center

RUC2 Graphics from SPC.

Various Meso-Scale Models

- Canadian GEM
- Locally produced Model Output (Extended, Regional, Lake Huron, Convective Init

NGM Model Output Statistics (MOS)

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The following are all the articles that Bill Deedler has put on the White Lake webpage since we first came onto the World Wide Web in April of 1996.

- **White Christmas?**
How common are white Christmases across Southeast Michigan? Bill Deedler looks at our historic chances for a white Christmas, and also some notable Christmases of the past.
- **Peak Fall Color Nears**
With trees changing color, Bill Deedler discusses this season's color and how weather affects fall foliage.
- "A great storm is upon Michigan" - The Great Blizzard of 1978 : **25th Anniversary** of the one of the most severe winter storms ever to hit the Great Lakes Region.
- How do the dry spells of 2002 compare to previous years?
- Summary of the 2001-2002 winter season.
- The outlook for the Winter of 2001-02 for Southeast Michigan can be found here.
- Final Summary for Winter of 2000-2001.
- Updated Outlook for the rest of the Winter of 2000-2001 issued in February of 2001.
- The Outlook for the Winter of 2000/2001.
- The Snow Storms of 1886 and 1974 and their similarities.
- Bill Deedler and Jeff Boyne take a look at La Niña and its affects on the upcoming winter weather (winter of 1999-2000) for Southeast Lower Michigan.
- The Winter of 1899-1900 and a close look at the last week of 1899.
- How the remnants of Hurricanes have affected Michigan.
- A Thumbnail Sketch of a Great Flood in Southeast Michigan.
- How the Winter of 1998-1999 compared to previous La Niña Winters.
- How past La Niñas have affected Southeast Lower Michigan and what might be in store for us during the Winter of 1998-1999.
- A summary of the Winter of 1997-98 and looks at what maybe in store for Southeast Lower Michigan for the Spring of 1998.
- How past El Niño Winters have affected Southeast Lower Michigan.
- How the Summer and Fall weather affects Fall Foliage.
- Summertime dry spells.

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- The Cold Summer of 1992.
- Wide Variety of weather that is possible during the month of May.
- Mild March of 1945.
- All about White Christmases.
- Great Lakes Storm of 1913.
- What is Indian Summer?
- Heat Waves across Southeast Lower Michigan and information about the Heat Index.
- Story of the Flint-Beecher Tornado.
- Snow Storm that occurred across Southeast Lower Michigan in May of 1923.

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News and Photo Archives

- **Snowfall totals from the February 23rd-24th, 2004, winter storm**
  Snowfall totals through 7 am February 24th, 2004, are available in graphic and text formats.
- **Snowfall totals from the January 27th, 2004, winter storm**
  Snowfall totals are available in graphic and text formats.
- **Snowfall totals from the January 23rd, 2004, winter storm**
  Snowfall totals are available in graphic and text formats.
- **Snowfall totals from the January 17th, 2004, winter storm**
  Snowfall totals are available in graphic and text formats.
- **2003 Annual Climate Summary for Detroit**
  The weather of 2003 will be remembered as quite volatile and relatively cool across Southeast Lower Michigan. Check out the annual climate summary for Detroit.
- **Snowfall totals from the January 14th, 2004, winter storm**
  Snowfall totals are available in graphic and text formats, including lake effect snows across the Thumb during the morning of January 15th.
- **Frigid Temperatures Shiver Southeast Michigan**
  The coldest air of the season settled over Southeast Michigan the night of January 9th-10th. Here are some representative low temperatures from the morning of January 10th.
- **Lake Effect Snows near Lake Huron, January 9th, 2004**
  Snowfall totals from the lake effect snow event across the Thumb are available in graphic and text formats.
- **Snowfall totals from the January 4th-5th, 2004, winter storm**
  Snowfall totals are available in graphic and text formats.
- **Snowfall totals from the December 24th-25th, 2003, winter storm**
  Snowfall totals are available in graphic and text formats.
- **Weather Highlights of 2003**
  A recap of significant weather events that occurred in Southeast Michigan during 2003.
- **NOAA Weather Radio Dedication in Adrian**
  The National Weather Service, in conjunction with Lenawee County and the Lenawee

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Broadcasting Company, will hold a dedication ceremony on January 7th, 2004, for the new Adrian NOAA Weather Radio Station WNG-647 (162.450MHz).

- **NOAA Weather Radio Dedication in Sandusky**
  The National Weather Service, in conjunction with Acheson Ventures and Semco Energy, will hold a dedication ceremony for the new Sandusky NOAA Weather Radio Station WNG-582 (162.450MHz).
- **Winter 2003-2004 Outlook**
  Mother Nature is reluctant to tip her hand about the Winter of 2003-2004: Outlook for the 2003-2004 winter season for Southeast Michigan.
- **Strong Storm System November 12th-13th**
  A strong low pressure system tracked across the Great Lakes November 12th-13, bringing severe weather ahead of it and strong winds behind it. There was a confirmed F1 tornado in Tuscola County and numerous high wind reports across Southeast Michigan.
- The 2003 Summer Review for Southeast Michigan, plus an outlook for the fall season.
- Remnants of Isabel bring rainfall to Southeast Michigan
- Preliminary storm report from the August 21st, 2003, severe weather episode.
- Mid-Summer 2003 Outlook Update for Southeast Lower Michigan - Overall a fairly comfortable summer is on track
- Preliminary storm report from the July 4th severe weather event.
- Summer 2003 Outlook for Southeast Lower Michigan
- Preliminary storm report and storm survey results from the June 8th, 2003, severe event. This event, exactly 50 years after the 1953 Flint-Beecher tornado, featured wind gusts to 74 mph in downtown Flint and a tornado over southern Genesee County. Here are a couple of satellite and radar images from the event.
- A Review of the 2002-2003 Winter Outlook and recent spring trends.
- Winter 2002-2003 Review: El Niño's reputed milder weather visited infrequently during the long, cold winter of 2002-2003.
- Summary of peak wind gusts from the May 11th, 2003, high wind event.
- Preliminary storm report from the May 5th, 2003, severe weather episode. Also, satellite and radar imagery from the episode.
- Snowfall totals from the April 7th, 2003, winter storm.
- Snowfall totals from the March 4th-5th, 2003, winter storm (text or graphic)
- Flood stages for the River Raisin near Techumseh and Adrian to be raised
- Snowfall totals from the February 22-23, 2003, winter storm (text or graphic)
- 2002 Annual Climatological Summaries for Detroit and Flint
- Map of snowfall totals from the January 2nd, 2003, snow event
- Lake Effect Snow Event from November 26, 2002
- Experimental marine forecast graphics are available for Lakes Huron and St. Clair.

- Winter outlook for 2002-2003: Strong El Niños bring mild and relatively dry winters to Southeast Michigan, but what of the weak to moderate El Niños?
- Severe weather statistics for Southeast Michigan (1995-2001)
- The 2002 Summer Review for Southeast Michigan
- The 2002 Summer Outlook for Southeast Michigan.
- March Madness, weather-wise. The monthly climate summaries for Detroit and Flint describe the active storm systems and temperature swings that affected Southeast Lower Michigan last month.
- Snowfall totals from the March 26th storm are available in graphic and text formats. There was a very sharp cutoff to the snow; accumulations along the border between Washtenaw and Wayne counties ranged from 1.0" to 5.0" within 8 miles.
- A map of total snowfall from the March 1-2, 2002, winter storm is available. Up to 12 inches of snow fell across the Saginaw Valley on Friday Night and Saturday.
- A map of total snowfall from the February 25-26, 2002, winter storm is available. Up to 7 inches of snow fell across Southeast Michigan.
- A map of total snowfall from the January 30-31, 2002, winter storm is available here. Up to 12 inches of snow fell across Southeast Michigan from Wednesday morning to Thursday morning. (Graphic created at 12:30 p.m. 1/31/2002; a text version of the data is also available)
- Snowfall totals map from the January 16th, 2002 storm.
- This article gives some insight into some notable weather during previous Christmas seasons in Southeast Lower Michigan.
- A new Automatic Weather Station can be found on Lake St Clair. Read about it here.
- First Weather Warning issued November 8th, 1870. Read about this historical event.
- The outlook for the Winter of 2001-02 for Southeast Michigan can be found here.
- Severe thunderstorms roared across portions of Southeast Lower Michigan on Wednesday October 24th. The damage survey can be found here.
- The complete story on the New Wind Chill Index can be found here.
- New Voices coming to NOAA Weather Radio.
- Concerned about the dry weather? Check out this web site. What is the definition of a drought? Locally written article about common summertime dry spells.
- Mayfly mating ritual over Lake St. Clair captured by NWS Doppler radar!
- 3 tornados moved across portions of Southeast Michigan during the afternoon of May 21st, 2001. The storm survey along with some radar pictures can be found here.
- May 12th, 2001 marked the 45th anniversary of a violent tornado that struck Flint. More information about this tornado can be found here. (in PDF format)
- Lake Breezes
- April 9th, 2001 severe weather event - a little discussion and some pictures.

- West Bloomfield F4 Tornado
- Cold IR tops
- Top 10 Weather Events of the 20th Century

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Government Weather Information Services

- Storm Prediction Center (SPC) Latest severe weather outlooks, watches, severe weather statistics and historical severe weather data
- Aviation Weather Center (AWC) Aviation weather products including airmets, sigmets, and terminal aerodrome forecasts (TAFs)
- Tropical Prediction Center This office is composed of the National Hurricane Center, Analysis and Forecast Branch, and the Technical Support Branch
- NOAA's National Data Buoy Center provides information about the meteorological observing platforms in the Atlantic, the Gulf of Mexico, and the Great Lakes
- Great Lakes Environmental Research Lab All about GLERL, including research activities and Coastwatch information
- National Severe Storms Laboratory (NSSL) NSSL has its headquarters in Norman, OK and is involved in the investigation of severe weather
- Center for the Analysis and Prediction of Storms (CAPS) concentrates on small-scale numerical weather prediction studies
- NOAA Defense Meteorological Satellite Program provides satellite images from polar orbiting satellites
- NOAA AVHRR Oceans Pathfinder Home Page has images of global sea surface temperature online
- Climate Prediction Center Long-Range Forecasts Climate and Long-Range prediction
- Introduction to METAR/TAF
- Systems Operations Center of the NWS
- Climate Diagnostic Center (CDC) Another NOAA Research Laboratory, CDC is working to identify the causes of climate variations. The CDC Map Room has some short-term products from NCEP and some long-term products from the CDC.

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Climate

- National Climatic Data Center (NCDC) the national storehouse for U.S. Weather and climatic data records.
- Midwestern Climate Center

World Weather

- Environment Canada - Canadian Meteorological Center
- Australian Bureau of Meteorology - Melbourne, Australia
- Netherlands Weather Royal Netherlands Meteorological Institute
- Germany's Weather via the Institute of Meteorology, Free University of Berlin

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Other Meteorological Sites

- Commercial Vendor Home Pages

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NWS Detroit/Pontiac Weather Glossary

This glossary not only contains general weather terms, but also definitions in the areas of marine, fire weather, hydrology, aviation, and climatology. We also added definitions explaining what the various National Weather Service products, advisories, watches, and warnings mean. Finally, an "Acronym and Abbreviation Section" was added so that our users will be able to decipher the many abbreviations and acronyms that we use in our forecast discussions and aviation weather forecasts. We hope that you will find this glossary useful in understanding the weather and our products!

Acknowledgments: Thanks to the many individuals who provided input to this glossary.

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Welcome to the Detroit/Pontiac Forecast Office's Homepage

What We Do

A Look Into Your NWS Office
A brief look into National Weather Service operations at your White Lake office. Files are available in different media formats:
(WMV: 2MB file | MPEG: 6MB file | Flash: 2MB file)

The Detroit/Pontiac Forecast Office is located in White Lake Michigan, about 10 miles northwest of Pontiac. We issue public forecasts and long-fuse warnings (winter storm watches and warnings, flash flood watches, etc.) for Southeast Lower Michigan counties. We also issue short-fuse warnings (tornado, severe thunderstorm, flash flood warnings, etc.), aviation forecasts, short-term forecasts, and hydrological forecasts and warnings. Our marine responsibility includes routine forecasts and warnings for lakes Huron and St. Clair, as well as nearshore forecasts (within 5 miles of the shore) and special marine warnings and statements for the lakeshore that is adjacent to our county warning area.

Additional ways to get weather information

In addition to obtaining weather information from our homepage, our latest forecasts and warnings as well as climatological information are available 24 hours a day on NOAA Weather Radio. Our broadcast reaches a radius of approximately 40 miles from the transmitter sites.

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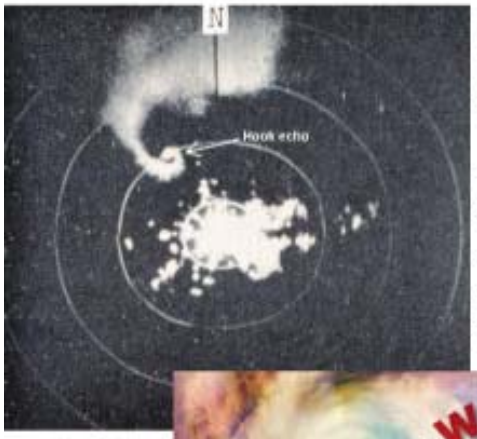
Beecher 50th Anniversary Commemoration

1953 Beecher Tornado

Welcome to the 50th Anniversary Commemoration Web Site of the June 8th, 1953 Flint-Beecher Tornado



On June 8, 1953, the deadliest tornado in Michigan history struck the northern Flint community of Beecher - killing 116 and injuring 844 along it's path.

To commemorate the event and promote severe weather awareness, the pages within describe some of the events of that day, advances in the science of tornado prediction, survivor stories, and various news accounts of the event.

A commemoration ceremony, open to the public will be held at Noon, Sunday, June 8th at the Beecher High School Auditorium near the corner of Saginaw St, and Coldwater Rd.

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