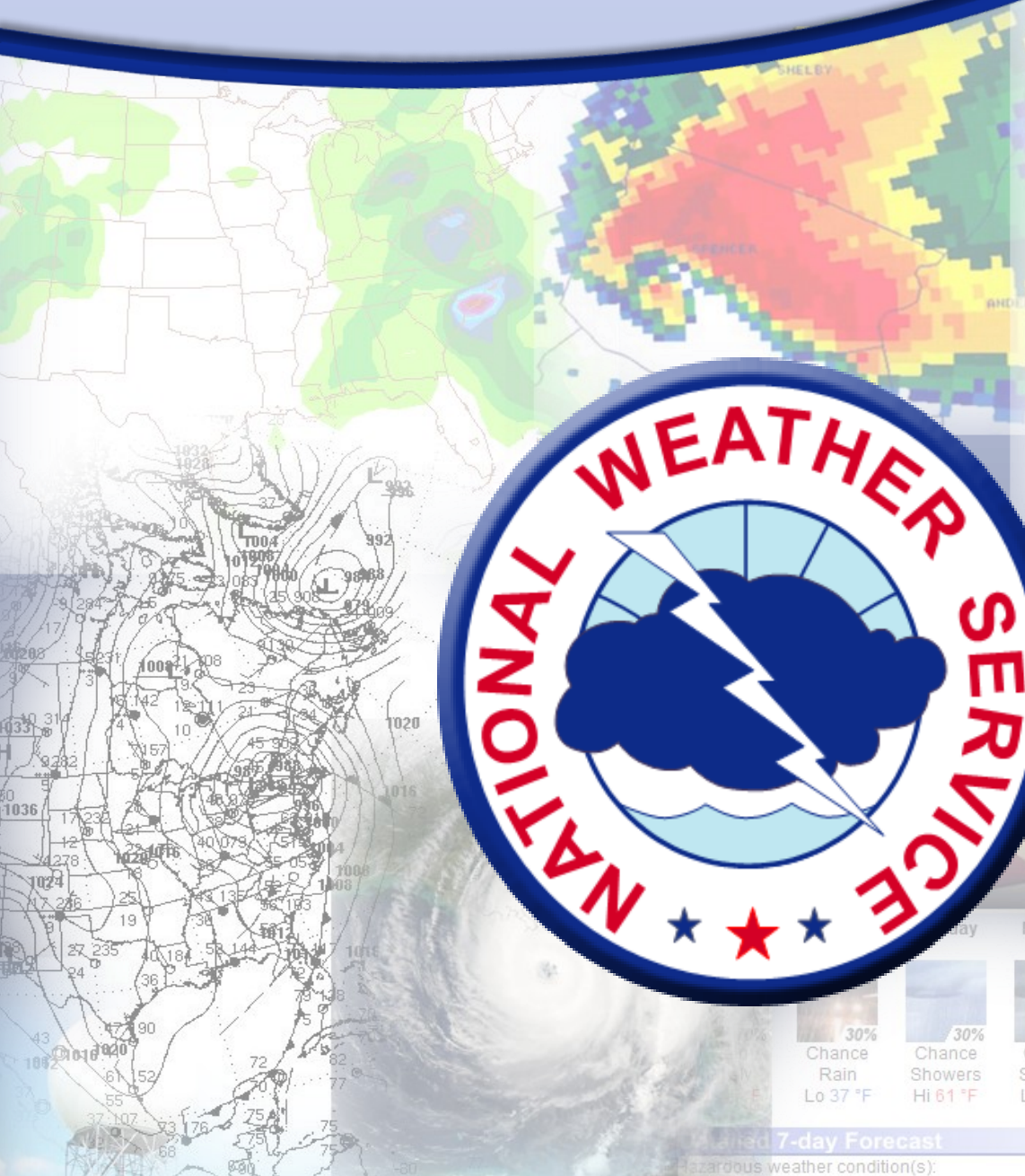


National Weather Service Reference Guide



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[00:35:54] <nws-
[00:42:24] <nwsbot@nwschat.weather.gov/
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very heavy snowfall rates now and IF
central ia. airport just called with 1.9 i
[02:53] <nw-
@nwschat

Day	Monday Night	Tuesday
30% Chance Rain Lo 37 °F	30% Chance Showers Hi 61 °F	50% Chance Showers Lo 46 °F

7-day Forecast
Hazardous weather condition(s):

Short Term Forecast

This Afternoon: Rain likely, mainly before 4pm. Mostly cloudy, with a high near 45. West wind around 8 mph. Chance of precipitation is 70%.

Tonight: A chance of rain before 7pm. Patchy fog after 7pm. Otherwise, partly cloudy, with a low around 37. Southwest wind around 5 mph becoming calm. Chance of precipitation is 30%.

Monday: A chance of showers after 1pm. Areas of fog before 5am. Otherwise, mostly cloudy, with a high near 61. Calm wind becoming south between 4 and 7 mph. Chance of



Purpose of this Document

The National Weather Service (NWS) provides many products and services which can be used by other governmental agencies, Tribal Nations, the private sector, the public and the global community. The data and services provided by the NWS are designed to fulfill users' needs and provide valuable information in the areas of weather, hydrology and climate. In addition, the NWS has numerous partnerships with private and other government entities. These partnerships help facilitate the mission of the NWS, which is to protect life and property and enhance the national economy. This document is intended to serve as a reference guide and information manual of the products and services provided by the NWS on a national basis.

Editor's note: Throughout this document, the term "county" will be used to represent counties, parishes, and boroughs. Similarly, "county warning area" will be used to represent the area of responsibility of all offices.



The local forecast office at Buffalo, New York, January, 1899.

The local National Weather Service Office in Tallahassee, FL, present day.



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1. What is the National Weather Service?

The National Weather Service (NWS) is a Federal agency under the National Oceanic and Atmospheric Administration (NOAA). Both NOAA and the NWS are agencies of the United States Department of Commerce (DOC). Formerly known as the Weather Bureau until January 1971, the NWS is comprised of meteorologists, hydrologists, hydro-meteorological technicians, climatologists, electronics technicians, computer specialists and management personnel. The NWS provides weather products and services in three major areas:

- 1.) Official weather and water watches, advisories and warnings
- 2.) Data collection and weather/water forecasts
- 3.) Climate data and forecasts



Department of Commerce (DOC)

www.commerce.gov



National Oceanic and Atmospheric Administration (NOAA)

www.noaa.gov



National Weather Service (NWS)

www.weather.gov

Users of NWS Products and Services

NWS data and products form a national informational database infrastructure that can be used by other government agencies, the media, the private sector and the general public.



National Weather Service Mission Statement

The National Weather Service (NWS) provides weather, water and climate data, forecasts and warnings for the protection of life and property and the enhancement of the national economy.



View of inundated areas in New Orleans following the breaking of levees surrounding the city as the result of Hurricane Katrina in 2005.

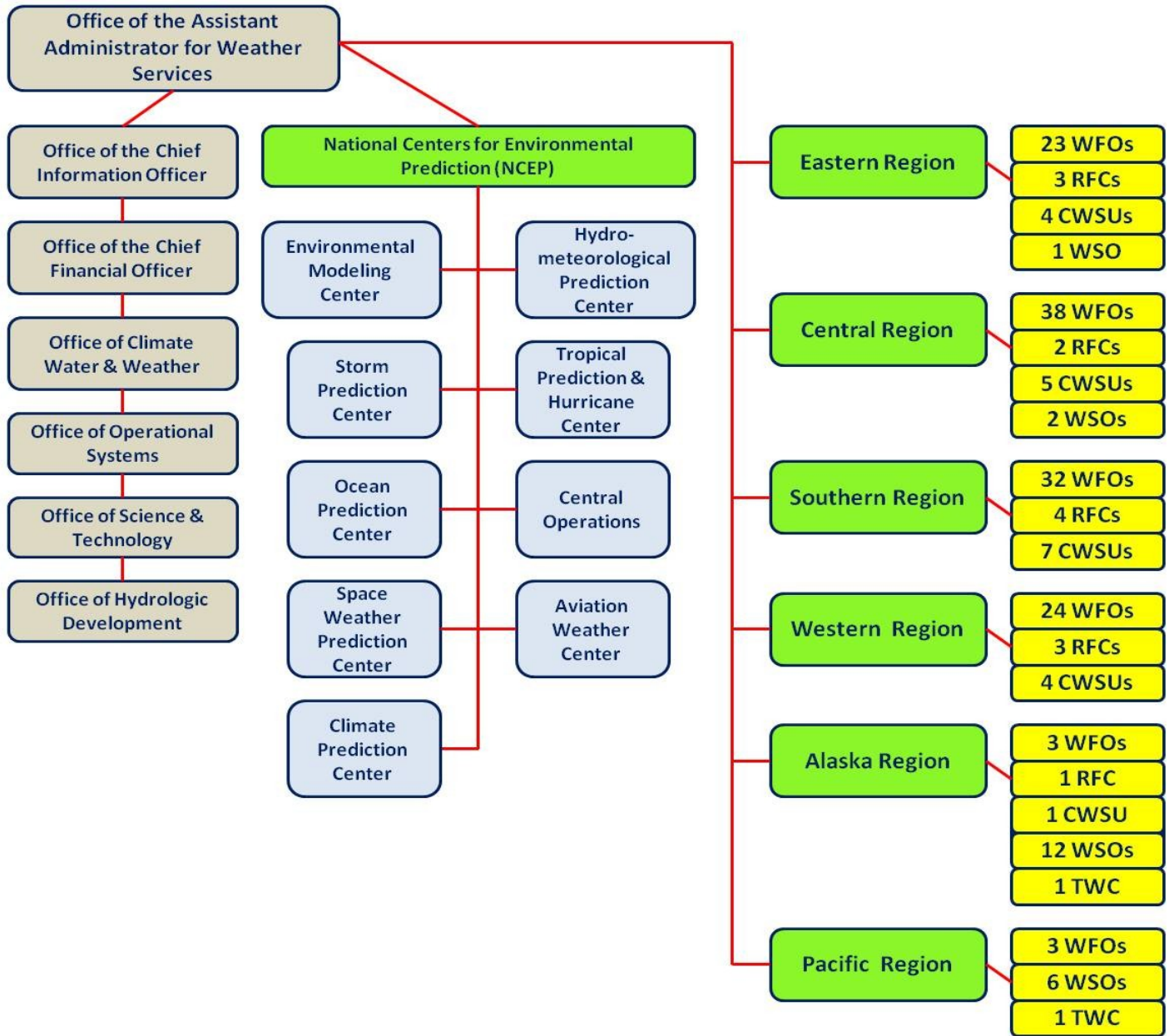


Washington DC metro area snowstorm February 5-6, 2010.

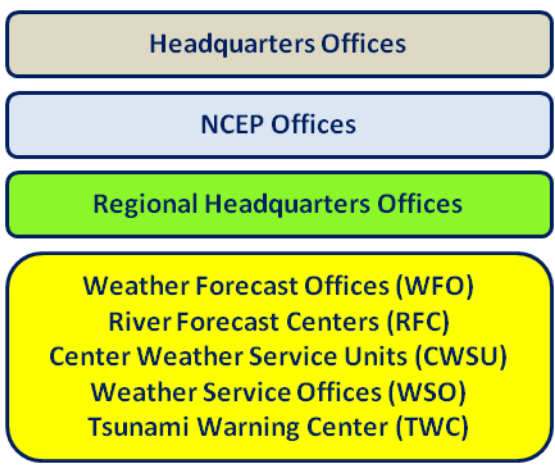


Aftermath of the Parkersburg, IA tornado, May 25, 2008.

NWS Organizational Structure

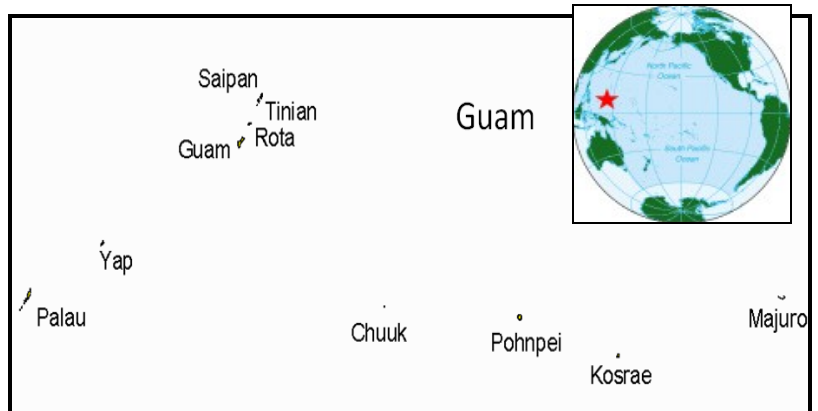
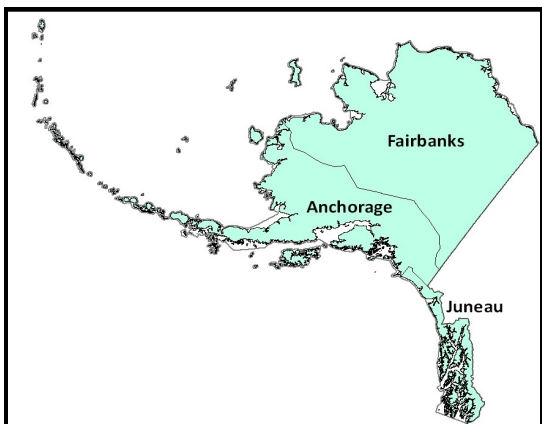
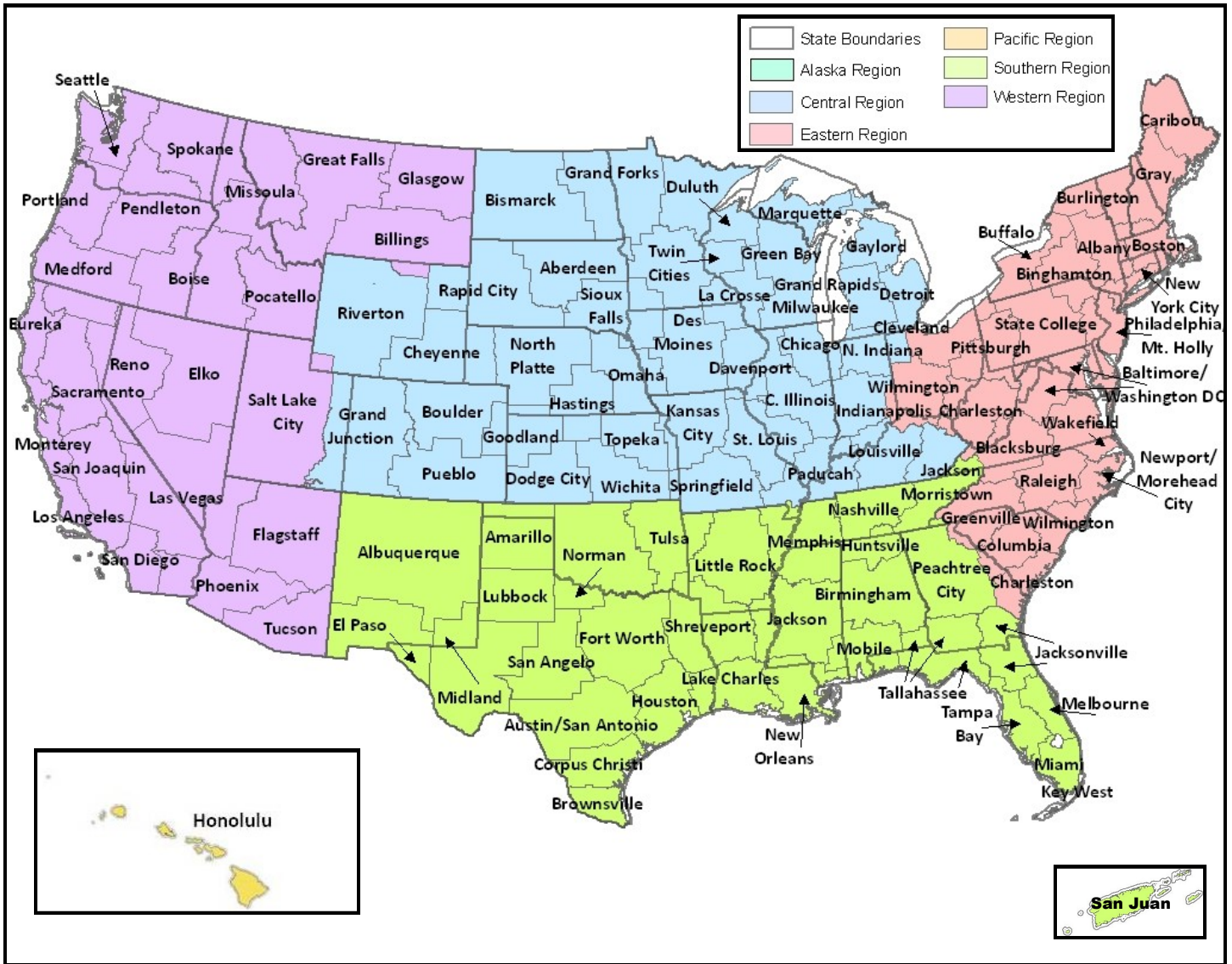


- ◆ 4,800 NWS Employees
- ◆ 123 Weather Forecast Offices
- ◆ 13 River Forecast Centers
- ◆ 21 Center Weather Service Units
- ◆ 21 Weather Service Offices
- ◆ 2 Tsunami Warning Centers
- ◆ 9 NCEP Centers
- ◆ 6 Regional Headquarters



County Warning Areas (CWA)

Each WFO is given an area of responsibility, known as a County Warning Area or CWA for most forecast offices. The CWAs include the 564 Federally recognized Tribal governments. Alaska office areas are simply referred to as Areas of Responsibility and are comprised of boroughs. There are 123 WFOs in the NWS, which span the continental US, Alaska, Hawaii, Guam and Puerto Rico. All WFOs are responsible for issuing products and providing services to the counties in their CWA.



WFO IDs by State

Alabama	BMX Birmingham	HUN Huntsville	MOB Mobile
Alaska	AFC Anchorage	AFG Fairbanks	AJK Juneau
American Samoa	STU Pago Pago		
Arizona	FGZ Flagstaff	PSR Phoenix	TWC Tucson
Arkansas	LZK Little Rock		
California	EKA Eureka	LOX Los Angeles	STO Sacramento
	SGX San Diego	MTR San Francisco	HNX San Joaquin Valley
Colorado	BOU Denver/Boulder	GJT Grand Junction	PUB Pueblo
Florida	JAX Jacksonville	KEY Key West	MLB Melbourne
	MFL Miami	TAE Tallahassee	WMZ Tampa Bay Area
Georgia	FFC Atlanta		
Guam	GUM Guam		
Hawaii	HNL Honolulu		
Idaho	BOI Boise	PIH Pocatello/Idaho Falls	
Illinois	ILX Central Illinois	LOT Chicago	
Indiana	IND Indianapolis	IWX Northern Indiana	
Iowa	DMX Des Moines	DVN Quad Cities	
Kansas	DDC Dodge City	GLD Goodland	TOP Topeka
	ICT Wichita		
Kentucky	JKL Jackson	LMK Louisville	PAH Paducah
Louisiana	LCH Lake Charles	LIX New Orleans	SHV Shreveport
Maine	CAR Caribou	GYX Portland/Gray	
Massachusetts	BOX Boston		
Michigan	DTX Detroit	APX Grand Rapids	MQT Marquette
	APX Gaylord		
Minnesota	DLH Duluth	MPX Minneapolis	
Mississippi	JAN Jackson		
Missouri	EAX Kansas City	SGF Springfield	LSX St. Louis
Montana	BYZ Billings	GGW Glasgow	TFX Great Falls
	MSO Missoula		
Nebraska	GID Hastings	LBF North Platte	OAX Omaha
Nevada	LKN Elko	VEF Las Vegas	REV Reno
New Jersey	PHI Philadelphia/Mt. Holly		
New Mexico	ABQ Albuquerque		
New York	ALY Albany	BGM Binghamton	BUF Buffalo
	OKX New York City		
North Carolina	MHX Newport/Morehead City	RAH Raleigh/Durham	ILM Wilmington
North Dakota	BIS Bismarck	FGF Grand Forks	
Ohio	CLE Cleveland	ILN Wilmington	
Oklahoma	OUN Oklahoma City/Norman	TSA Tulsa	
Oregon	MFR Medford	PDT Pendleton	PQR Portland
Pennsylvania	CTP State College	PHI Philadelphia	PBZ Pittsburgh
Puerto Rico	SJU San Juan		
South Carolina	CHS Charleston	CAE Columbia	GSP Greenville
South Dakota	ABR Aberdeen	UNR Rapid City	FSD Sioux Falls
Tennessee	MRX Knoxville	MEG Memphis	OHX Nashville
Texas	AMA Amarillo	EWX Austin/San Antonio	BRO Brownsville
	CRP Corpus Christi	FWD Dallas/Fort Worth	EPZ El Paso
	HGX Houston/Galveston	LUB Lubbock	MAF Midland/Odessa
	SJT San Angelo		
Utah	SLC Salt Lake City		
Vermont	BTV Burlington		
Virginia	LWX Baltimore/Washington	RNK Blacksburg	AKQ Wakefield
Washington	SEW Seattle/Tacoma	OTX Spokane	
West Virginia	RLX Charleston		
Wisconsin	GRB Green Bay	ARX La Crosse	MKX Milwaukee
Wyoming	CYS Cheyenne	RIW Riverton	

NWS Weather Forecast Office (WFO) Staff

NWS forecast offices operate 24 hours a day, 365 days a year. At each WFO, roughly one third of the personnel on station are comprised of managers and support staff. The tables below show the different positions in each of these categories. The other two thirds of the staff are comprised of forecasters and technicians. Management, program leaders and electronics technicians all work a typical daytime Monday through Friday schedule. On the other hand, the forecasters and hydro-meteorological technicians work rotating shifts to make sure the office is staffed 24 hours a day. Typically, there are two or three forecasters/hydro-meteorological technicians on shift at a time. However, during periods of active weather, such as severe weather outbreaks, extra staff may be utilized to support operations.

Management

Meteorologist-in-Charge (MIC)
Electronics Systems Analyst (ESA)
Science and Operations Officer (SOO)
Warning Coordination Meteorologist (WCM)
Data Acquisition Program Manager (DAPM) (some offices)

Support Staff

Administrative Assistant (ASA)
Information Technology Officer (ITO)
Service Hydrologist (some offices)
Observation Program Leader (OPL) (some offices)

Operational Staff

Senior Forecasters (4-6 per office)
General Forecasters (4-6 per office)
Meteorologist: Interns (1-4 per office)
Hydro-Meteorological Technicians (1-4 per office)
Electronics Technicians (2-3 per office)

These positions are described in greater detail in the next two pages

NWS WFO Staff

Meteorologist-in-Charge (MIC)

The MIC carries full managerial, supervisory and technical responsibility for the provision of weather warnings, forecasts, services and support activities within the area served by the WFO, and for the conduct of important scientific development work which is undertaken in an operational weather forecast environment.

Electronics Systems Analyst (ESA)

The ESA serves as the site's lead technical focal point for maintenance on all electronic systems and electronic equipment for assigned local and remote areas and serves as the immediate supervisor for the site's field maintenance electronics staff.

Science and Operations Officer (SOO)

The SOO is in place to ensure the scientific integrity of the products and services provided to the public by the WFO and also to lead or participate in joint research projects and developmental efforts conducted with any collocated university/research center. The SOO is expected to initiate and oversee the transfer of new technologies from the research community to the operational environment, to promote the development of local forecast techniques, to establish professional staff enrichment activities and to evaluate and improve the professional operational activities of the office.

Warning Coordination Meteorologist (WCM)

The WCM serves as the principal interface between the WFO and the users of WFO products and services in leading the effort to ensure their evaluation, adjustment and improvement. The WCM is fully responsible for planning, coordinating, and carrying out the WFO area-wide public awareness program designed to educate the public to ensure the mitigation of death, injury and property damage or loss caused by severe natural hydrometeorological events. The WCM also leads and coordinates WFO staff efforts and provides direction, guidance, instructions and assistance to the staff in the conduct of weather service operations.

Data Acquisition Program Manager (DAPM)

The DAPM supervises a technical staff in activities which can be divided into three major categories: Data management and acquisition, public service and user interaction and forecaster assistance. The incumbent supervises a technical staff comprised of three or four hydro-meteorological technicians or interns. The DAPM schedules these employees, makes work assignments, assigns work priorities and adjusts work as necessary. The DAPM evaluates the work performance of the technical staff, counsels employees concerning their performance, conduct and work progress, evaluates their training needs and recommends significant personnel actions. An office has a DAPM or Observation Program Leader (described on next page), not both.

Administrative Assistant (ASA)

The ASA is the principal administrative assistant to the MIC and performs a wide range of administrative functions for the staff management team. The ASA performs technical aspects of all administrative programs and activities for the office related to budget, funds control, purchasing, procurement requests, contract monitoring, bankcard, property, vehicles, travel, training, personnel actions, time and attendance, mail, office supplies and equipment, etc.

Information Technology Officer (ITO)

The ITO establishes and performs tasks necessary to plan, design, develop, acquire, document, test, implement, integrate, maintain, or modify systems for solving problems or accomplishing work processes by using computers. This includes analyzing and evaluating work concerned with integrated systems of computer programs and/or computer equipment. The ITO applies available technologies and basic management principles to adapt computer methods to a variety of subject matter situations. The ITO also oversees/performs equipment installation or relocation, testing and acceptance processes and responds to and resolves problems with software, hardware and systems management.

Service Hydrologist (SH)

The Service Hydrologist is responsible for providing the primary NWS hydrologic support and interface to the state emergency management and other water resources-related agencies. The hydrologist serves as the "resident expert" on WFO hydrometeorological technologies as they relate to mesoscale hydrologic forecast problems and their application to meeting the diverse requirements existing in the designated support area.

Observation Program Leader (OPL)

The OPL ensures that a full range of technical support and assistance is provided for WFO operations and other basic activities, especially the incorporation of timely, high quality observational data into WFO forecast and warning decision-making processes. The high quality observational data is used extensively to support NOAA's climate mission. The OPL is a team leader of a staff for data management, acquisition and quality and user interaction. The incumbent also assists forecasters during the forecast process. An office has a DAPM or an OPL, not both.

Senior Forecaster

The Senior Forecaster serves as shift leader, routinely supervising at least one General Forecaster and one Hydro-meteorological Technician or Intern. The Senior Forecaster ensures the provision of general weather information, warnings, advisories and forecasts to the general public and special user groups in the WFO service area. The Senior Forecaster is responsible for all NWS service products, warnings and advisories produced on the shift and for their coordination with other NWS offices. The forecaster leads and coordinates WFO staff efforts and provides direction, guidance, instructions and assistance to the shift staff. During an assigned shift, the forecaster is responsible for integrating all meteorological data available from a variety of sources, and for analyzing and assessing the current and forecast weather situation at both the synoptic and mesoscale levels. The forecaster devises and formulates all necessary warning, advisory and forecast products assigned to his/her forecast "desk", with emphasis on meeting the needs of the user.

General Forecaster

The General Forecaster provides general weather information, warnings, advisories, aviation and public forecasts to the general public and to special user groups in the WFO service area. The forecaster is responsible for the coordination of NWS products, warnings and forecasts with other staff on duty. During an assigned shift, the forecaster is responsible for integrating all meteorological data available from a variety of sources, and for analyzing and assessing the current and forecast weather situation at both the synoptic and mesoscale levels. The forecaster devises and formulates all necessary warning, advisory and forecast products assigned to his/her forecast "desk", with emphasis on meeting user needs.

Meteorologist Intern

The Intern is a meteorological trainee, involved in forecasting and interpretive studies and/or conducting related projects and programs. The Intern adapts general forecasts to conform to observed local weather phenomena and prepares warnings and advisories. Once qualified, the Intern warns or alerts general public of immediate danger situations such as hurricanes, tornadoes and other severe storms by issuing local statements, warnings and advisories in accordance with procedures. The intern also retrieves and evaluates climatological data from standard data sources and analyzes and reports data using standard statistical methods and procedures.

Hydro-Meteorological Technician (HMT)

The HMT provides a full range of technical support and assistance to shift operations of the WFO. Those activities include: forecaster assistance, data management and acquisition, public service and user interaction. The HMT assists the Data Acquisition Program Manager (DAPM) or the Observing Program Leader (OPL) in planning, developing, monitoring, managing, assuring and controlling the quality of numerous mesoscale data sources in the WFO area.

Electronics Technician (ET)

The ET provides field maintenance technical services (e.g., installation, maintenance, troubleshooting, repair, calibration) and related support for a wide range of complex electronic, electro-mechanical, data acquisition, communications equipment and standalone and networked computer systems. The ET implements nationally issued technical orders (e.g., system/equipment modification, software upgrade) issued by higher levels; plans and conducts complex tests and analyzes results. The ET also provides Information Technology (IT) support in the administration, monitoring, operation and maintenance of the site's computer systems, Local Area Networks (LANs), Wide Area Networks (WANs) and associated hardware and software.

River Forecast Center (RFC) Staff

Hydrologist-in-Charge (HIC)

The HIC provides oversight for all RFC activities and the technical aspects of hydrologic services in his/her area of responsibility. The HIC is involved in the many cooperative efforts with other NWS offices as well as water management and hydrologic-oriented agencies outside the NWS. The HIC manages the RFC involvement in these areas and provides overall direction of the staff effort given to maintaining and improving a variety of RFC services to WFOs and outside authorities and agencies.

Hydrologist: Development and Operations (DOH)

The DOH provides direction for integrated implementation and operational support for the high levels of technology employed in the RFC. Under the direction of the HIC, the DOH interacts in a collaborative effort with the Hydrologic Research Laboratory (HRL) and the Hydrologic Operations Division (HOD), as well as with the regional headquarters to support the movement toward more advanced hydrologic modeling systems and data analysis. The DOH has overall responsibility for assessment of data and forecast systems deficiencies along with providing direction for system modifications and enhancements; oversight of the complex details associated with training for the RFC staff is also an important responsibility.

Service Coordination Hydrologist (SCH)

The SCH is a management level position at each of the RFCs designed to provide a more coordinated and consistent response in assessing user needs. The SCH is completely knowledgeable of new science and forecast methods with regards to RFC operations. The SCH also serves as manager of the RFC outreach programs in order to effectively provide maximum impact in fostering relationships between the RFC and cooperating agencies and partners.

Senior Hydromet Analysis and Support (SHAS) and Hydromet Analysis and Support (HAS)

Each RFC has one SHAS forecaster and two journeyman-level HAS forecasters, who are responsible for the Hydrometeorological Analysis and Support (HAS) function of the RFC. These forecasters lead the effort to facilitate effective utilization of large volumes of hydrometeorological information and forecast products in order to capitalize on technological improvements and scientific advances. Duties include: processing, quality control and assimilation of real-time hydro-meteorological data, especially radar-based precipitation fields; assimilation and quality control of hydrometeorological forecasts; analysis of upcoming hydrometeorological events; coordination with other NWS offices and cooperators, and production of hydrometeorological discussions and other coordination products.

Senior Hydrologist (SRHYD)

The Senior Hydrologist serves as the lead hydrologic forecaster for the day-to-day operations of the RFC. In addition, Senior Hydrologists have in-depth expertise in one or more specialty area such as flash flood hydrology, extended-range streamflow forecasting, hydrometeorological data systems, computer systems and advanced modeling techniques. Senior hydrologic forecasters apply their area of expertise towards the procedure development needs of the RFC. They also provide advice and training in their area(s) of expertise to hydrologic forecasters, HAS forecasters and hydrologic interns. SRHYDs also assist with the RFC HAS functions and are part of the HAS shift rotation.

Hydrologists (HYD)

Hydrologists perform the daily hydrologic operations of the RFC, including both hydrologic forecasting duties and operational support. Hydrologists collect, analyze, disseminate and manage networks of basic water resource data, such as information on reservoir and lake storage, ground water levels, and surface and ground water quality. The Hydrologist develops and modifies hydrologic procedures, models, techniques, and plans to ensure optimal use of technologies and data. The Hydrologist performs daily hydrologic forecast functions including short-range forecasting during high water and flood events, stage forecasts, daily forecasts, river velocity forecasts, etc. The Hydrologist performs long-range hydrologic forecasting to include spring snowmelt, flood outlooks, river volume, etc.

Note: RFCs also employ a Secretary (SEC) and Hydrologic Technicians (HT), who perform functions very similar to the ASA and ET described in detail under the NWS WFO Staff.

National Weather Service Directives System (NDS)

The NWS Directives System translates the ideas, goals or principles contained in the NWS mission, vision, and strategic plan into action-related directives. Specific information about NWS forecasts, warnings and services provided can be found in the NDS.

NDS Organization

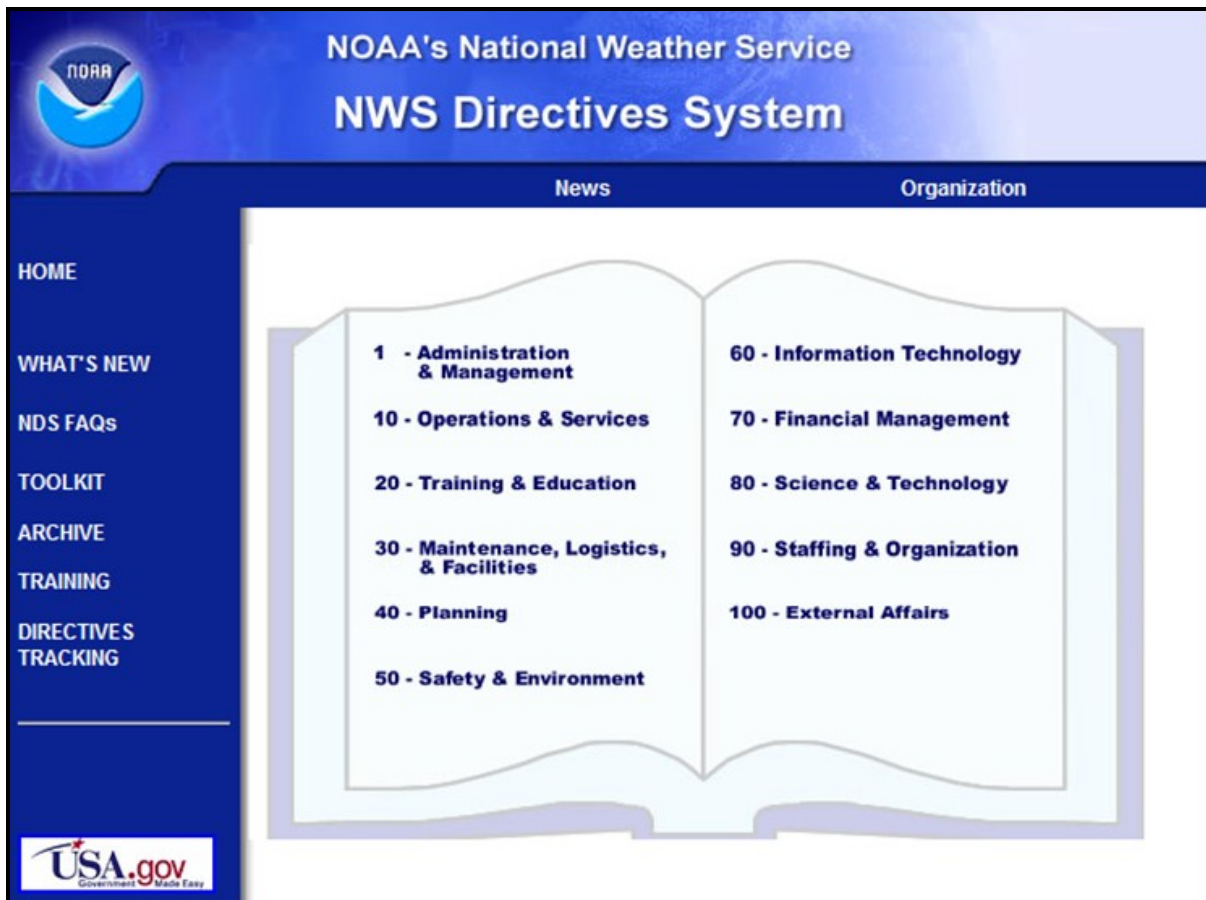
There are three types of directives in the NDS:

- **Policy Directives:** Statements of important, high-level direction that guides decisions and actions throughout the NWS.
- **Procedural Directives:** Describes how policy directives are implemented.
- **Supplements:** Contain detailed information on implementation of procedural directives.

Who Can Use NDS?

The NDS is accessible to everyone via the following web link. All users of NWS services, forecasts and warnings will find a wealth of detailed information in the NDS: <http://www.nws.noaa.gov/directives/index.htm>

Below is a snapshot of the NDS index. Most users will commonly use information on NWS “Operations and Services” found in Section 10.



2. Non-Routine Products and Services

One of the primary duties of the NWS forecast office is to highlight the potential for hazardous or dangerous weather conditions in the form of watches, warnings and advisories. This threat for hazardous or dangerous weather then needs to be communicated to the users in an efficient and convenient way. This section describes both the non-routine products issued and the non-routine services provided by the NWS.

Non-routine products and services of the NWS include all non-scheduled, event-driven services. The watch and warning program is one of the most important functions of the NWS. The NWS WFO is staffed 24 hours a day, 365 days a year and is able to shift quickly from routine duties to non-routine duties if conditions warrant.

The watch and warning program is not the only non-routine service provided. On-site or remote decision support services are provided for both weather and non-weather emergencies. Other examples of services include: storm damage surveys, teaching storm spotter training classes and participating in other outreach activities. These are described at length in the next section.

Product Categories

The NWS issues watches, warnings, advisories and statements to highlight the potential for hazardous or dangerous weather conditions. These special products, often referred to as ‘headlines,’ are issued when the forecaster feels there is sufficient confidence of an event occurring. The NWS warning program uses a multi-tiered concept to increase public awareness and promote proper response to the impending hazard. Generally, the multi-tiered concept conveys certain levels of urgency as described below:

1. **Outlook/Statement:** An outlook or statement is used to indicate that a hazardous weather event may develop but there is still uncertainty. Forecaster confidence of an event occurring is generally greater than 30 percent. This stage is intended to provide those who need it, considerable lead-time to prepare for the possible event.
2. **Watch:** A watch is used when the risk of a hazardous weather event has increased, but its occurrence, location and/or timing is still somewhat uncertain. Forecaster confidence is generally greater than 50 percent. This stage is intended to provide enough lead-time so those who need to set their plans in motion can do so.
3. **Warning/Advisory:** A warning or advisory is used when a hazardous weather event is imminent, or is already occurring. Forecaster confidence is generally greater than 80 percent. A warning is used for conditions that pose a threat to life and property. An advisory is used for less serious conditions that cause significant inconvenience and, if proper precautions are not taken, could pose a threat to life and property. When a warning or advisory is issued, preparations should be completed or rushed to completion.

Short-fuse convective warning philosophy: Generally, to issue a short-fused warning (e.g. Severe Thunderstorm Warning, Tornado Warning or Flash Flood Warning), forecasters prefer to have at least two out of the following three elements satisfied to warrant its issuance; atmospheric conditions support the hazard, radar signatures indicate a hazard or a credible severe weather spotter reports a hazard.

Headline categories: All headlines fall into nine categories: convective, winter weather, tropical, hydrologic, coastal flood, non-precipitation, marine, fire weather and other. A listing of these categories and their associated headlines are shown in the following tables.

Convective

Convective							
	Headline	Issuance Criteria	Typical Lead Time	VTEC Code	Product ID	Follow-up Product	Issued By
Watches	Severe Thunderstorm Watch	Conditions are favorable for thunderstorms containing 1 inch or larger hail and/or wind gusts of at least 58 mph (50 knots).	2 to 8 hours	SV.A	SELx	Watch County Notification	SPC (updates/cancellations issued by WFO)
	PDS Severe Thunderstorm Watch	Conditions are favorable for widespread, significant, non-tornadic thunderstorms. Example: convective winds greater than 75mph (65knots). <i>Note: "PDS" does not appear in the watch headline, but as a special line within the initial watch product.</i>	2 to 8 hours	SV.A	SELx	Watch County Notification	SPC (updates/cancellations issued by WFO)
	Tornado Watch	Conditions are favorable for thunderstorms producing tornadoes. Hail and strong winds are also possible.	2 to 8 hours	TO.A	SELx	Watch County Notification	SPC (updates/cancellations issued by WFO)
	PDS Tornado Watch	Conditions are favorable for thunderstorms producing destructive tornadoes. Hail and strong winds are also possible. Typically issued when there is a likelihood of multiple strong (damage of EF2 or EF3) or violent (damage of EF4 or EF5) tornadoes. <i>Note: "PDS" does not appear in the watch headline, but as a special line within the initial watch product.</i>	2 to 8 hours	TO.A	SELx	Watch County Notification	SPC (updates/cancellations issued by WFO)
Warnings	Severe Thunderstorm Warning	A thunderstorm producing 1 inch or larger hail and/or wind gusts of at least 58 mph (50 knots) is occurring or imminent.	10 to 30 minutes	SV.W	SVR	Severe Weather Statement	Local WFO
	Special Marine Warning	A thunderstorm producing 3/4 inch hail, and/or wind gusts to 34 knots and/or waterspouts. In addition, short duration, non-thunderstorm wind gusts to 34 knots.	30 to 90 minutes	MA.W	SMW	Marine Weather Statement	Local WFO
	Tornado Warning	A tornado has been reported or is highly likely to occur based on Doppler radar signatures.	10 to 30 minutes	TO.W	TOR	Severe Weather Statement	Local WFO
	Tornado Emergency	Added to tornado warning in exceedingly rare situations, when a severe threat to human life and catastrophic damage from a tornado is imminent or ongoing,	10 to 30 minutes	TO.W	TOR	Severe Weather Statement	Local WFO
Advisories	Significant Weather Advisory	Issued under the Special Weather Statement product for strong thunderstorms producing winds between 40 and 57 mph, and/or hail less than 1 inch in diameter, and/or frequent or continuous lightning and/or funnel clouds or cold air funnels.	Up to 1 hour	N/A	SPS	Special Weather Statement	Local WFO

Tropical

Tropical							
	Headline	Issuance Criteria	Typical Lead Time	VTEC Code	Product ID	Follow-up Product	Issued By
Watches	Hurricane Watch	Hurricane conditions (sustained winds of 74 mph or higher) are possible within the specified coastal area. Because hurricane preparedness activities become difficult once winds reach tropical storm force, the hurricane watch is issued 48 hours in advance of the anticipated onset of tropical-storm-force winds.	48 hours	HU.A	TCV	Tropical Cyclone Public Advisory and Hurricane Local Statement	NHC/CPHC (Watch), WFO (HLS)
	Hurricane Wind Watch	Hurricane force winds (sustained winds of 74 mph or higher) are possible inland due to a landfalling hurricane.	48 hours	HI.A	HLS	Hurricane Local Statement	Local WFO
	Tropical Storm Watch	Tropical storm conditions (sustained winds of 39 to 73 mph) are possible within the specified coastal area within 48 hours in the eastern and central Pacific and Atlantic Basins, 36 hours in the remainder of the western North Pacific .	48 hours, except 36 hours in the western North Pacific	TR.A	TCV	Tropical Cyclone Public Advisory and Hurricane Local Statement	NHC/CPHC/ JTWC (Watch), WFO (HLS)
	Tropical Storm Wind Watch	Tropical storm force winds (sustained winds of 39 to 73 mph) are possible inland due to a landfalling tropical cyclone.	48 hours	TI.A	HLS	Hurricane Local Statement	Local WFO
	Typhoon Watch	Typhoon conditions (sustained winds of 74 mph or higher) are possible within the specified coastal area within 36 hours (the naming convention changes from hurricane to typhoon west of the international date line in the Pacific Ocean).	36 hours	TY.A	HLS	Tropical Cyclone Public Advisory and Typhoon Local Statement	JTWC (Watch), WFO (HLS)
Warnings	Extreme Wind Warning	A landfalling hurricane or typhoon is expected to spread sustained surface winds of 115 mph or greater onshore within one hour. In order to be issued, the NHC, CPHC, or JTWC must designate the storm as a category 3 (115 mph or greater).	1 to 2 hours	EW.W	EWW	Severe Weather Statement	Local WFO
	Hurricane Warning	Hurricane conditions (sustained winds of 74 mph or higher) are expected somewhere within the specified coastal area. Because hurricane preparedness activities become difficult once winds reach tropical storm force, the hurricane warning is issued 36 hours in advance of the anticipated onset of tropical-storm-force winds.	36 hours	HU.W	TCV	Tropical Cyclone Public Advisory and Hurricane Local Statement	NHC/CPHC (Warning), WFO (HLS)
	Hurricane Wind Warning	Hurricane force winds (sustained winds of 74 mph or higher) are expected inland due to a landfalling hurricane.	36 hours	HI.W	HLS	Hurricane Local Statement	Local WFO
	Tropical Storm Warning	Tropical storm conditions (sustained winds of 39 to 73 mph) are expected within the specified coastal area within 36 hours in the eastern and central Pacific and Atlantic Basins, 24 hours in the rest of the Pacific.	36 hours	TR.W	TCV	Tropical Cyclone Public Advisory and Hurricane Local Statement	NHC/CPHC/ JTWC (Warning), WFO (HLS)
	Tropical Storm Wind Warning	Tropical storm force winds (sustained winds of 39 to 73 mph) are expected inland due to a landfalling tropical cyclone.	24 to 36 hours	TI.W	HLS	Hurricane Local Statement	Local WFO
	Typhoon Warning	Typhoon conditions (sustained winds of 74 mph or higher) are expected within the specified coastal area within 24 hours (the naming convention changes from hurricane to typhoon west of the international date line in the Pacific Ocean).	24 hours	TY.W	HLS	Tropical Cyclone Public Advisory and Typhoon Local Statement	JTWC (Warning), WFO (HLS)

Winter Weather

	Headline	Issuance Criteria	Typical Lead Time	VTEC Code	Product ID	Follow-up Product	Issued By
Watches	Blizzard Watch	Possibility of sustained winds or wind gusts above 35 mph causing falling and/or blowing snow to reduce visibilities below 1/4 mile for 3 hours or longer.	12 to 48 hours	BZ.A	WSW	Winter Weather Message	Local WFO
	Lake Effect Snow Watch	Possibility of heavy lake effect snow accumulations, generally more than 6 inches in 12 hours or 8 inches in 24 hours. (Specific criteria vary by office)	12 to 48 hours	LE.A	WSW	Winter Weather Message	Local WFO
	Wind Chill Watch	Possibility of very cold temperatures and brisk winds causing dangerously cold wind chills.	12 to 48 hours	WC.A	WSW	Winter Weather Message	Local WFO
	Winter Storm Watch	Possibility of accumulating snow, sleet, and/or freezing rain causing severe impacts to society and commerce.	12 to 48 hours	WS.A	WSW	Winter Weather Message	Local WFO
Warnings	Blizzard Warning	Sustained winds or frequent gusts above 35 mph causing falling and/or blowing snow to reduce visibilities below 1/4 mile for 3 hours or longer is imminent or occurring.	8 to 36 hours	BZ.W	WSW	Winter Weather Message	Local WFO
	Ice Storm Warning	Heavy ice accumulations of 1/4 inch or greater within 12 hours due to freezing rain are imminent or occurring. (Specific criteria vary by office)	8 to 36 hours	IS.W	WSW	Winter Weather Message	Local WFO
	Lake Effect Snow Warning	Heavy lake effect snow accumulations of generally more than 6 inches in 12 hours or 8 inches in 24 hours are imminent or occurring. (Specific criteria vary by office)	8 to 36 hours	LE.W	WSW	Winter Weather Message	Local WFO
	Wind Chill Warning	Very cold air temperatures and brisk wind causing dangerously cold wind chills is imminent or occurring. Hypothermia, frost bite or death is likely if proper precautions are not taken. (Specific criteria vary by office)	8 to 36 hours	WC.W	WSW	Winter Weather Message	Local WFO
	Winter Storm Warning	Heavy snow and/or sleet and ice accumulations are imminent or occurring. Society and commerce is expected to be greatly impacted. Precipitation may be accompanied by gusty wind. (Specific criteria vary by office)	8 to 36 hours	WS.W	WSW	Winter Weather Message	Local WFO
Advisories	Freezing Rain Advisory	Ice accumulations less than 1/4 inch within 12 hours due to freezing rain are imminent or occurring. (Specific criteria vary by office)	8 to 24 hours	ZR.Y	WSW	Winter Weather Message	Local WFO
	Lake Effect Snow Advisory	Lake effect snow accumulations generally more than 3 inches within 12 hours are imminent or occurring. (Specific criteria vary by office)	8 to 24 hours	LE.Y	WSW	Winter Weather Message	Local WFO
	Wind Chill Advisory	Cold temperatures and brisk wind causing hazardous wind chills are imminent or occurring. Hypothermia and frost bite are possible if proper precautions are not taken. (Specific criteria vary by office)	8 to 24 hours	WC.Y	WSW	Winter Weather Message	Local WFO
	Winter Weather Advisory	Snow and/or sleet and ice accumulations causing an inconvenience to society and commerce are imminent or occurring. Specific criteria varies greatly per region. (Specific criteria vary by office)	8 to 24 hours	WW.Y	WSW	Winter Weather Message	Local WFO

Hydrology

	Headline	Issuance Criteria	Typical Lead Time	VTEC Code	Product ID	Follow-up Product	Issued By
Watches	Flash Flood Watch	Rapidly developing and life-threatening flooding is possible due to a hydrologic event (e.g. heavy rain) or dam or levee failure.	6 to 24 hours	FF.A	FFA	Flash Flood Watch	Local WFO
	Flood Watch	Flood Watch (Areal): Flooding of land and/or rivers and streams is possible. Flood Watch (Forecast Point): Flooding is possible at a particular point on a river or stream.	6 to 48 hours	FA.A (areal), FL.A (forecast point)	FFA	Flood Watch	Local WFO
Warnings	Flash Flood Warning	A) Flash flooding is reported; and/or B) A dam or levee failure is imminent or occurring; and/or C) A sudden failure of a naturally-caused stream obstruction (including debris slide, avalanche, or ice jam) is imminent or occurring; and/or D) Precipitation capable of causing flash flooding is indicated by radar, rain gages, and/or satellite; and/or E) Precipitation as indicated by radar, rain gages, satellite and/or other guidance is capable of causing debris flows, particularly (but not only) in burn areas; and/or F) Local monitoring and prediction tools indicate flash flooding is likely; and/or G) A hydrologic model indicates flash flooding for locations on small streams.	30 minutes to 2 hours	FF.W	FFW	Flash Flood Statement	Local WFO
	Flash Flood Emergency	In exceedingly rare situations, when a severe threat to human life and catastrophic damage from a flash flood is imminent or ongoing.	30 minutes to 3 hours	FF.W	FFW	Flash Flood Statement	Local WFO
	Flood Warning	Human life and catastrophic damage from a flood is imminent or ongoing.	6 to 12 hours	FA.W (areal), FL.W (forecast point)	FLW	Flood Statement	Local WFO
Advisories	Flood Advisory	Flood Advisory (Areal/Forecast Point/Urban and Small Stream): Issued when flooding is expected to be of inconvenience, but not necessarily life-threatening.	30 minutes to 2 hours	FA.Y	FLS	Flood Statement	Local WFO

Coastal Flood

	Headline	Issuance Criteria	Typical Lead Time	VTEC Code	Product ID	Follow-up Product	Issued By
Watches	Coastal Flood Watch	Inundation of people, buildings and coastal structures on land at locations that, under normal conditions, are above the level of high tide is possible.	12 to 48 hours	CF.A	CFW	Coastal Hazard Message	Local WFO
	Lakeshore Flood Watch	Inundation of land areas along any of the Great Lakes over and above normal lake levels is possible.	12 to 48 hours	LS.A	CFW	Lakeshore Hazard Message	Local WFO
Warnings	Coastal Flood Warning	Inundation of people, buildings and coastal structures on land at locations that, under normal conditions, are above the level of high tide is imminent or occurring.	12 to 24 hours	CF.W	CFW	Coastal Hazard Message	Local WFO
	High Surf Warning	Breaking wave action that results in an especially heightened threat to life and property within the surf zone is imminent or occurring. Specific criteria varies by region. Not issued for the Great Lakes.	12 to 24 hours	SU.W	CFW	Coastal Hazard Message	Local WFO
	Lakeshore Flood Warning	Inundation of land areas along any of the Great Lakes over and above normal lake levels is imminent or occurring.	12 to 24 hours	LS.W	CFW	Lakeshore Hazard Message	Local WFO
Advisories	Coastal Flood Advisory	Minor flooding of coastal areas is possible within 12 hours.	12 hours	CF.Y	CFW	Coastal Hazard Message	Local WFO
	High Surf Advisory	Breaking wave action posing a threat to life and property within the surf zone is imminent or occurring. Specific criteria varies by region. Not issued for the Great Lakes.	12 hours	SU.Y	CFW	Coastal Hazard Message	Local WFO
	Lakeshore Flood Advisory	Minor flooding of lakeshore areas is possible within 12 hours.	12 hours	LS.Y	CFW	Lakeshore Hazard Message	Local WFO

Marine

	Headline	Issuance Criteria	Typical Lead Time	VTEC Code	Product ID	Follow-up Product	Issued By
Watches	Gale Watch	Conditions are favorable for a gale force wind event of sustained winds or frequent gusts of 34 knots (39 mph) to 47 knots (54 mph).	24 to 48 hours	GL.A	MWW	Marine Weather Message	Local WFO
	Hazardous Seas Watch	Conditions are favorable for a hazardous seas event to meet or exceed Hazardous Seas Warning criteria.	24 to 48 hours	SE.A	MWW	Marine Weather Message	Local WFO
	Heavy Freezing Spray Watch	Conditions are favorable for a heavy freezing spray event to meet local Heavy Freezing Spray Warning criteria.	24 to 48 hours	UP.A	MWW	Marine Weather Message	Local WFO
	Hurricane Force Wind Watch	Conditions are favorable for a hurricane force wind event of sustained winds or frequent gusts of 64 knots (74 mph) or greater.	24 to 48 hours	HF.A	MWW	Marine Weather Message	Local WFO
	Storm Watch	Conditions are favorable for a storm force wind event of sustained winds or frequent gust of 48 knots (55 mph) to 63 knots (73 mph).	3 to 6 hours	TS.A	TSU	Tsunami Statement	West Coast/ Alaska and Pacific Tsunami Warning Cen-
	Tsunami Watch	Issued to alert emergency management officials and the public of an event which may later impact the watch area. Danger level not yet known -> Stay alert for more info	3 to 6 hours	TS.A	TSU	Tsunami Statement	West Coast/ Alaska and Pacific Tsunami Warning Centers
Warnings	Ashfall Warning	Airborne ash plume resulting in ongoing deposition at the surface. Ashfall may originate directly from a volcanic eruption or from the resuspension (by wind) of a significant amount of relic ash.	12 to 36 hours	MH.W	MWW	Marine Weather Message	Local WFO
	Gale Warning	Sustained surface winds, or frequent gusts, in the range of 34 knots (39 mph) to 47 knots (54 mph) inclusive, either predicted or occurring, and not directly associated with a tropical cyclone.	12 to 36 hours	GL.W	MWW	Marine Weather Message	Local WFO
	Hazardous Seas Warning	Wave heights and/or wave steepness values meeting or exceeding locally defined warning criteria.	12 to 36 hours	SE.W	MWW	Marine Weather Message	Local WFO
	Heavy Freezing Spray Warning	Usually issued for an accumulation of freezing water droplets on a vessel at a rate of 2 cm per hour or greater caused by some appropriate combination of cold water, wind, cold air temperature, and vessel movement. Local criteria may vary.	12 to 36 hours	UP.W	MWW	Marine Weather Message	Local WFO
	Hurricane Force Wind Warning	Sustained winds, or frequent gusts, of 64 knots (74 mph) or greater, either predicted or occurring, and not directly associated with a tropical cyclone.	12 to 36 hours	HF.W	MWW	Marine Weather Message	Local WFO
	Storm Warning	Sustained surface winds, or frequent gusts, in the range of 48 knots (55 mph) to 63 knots (73 mph) inclusive, either predicted or occurring, and not directly associated with a tropical cyclone.	12 to 36 hours	SR.W	MWW	Marine Weather Message	Local WFO
	Tsunami Warning	A potential tsunami with significant, widespread inundation is imminent or expected. Inundating wave possible -> Full evacuation suggested	Less than 3 hours	TS.W	TSU	Tsunami Message	West Coast/ Alaska and Pacific Tsunami Warning Cen-

Marine

Advisories	Headline	Issuance Criteria	Typical Lead Time	VTEC Code	Product ID	Follow-up Product	Issued By
	Ashfall Advisory	Airborne ash plume resulting in ongoing deposition at the surface. Ashfall may originate directly from a volcanic eruption or from the resuspension (by wind) of a significant amount of relic ash.	12 to 36 hours	MH.Y	MWW	Marine Weather Message	Local WFO
	Brisk Wind Advisory	Sustained wind speeds or frequent gusts of 20 to 33 knots (locally defined) expected for ice-covered waters.	12 to 36 hours	BW.Y	MWW	Marine Weather Message	Local WFO
	Dense Fog Advisory	Widespread or localized fog reducing visibilities to 1 nautical mile or less (regionally or locally defined).	12 to 36 hours	MF.Y	MWW	Marine Weather Message	Local WFO
	Dense Smoke Advisory	Widespread or localized smoke reducing visibilities to 1 nautical mile or less (regionally or locally defined).	12 to 36 hours	MS.Y	MWW	Marine Weather Message	Local WFO
	Freezing Spray Advisory	Light to moderate accumulation of ice is expected on vessels.	12 to 36 hours	UP.Y	MWW	Marine Weather Message	Local WFO
	Low Water Advisory	Water levels are significantly below average and may cause impact to safe marine navigation. The need for this product is locally determined.	12 to 36 hours	LO.Y	MWW	Marine Weather Message	Local WFO
	Small Craft Advisory	Sustained wind speeds or frequent gusts of 20 to 33 knots (locally defined) and/or seas or waves 4 feet and greater (locally defined).	12 to 36 hours	SC.Y	MWW	Marine Weather Message	Local WFO
	Small Craft Advisory for Hazardous Seas	Wind speeds are lower than small craft advisory criteria, yet waves or seas are potentially hazardous due to wave period, steepness, or swell direction. The criteria is locally defined.	12 to 36 hours	SW.Y	MWW	Marine Weather Message	Local WFO
	Small Craft Advisory for Rough Bar	Waves in or near bars are hazardous to mariners due to the interaction of swell, tidal or river currents in relatively shallow water. Threshold criteria are locally defined and are specific to local geographic areas, and are based upon parameters such as wave steepness, wind speed and direction, and local bathymetry.	12 to 36 hours	RB.Y	MWW	Marine Weather Message	Local WFO
	Small Craft Advisory for Winds	When wave heights and/or wave steepness are lower than Small Craft Advisory criteria, yet wind speeds are potentially hazardous.	12 to 36 hours	SI.Y	MWW	Marine Weather Message	Local WFO
	Tsunami Advisory	A potential tsunami which may produce strong currents or waves dangerous to those in or near the water. Strong currents likely -> Stay away from the shore	Less than 3 hours	TS.Y	TSU	Tsunami Message	West Coast/ Alaska and Pacific Tsunami Warning Centers

Non-Precipitation

	Headline	Issuance Criteria	Typical Lead Time	VTEC Code	Product ID	Follow-up Product	Issued By
Watches	Excessive Heat Watch	Conditions are favorable for an excessive heat event to meet or exceed Excessive Heat Warning criteria.	24 to 72 hours	EH.A	NPW	Weather Message	Local WFO
	Freeze Watch	Minimum shelter temperatures below 32°F are possible during the locally defined growing season which poses a threat to plants and crops.	18 to 48 hours	FZ.A	NPW	Weather Message	Local WFO
	Hard Freeze Watch	Minimum shelter temperatures may drop to 28°F or lower during the locally defined growing season which poses an especially high risk to plants and crops.	18 to 48 hours	HZ.A	NPW	Weather Message	Local WFO
	High Wind Watch	Conditions are favorable for sustained winds of at least 40 mph for one hour or longer, or wind gusts of at least 58 mph of any duration.	18 to 48 hours	HW.A	NPW	Weather Message	Local WFO
Warnings	Dust Storm Warning	Widespread or localized blowing dust reducing visibilities to 1/4 mile or less. Sustained winds of 25 mph or greater are usually required.	6 to 24 hours	DS.W	NPW	Weather Message	Local WFO
	Excessive Heat Warning	Heat index values (HI) are forecast to meet or exceed locally defined warning criteria for at least two consecutive days (Typical values: 1) Maximum daytime HI >= 105°F north to 110°F south and 2) Minimum nighttime lows >= 75°F.) Criteria may vary widely in different parts of the country due to climate variability and the effect of excessive heat on local population.	12 to 48 hours	EH.W	NPW	Weather Message	Local WFO
	Freeze Warning	Minimum shelter temperatures below 32°F are expected during the locally defined growing season which poses a threat to plants and crops.	12 to 36 hours	FZ.W	NPW	Weather Message	Local WFO
	Hard Freeze Warning	Minimum shelter temperatures are expected to drop to 28°F or lower during the locally defined growing season which poses an especially high risk to plants and crops.	12 to 36 hours	HZ.A	NPW	Weather Message	Local WFO
	High Wind Warning	Sustained winds of at least 40 mph for one hour or longer, or wind gusts of at least 58 mph of any duration are expected.	12 to 36 hours	HW.W	NPW	Weather Message	Local WFO
Advisories	Air Stagnation Advisory	Atmospheric conditions stable enough to cause air pollutants to accumulate in a given area. Criteria developed in conjunction with the local or state EPA and the product issued at their request.	12 to 36 hours	AS.Y	NPW	Weather Message	Local WFO
	Ashfall Advisory	Airborne ash plume resulting in ongoing deposition at the surface. Ashfall may originate directly from a volcanic eruption or from the resuspension (by wind) of a significant amount of relic ash.	12 to 36 hours	AF.Y	NPW	Weather Message	Local WFO
	Blowing Dust Advisory	Widespread or localized blowing dust reducing visibilities to one mile or less, but greater than 1/4 mile. Winds of 25 mph or greater are usually required.	12 to 36 hours	DU.Y	NPW	Weather Message	Local WFO

Non-Precipitation

Non-Precipitation							
	Headline	Issuance Criteria	Typical Lead Time	VTEC Code	Product ID	Follow-up Product	Issued By
Advisories	Dense Fog Advisory	Widespread or localized fog reducing visibilities to 1/4 mile or less.	12 to 36 hours	FG.Y	NPW	Weather Message	Local WFO
	Dense Smoke Advisory	Widespread or localized smoke reducing visibilities to 1/4 mile or less.	12 to 36 hours	SM.Y	NPW	Weather Message	Local WFO
	Freezing Fog Advisory	Very light ice accumulation resulting from freezing fog (no visibility requirement).	12 to 36 hours	ZF.Y	NPW	Weather Message	Local WFO
	Frost Advisory	Minimum shelter temperature forecast to be 33 to 36°F during the locally defined growing season, on nights with good radiational cooling conditions conducive for frost formation (e.g., light winds and clear skies).	12 to 36 hours	FR.Y	NPW	Weather Message	Local WFO
	Heat Advisory	Heat Index values forecast to meet or exceed locally defined advisory criteria for one to two days (Typical values: 1) Maximum daytime HI \geq 100°F north to 105°F south 2) Minimum nighttime lows \geq 75°F). Criteria may vary widely in different parts of the country due to climate variability and the effect of excessive heat on local population.	12 to 36 hours	HT.Y	NPW	Weather Message	Local WFO
	Lake Wind Advisory	Sustained wind speeds of 20 to 29 mph (or locally defined) lasting for 1 hour or longer for regions which have a significant user community. The need for this product is locally determined.	12 to 36 hours	LW.Y	NPW	Weather Message	Local WFO
	Wind Advisory	Sustained wind speeds of 30 to 39 mph lasting for 1 hour or longer or locally defined.	12 to 36 hours	WI.Y	NPW	Weather Message	Local WFO

Fire Weather

Fire Weather							
	Headline	Issuance Criteria	Typical Lead Time	VTEC Code	Product ID	Follow-up Product	Issued By
Watches	Fire Weather Watch	A high potential for the development of a locally defined Red Flag Event. Red Flag Event criteria are determined by coordination between WFO personnel and land management users in the WFO fire weather service area.	12 to 96 hours	FW.A	RFW	Fire Weather Message	Local WFO
Warnings	Red Flag Warning	The combination of dry fuels and weather conditions support extreme fire danger and/or fire behavior. These conditions alert land management agencies to the potential for widespread new ignitions or control problems with existing fires, both of which could pose a threat to life and property.	12 to 36 hours	FW.W	RFW	Fire Weather Message	Local WFO

Other

Warnings	Headline	Issuance Criteria	Typical Lead Time	VTEC Code	Product ID	Follow-up Product	Issued By
	Airport Weather Warning	Varies per airport, but some examples include: a. Surface wind gusts >40 knots b. Onset of freezing rain c. Cloud to ground lightning within 5 miles of the airport d. Thunderstorms with >½ inch hail e. Onset of heavy snow	Varies per type of event, but generally as long as possible	N/A	AWW	Airport Weather Warning	Local WFO

Statements

Headline	Primary Use	VTEC Code	Product ID	Issued By
Air Quality Alert	Air quality messages issued by local or state agencies during times of poor air quality that are relayed by the NWS.	N/A	AQA	Local or State Agencies
Coastal Hazard Message	Updates coastal hazards along the coast.	N/A	CFW	Local WFO
Fire Weather Message	Updates Fire Weather Watches and Red Flag Warnings.	N/A	RFW	Local WFO
Flash Flood Statement	Updates Flash Flood Warnings.	N/A	FFS	Local WFO
Flood Statement	Updates areal and river Flood Warnings.	N/A	FLS	Local WFO
Hurricane/Typhoon Local Statements	Relays tropical cyclone information, including valid tropical cyclone watches and warnings to the public, media and local decision makers of potential or actual storm effects due to tropical cyclones.	N/A	HLS	Local WFO
Lakeshore Hazard Message	Updates hydrologic hazards along the lakeshores of the Great Lakes.	N/A	CFW	Local WFO
Marine Weather Message	Updates marine headlines.	N/A	MWW	Local WFO
Public Information Statement	An alphanumeric message used to distribute information regarding hydrometeorological events; public education; National Weather Service (NWS) service changes, limitations or interruptions; and special guidelines for interpreting NWS data.	N/A	PNS	Local WFO
Rangeland/Grassland Fire Danger Statement	A miscellaneous product which provides advisory information on rangeland and/or grassland fire potential or conditions. Land management and NWS personnel establishes the contents, format, frequency of issuance, dissemination, etc.	N/A	RFD	Local WFO
Severe Weather Statement	Updates Severe Thunderstorm Warnings and Tornado Warnings.	N/A	SVS	Local WFO
Special Weather Statement	Issued for ongoing or imminent weather conditions significant enough to warrant special highlighting, but less severe than advisory or warning criteria. Also may be used to highlight possible warning or advisory conditions beyond their normal issuance range.	N/A	SPS	Local WFO
Tsunami Information Statement	Information that an earthquake has occurred, or that a tsunami warning, watch or advisory has been issued for another section of the ocean. In most cases, information statements are issued to indicate there is no threat of a destructive tsunami and to prevent unnecessary evacuations as the earthquake may have been felt in coastal areas.	N/A	TIB	West Coast/ Alaska and Pacific Tsunami Warning Centers
Watch County Notification Message	Cancels, extends the valid time or extends in area portions of one or more convective watches.	N/A	WCN	Local WFO
Weather Message	Updates non-precipitation headlines.	N/A	NPW	Local WFO
Winter Weather Message	Updates winter headlines.	N/A	WSW	Local WFO

Other Non-Routine Products

Product	Primary Use	VTEC Code	Product ID	Issued By
Earthquake Information Report	A statement containing information regarding a local earthquake occurrence.	N/A	EQR	Local WFO
Hazardous Weather Outlook	Issued daily to inform the public, media and emergency managers of the potential for winter weather, fire weather, non-precipitation, convective weather, tropical, marine or flood hazards.	N/A	HWO	Local WFO
Free Text Message	A text message sent by the WFO to indicate an interruption in radar products. The message typically explains why radar products are currently unavailable and, if known, an estimated time the products will return.	N/A	FTM	Local WFO
Mesoscale Convective Discussion	Issued to convey to CONUS WFOs, the public, media and emergency managers the current meteorological reasoning for short term hazardous weather concerns. Issued for severe thunderstorm potential and/or trends, heavy rainfall, heavy snowfall, freezing rain, blizzards, and convective outlook upgrades.	N/A	MCD	SPC
Preliminary Local Storm Report	Issued to provide the Storm Prediction Center (SPC), adjacent WFOs, the public, media and emergency managers with reported observations of hazardous weather events.	N/A	LSR	Local WFO
Record Event Report	A statement of the new record and the previous record it broke. Climatologically significant elements such as high and low temperatures, and extreme precipitation may be included in a record event report.	N/A	RER	Local WFO
Short Term Forecast	A means of communicating plain language forecasts of short term weather and appropriate hydrological conditions within 6 hours of issuance. Examples include: to discuss the evolution of convective and stratiform precipitation, winter weather, tropical cyclone landfall events, marine events, fog, significant winds, blowing dust and extreme temperatures (excessive heat or cold).	N/A	NOW	Local WFO
Administrative Message	Issued by local, state, or federal agencies and relayed by the National Weather Service as a means of quickly accessing the Emergency Alert System for non-meteorological emergencies.	N/A	ADR	Local, State, or Federal Agencies but relayed by WFO
Avalanche Watch		N/A	AVA	
Avalanche Warning		N/A	AVW	
Child Abduction Emergency		N/A	CAE	
Civil Danger Warning		N/A	CDW	
Civil Emergency Message		N/A	CEM	
Earthquake Warning		N/A	EQW	
Evacuation Immediate		N/A	EVI	
Fire Warning		N/A	FRW	
Hazardous Materials Warning		N/A	HMW	
Local Area Emergency		N/A	LAE	
Law Enforcement Warning		N/A	LEW	
Nuclear Power Plant Warning		N/A	NUW	
Radiological Hazard Warning		N/A	RHW	
Shelter In Place Warning		N/A	SPW	
911 Telephone Outage Emergency		N/A	TOE	
Volcano Warning		N/A	VOW	

Extreme Weather Wording

NWS meteorologists from the local WFOs on up to the Storm Prediction Center (SPC) are trained to recognize when particularly dangerous storms are likely in an event. When this happens, watches and warnings for the extreme situations need to stand out from other watches and warnings, and their wording needs to be enhanced so that everyone quickly recognizes the urgency of the situation.

Tornado Emergency

A Tornado Emergency is enhanced wording embedded in a tornado warning or follow-up message during significant tornado occurrences in highly populated areas. A Tornado Emergency generally means that significant, widespread damage is expected with a large, strong to violent tornado.

It is hoped that the rare use of this phrase will illicit quick and decisive action on the part of the general public and decision-makers. The term was first used during the May 3, 1999 tornado outbreak that spawned the Moore F5 tornado just south of Oklahoma City, Oklahoma.

Below is an abbreviated example.

```
SEVERE WEATHER STATEMENT
NATIONAL WEATHER SERVICE JACKSON MS
1203 PM CDT SAT APR 24 2010
...A TORNADO WARNING REMAINS IN EFFECT UNTIL 1230 PM CDT FOR CENTRAL
YAZOO COUNTY...
...THIS IS A TORNADO EMERGENCY FOR THE WARNED AREA...
AT 1203 PM CDT...NATIONAL WEATHER SERVICE METEOROLOGISTS AND STORM
SPOTTERS WERE TRACKING A LARGE AND EXTREMELY DANGEROUS WEDGE
TORNADO. THIS TORNADO WAS LOCATED 6 MILES NORTH OF SATARTIA MOVING
NORTHEAST AT 60 MPH.
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Flash Flood Emergency

A Flash Flood Emergency is enhanced wording embedded in follow-up messages issued after an initial flash flood warning during significant, severe, flooding occurrences in local or widespread situations. A Flash Flood Emergency generally means that significant, local or widespread damage is expected.

The enhanced wording involves the use of the phrase “Flash Flood Emergency” within the FFS. It is hoped that the rare use of this phrase will illicit quick and decisive action on the part of the general public and decision-makers.

An abbreviated example follows.

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...A FLASH FLOOD WARNING REMAINS IN EFFECT UNTIL 530 PM CDT FOR
ANDERSON COUNTY...

.A FLASH FLOOD EMERGENCY FOR ANDERSON COUNTY...

AT 200 PM CDT...TRAINED WEATHER SPOTTERS AND PUBLIC REPORTED
WIDESPREAD FLOODING OVER ANDERSON COUNTY. KNOWN WATER RESCUES ARE
ONGOING WEST OF GARNETT. EMERGENCY CREWS ARE UNABLE TO FIND A ROUTE
FROM WESTPHALIA TO GARNETT. NUMEROUS PAVED AND GRAVEL ROADS HAVE
BEEN REPORTED TO BE UNDER WATER ACROSS THE COUNTY...SEVERAL AREAS 1
TO 2 FEET DEEP. MEASURED STORM TOTAL PRECIPITATION AMOUNTS RANGE
FROM 14 TO 16 INCHES OF RAINFALL DURING THE PAST THREE DAYS. WITH
```

Verification and Performance Goals

A marked shift in the way performance was managed within the federal government occurred during the Clinton administration through the 1993 passing of the Government Performance and Results Act (GPRA). GPRA addressed a broad range of concerns about government accountability and performance. Essentially, it requires government executives to focus on defining missions, setting goals, measuring performance and reporting accomplishments. This shifted management’s focus away from measuring “inputs” or how much work was being done to measuring “outputs” or results. Unlike other reforms that are primarily Executive Branch initiatives, GPRA is statutory; its performance measurement requirements are law.

For more information on NWS performance measures, please refer to NOAA’s NWS Chief Financial Officer web page at the following URL: http://www.weather.gov/cfo/program_planning/program_planning.htm.

Verification goals through fiscal year 2016:

GPRA Metric \ FY Goals	2010	2011	2012	2013	2014	2015	2016
Tornado Warnings Lead Time (min)	12	12	13	13	13	13	14
Tornado Warnings Accuracy (POD) (%)	70	70	72	72	72	72	73
Tornado Warnings False Alarm Ratio (FAR)(%)	72	72	74	74	74	74	73
Flash Flood Warnings Lead Time (min)	38	38	38	39	39	39	40
Flash Flood Warnings Accuracy (POD) (%)	72	72	72	73	73	73	74
Marine Wind Speed Forecast Accuracy (POD) (%)	69	69	70	70	70	71	71
Marine Wave Height Forecast Accuracy (POD) (%)	74	74	75	75	75	76	76
Winter Storm Warnings Lead Time (hrs)	16	16	16	16	17	17	18
Winter Storm Warnings Accuracy (POD) (%)	91	91	91	91	91	91	91
48-Hour Hurricane Forecast Track (miles)	107	106	102	100	98	96	94
48-Hour Hurricane Forecast Intensity (kts)	13	13	12	12	12	12	12
Aviation Forecast IFR Accuracy (POD) (%)	65	66	67	68	69	69	70
Aviation Forecast IFR False Alarm Ratio (FAR) (%)	42	41	40	39	38	38	37

POD = Probability of Detection	$\frac{\text{\# of Warned Events}}{\text{Total \# of Events}}$	FAR = False Alarm Ratio	$\frac{\text{\# of Warnings NOT Verified}}{\text{Total \# of Warnings}}$
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Impact-Based Decision Support Services

The NWS has an uncompromising commitment to public safety and works closely with public safety officials to ensure they understand the information provided in our products relating to hazardous weather. The area of impact based decision-support (sometimes referred to as IDSS) is an ever-changing regime of the NWS and will continue to be an important service provided by the NWS. These services are highly tied to emerging technologies and are constantly changing as current technology is refined or new technology is developed. The Incident Meteorologist or IMET is a key component of IDSS. The NWS sends IMETs or other forecasters to Incident Command Posts, Area Command and Emergency Operations Centers to work hand-in-hand with emergency personnel. If direct contact is not an option, there are a number of ways the NWS can communicate weather information and forecasts to public safety officials and emergency personnel, such as recorded multimedia briefings and virtual live briefings.

WCMs develop partnerships and link to local and state communications systems for the automated sharing of critical data. WCMs explore resource sharing with local Amateur Radio Emergency Services (ARES) and Radio Amateur Civil Emergency Service (RACES) amateur radio clubs. WCMs also promote existing dissemination systems including NOAA Weather Radio (NWR) All Hazards, Emergency Alert System (EAS), Emergency Managers Weather Information Network (EMWIN), NOAA Weather Wire Service (NWWS) and FEMA's National Warning System (NAWAS). The NWS works with its partners to reach new segments of the population by expanding innovative dissemination methods. This includes EMWIN retransmission, internet websites and non-NWS operated personal communication systems, such as pagers and cell phones.

A few of the IDSS utilities are listed on the following pages.



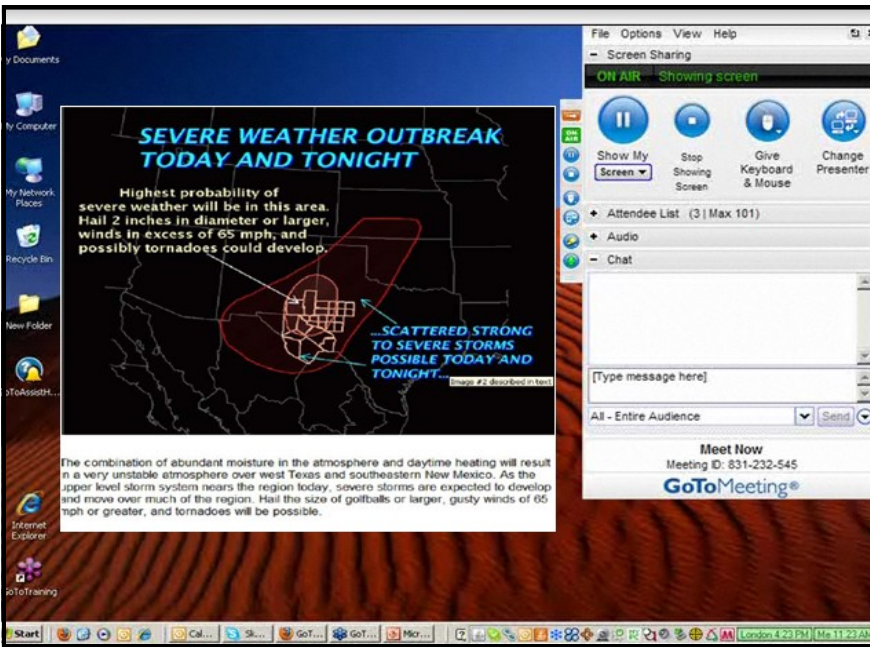
On Site at the Emergency Operations Center (EOC)

Information sharing between the NWS and members of the hazards community is critical for an effective warning program. WCMs promote the expansion of dissemination and communication systems. NWS offices work with state, tribal, and local officials, non-government organizations, the media and the private sector, to provide weather, water and climate information to assist those building disaster resistant communities. EOC activation for major events may require the presence of personnel from one or more NWS offices. Staffing duration could range from as little as 12 hours, to as much as several days or even a couple weeks.

On Site at the Incident

An IMET is always prepared to serve on an incident, especially during the normal fire season. Availability of the IMET will be determined by the local MIC and the IMET. In any given year, NOAA trains 10 to 15 new IMETs. To become an IMET, NWS meteorologists must complete a thorough training program, which includes course work, field training and attending the IMET Workshop. The IMET gives weather briefings to emergency personnel, including fire crews. IMETs are responsible for maintaining a weather watch, issuing weather alerts, conducting media interviews, providing briefings for the general public and assisting with fire investigations.



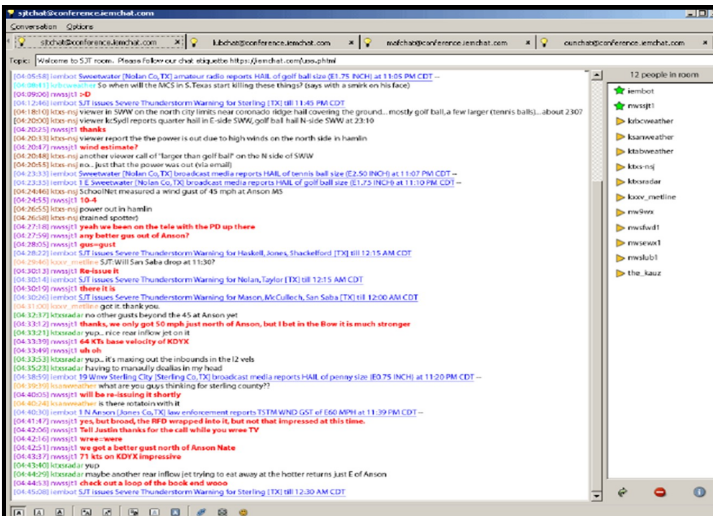
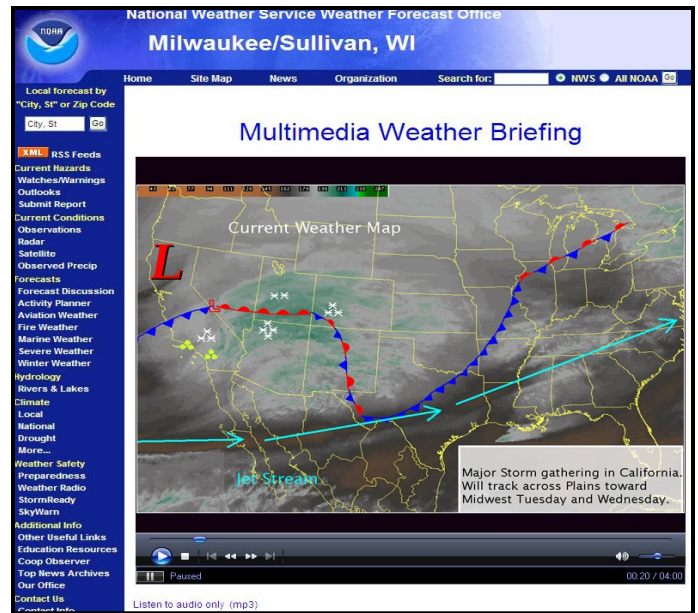


Virtual Live Briefing

Web conferencing tools allow the NWS to meet online rather than in a conference room. It is the easiest and most cost-effective way to organize and attend online meetings. Patented technology enables users to view any application running on a PC in real time. With the flexibility to meet in person or online, less travel is required. For most virtual tools, attendees can join meetings in seconds, without having to set up video feeds or webcams. Most allow for easy sharing of keyboard and mouse control or switch presenters.

Recorded Multimedia Briefing

The Multimedia Weather Briefing (MWB) is an internet-accessible multimedia file that provides information concerning hazardous weather events. The MWB offers a combined visual/auditory platform for supporting the planning activities of emergency response partners, tribal officials, and other key users, as well as the general public. MWB can be used to convey expected timing, location, reasoning and impacts associated with upcoming hazardous weather events, impending or current drought conditions, climate and hydrologic outlooks, etc. The purpose of the MWB is to serve as a decision assistance tool that can be used by emergency managers, first responders and other key decision makers. The briefings also serve as a means of conveying probabilities and other uncertainty information.



Chat/Instant Message Software

NWSChat is a tool developed as a means of direct communication between the NWS office and media, emergency managers, DNR and other specific partner organizations. The goal of NWSChat is for the users to pass on important information about current weather situations. The NWS office can provide information to the partners in chat that may be useful, but will not be specifically worded in a warning or other public product. Warnings and other products issued by the office are also automatically piped into the chat for quick viewing. More information on [Page 91](#).

Spot Forecast Request

Site-specific (spot) forecasts are issued by WFOs in support of wildfire management and natural resource management. These forecasts aid the land management and fire control agencies in protecting life and property during wildland fires, hazardous fuels reduction and rehabilitation and restoration of natural resources. Spot forecasts are also issued for hazardous materials incidents and other threats to public safety.

For more information on requesting a spot forecast, see [Page 33](#).

While NWS can provide support to public safety officials for special events, more specialized services are available from America's private weather industry, such as customized consulting services organized and packaged to help make decisions about how to plan and run the event.

RALEIGH NORTH CAROLINA SPOT FORECAST REQUEST
Required Elements in RED (*)

PROJECT NAME
 (*)Project Name: Chlorine Leak
 Wildfire WFU HAZMAT
 Prescribed Fire SAR
 Ignition Time: 2234 Station Local Time
 Date: 11/11/07

REQUESTING AGENCY
 (*)Requesting Agency: Emergency Management
 (*)Requesting Official: Commander
 (*)Phone Number: (919) 555-1212 Ext.
 FAX Number:
 Contact Person: Smith

REASON FOR SPOT FORECAST REQUEST
 (*)Must choose either Wildfire or one of the Non-Wildfire reasons
 Wildfire
 Non-Wildfire
 Under the Interagency Agreement for Meteorological Services (USFS, BLM, NPS, USFWS, EIA).
 State, tribal or local fire agency working in coordination with a federal participant in the Interagency Agreement for Meteorological Services.
 Essential to public safety, e.g. due to the proximity of population centers or critical infrastructure.

LOCATION
 (*)Lat: 35.83 (*)Elevation: Top: 425 Bottom: 430
 (*)Lon: 78.70 Drainage:
 7.5' Quad: (*)Aspect: None
 Size: (Acres)

FUEL
 Type:
 Sheltering
 Full
 Partial
 Unsheltered

Place	Elev	Time	Wind	Temp	Wetbulb	RH	Dewpt	Sky/Weather

PRIMARY FORECAST ELEMENTS
 TDA TMT TMR (Today, Tonight, Tomorrow)
 Sky / Weather
 Temperature
 Relative Humidity
 20 Foot Winds
 Smoke Dispersion

REMARKS
 Large chlorine leak from a train derailment. Unknown amount of material.
 Also need forecast rainfall chances and amounts for tonight.

Submit Changes Cancel Request Clear Form

These are just a few of the national or federal agencies the NWS partners with during incidents, such as wild fires, chemical spills and hazardous weather.

Federal Emergency Management Agency www.fema.gov		US Geological Survey www.usgs.gov	
US Department of Agriculture/Forest Service www.fs.fed.us		National Park Service www.nps.gov	
US Department of Interior Bureau of Land Management www.id.blm.gov		US Bureau of Reclamation www.usbr.gov	
National Interagency Fire Center www.nifc.gov		American Red Cross www.redcross.org	
International Association of Emergency Managers www.iaem.com		USDA Natural Resources Conservation Service www.id.nrcs.usda.gov	
Bureau of Indian Affairs www.bia.gov/		US Army Corps of Engineers www.usace.army.mil	
US Environmental Protection Agency www.epa.gov/			

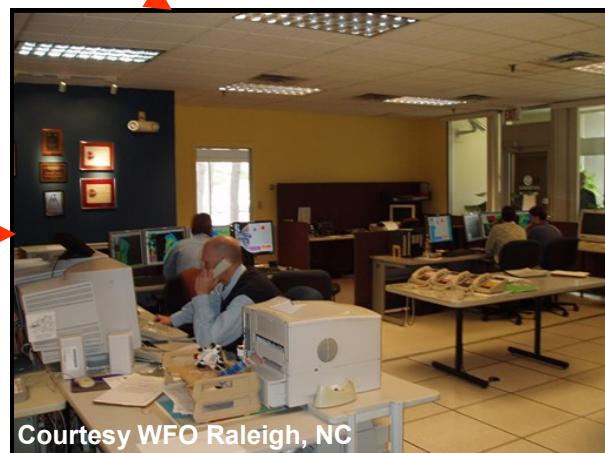
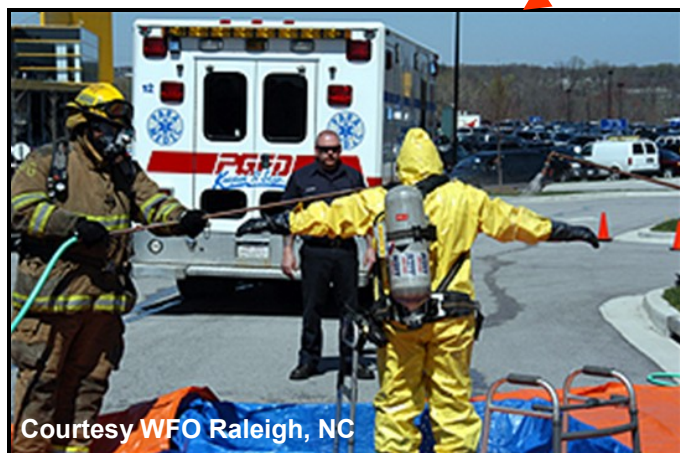
Incident Response Example from WFO Raleigh, NC

1. Emergency Management/Responder requests weather assistance
2. Senior Forecaster helps to determine if off-site or on-site response is necessary based upon magnitude
3. If on-site support is required:
Incident Support Meteorologist is contacted and dispatched to scene with on-scene dispatched equipment
4. Senior Forecaster will schedule relief personnel for deployments > 12 hours
5. If off-site support is required:
Local forecast staff will initiate off-site support duties
6. Senior Forecaster may call in additional staff if necessary



Emergency Response Personnel

NWS Weather Forecast Office



Requesting a Spot Forecast

The NWS Spot Forecast Request and Dissemination System provides users from authorized agencies a way to request fire weather spot forecasts from the NWS. The spot forecasts center around a daily spot forecast "monitor" page that shows all the spot forecast requests for a particular office on a particular day. The main spot forecast page updates every minute and shows the location and status of any spot forecasts that have already been requested for that day. You can view these other forecasts, as well as request a new spot forecast of your own.

Nearly all Weather Forecast Offices websites (www.weather.gov) have a link to a fire weather page. Fire weather pages are a great place to start.

Example: To request a spot forecast for a location in the Rapid City, SD forecast area, follow the link:

<http://spot.nws.noaa.gov/cgi-bin/spot/spotmon?site=unr>

→ in this example "unr" is the site ID for WFO Rapid City...it can be replaced with any office ID.

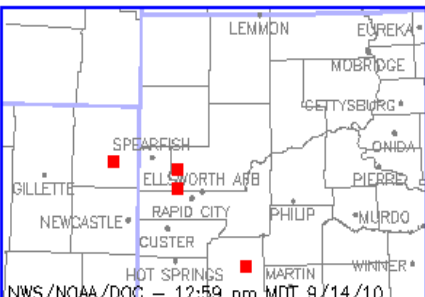
[Rapid City Fire Weather Webpage](#)

NWS RAPID CITY SPOT FORECASTS

for
Tuesday
Sep 14 2010

[CALENDAR](#)

[Submit a new Spot Request](#)



NWS/NOAA/DOC - 12:59 pm MDT 9/14/10
Pending Question Complete

Name	Ignition Time	Status
PCK RX	8:00 am MDT	COMPLETE at 12:57 pm MDT
PCK	8:00 am MDT	COMPLETE at 6:57 am MDT
Sharps	8:45 am MDT	COMPLETE at 8:53 am MDT
SUNDANCE RX	9:00 am MDT	COMPLETE at 2:46 pm MDT
fort meade rx#3 unit e	9:30 am MDT	COMPLETE at 7:43 am MDT

Each request has its own webpage where all the information about that request is displayed, including maps, information about the request and the forecast. Sensitive information about the request (such as phone numbers or names of contact persons) is NOT visible by everyone, but only on the computer that made the original request and NWS computers.

To view the webpage for any forecast, go to the main spot forecast webpage, click either on the name of the forecast listing or the dot on the map. This page will also automatically update every minute so that when new information becomes available, it can be seen immediately.

The image to the right is an example of the form filled out to request a spot forecast. The elements highlighted in red are required to complete your spot forecast.

NWS RAPID CITY SPOT FORECAST REQUEST

Required Elements in RED (*)

PROJECT NAME

(*)Project Name:

Wildfire HAZMAT
 Prescribed Fire SAR

Ignition Time: Mountain Local Time
 Central Local time

Date:

REQUESTING AGENCY

(*)Requesting Agency:

(*)Requesting Official:

(*)Phone Number: Ext.

FAX Number:

Contact Person:

REASON FOR SPOT FORECAST REQUEST

(*)Must choose either Wildfire or one of the Non-Wildfire reasons

Wildfire

Non-Wildfire

- Under the Interagency Agreement for Meteorological Services (USFS, BLM, NPS, USFWS, BIA).
- State, tribal or local fire agency working in coordination with a federal participant in the Interagency Agreement for Meteorological Services.
- Essential to public safety, e.g. due to the proximity of population centers or critical infrastructure.

LOCATION

(*)Lat:

(*)Lon:

7.5' Quad:

Legal (T/R):

SD
 WY

(*)Elevation: Top Bottom

Drainage:

(*)Aspect:

Size: (Acres)

FUEL

Type:

Sheltering

Full

Partial

Unsheltered

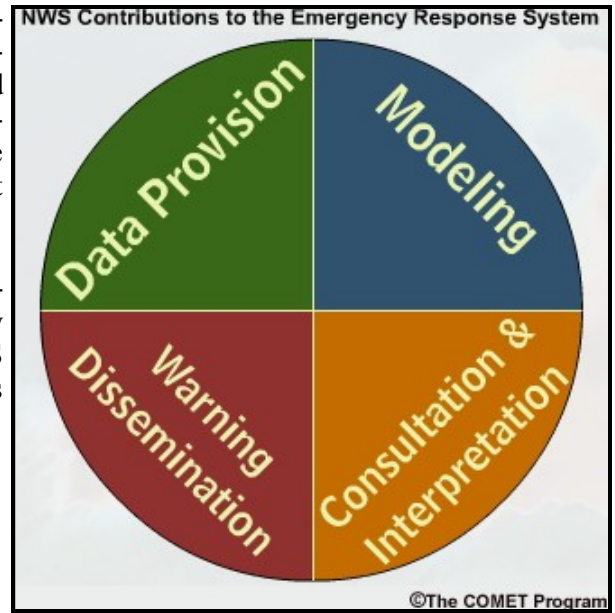
For NWS Spot forecast policy, see section 4.0 in NWS Instruction 10-401 at <http://www.nws.noaa.gov/directives/010/010.htm>

NWS Support During Hazardous Materials Emergencies

The NWS is the primary provider of weather information to emergency responders and other government agencies including observations, forecasts and warnings, model data and model interpretation. To enhance and protect public safety, WFOs work closely with decision makers and provide appropriate weather-related information. Threats such as terrorist incidents and accidental hazardous materials releases make dispersion modeling an important area of service and support for the NWS. Our meteorological expertise, wide range of observing systems, modeling capabilities and public alert capabilities are critical contributions to both local and national emergency response efforts.

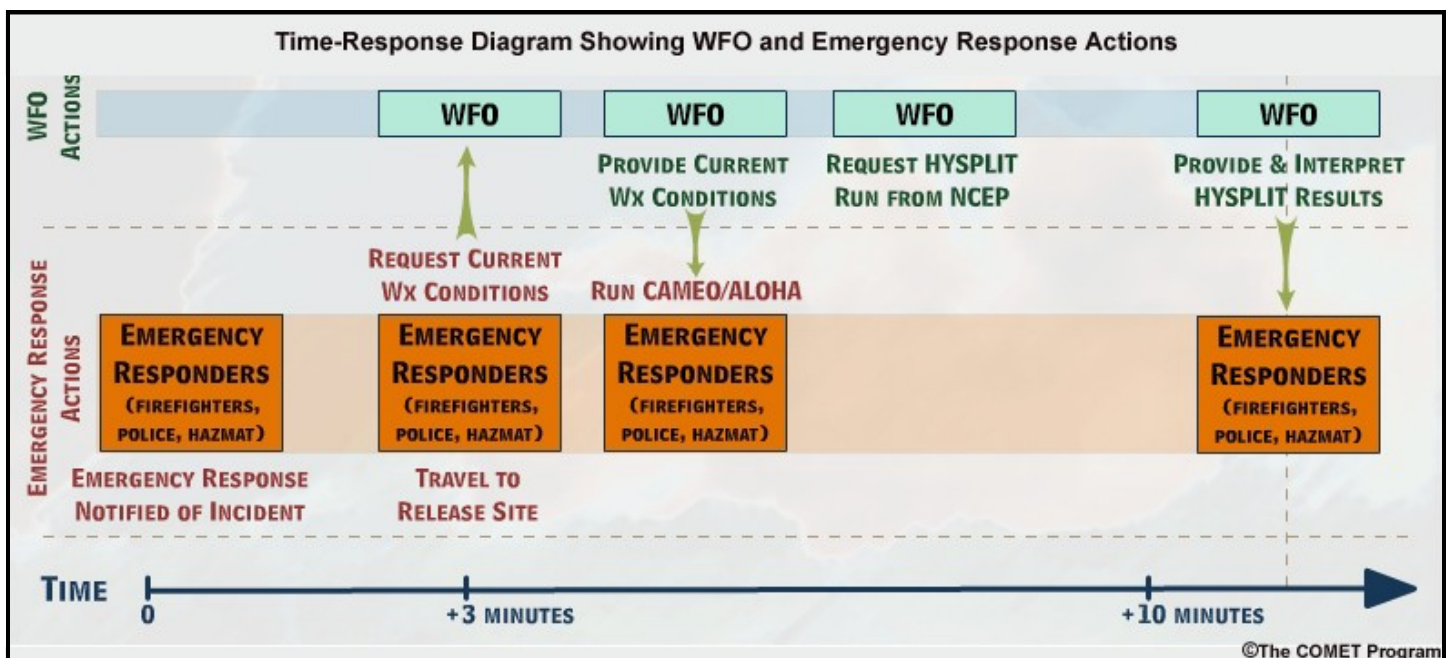
Specifically, when small-scale hazardous release events occur, forecasters can provide weather information to local emergency responders, who can then add this information to their own computer-based dispersion models. NWS information may include forecaster assessments of winds and other meteorological parameters near the release location and estimates of how meteorological conditions might change.

For medium or large-scale events, NWS knowledge of how the meteorological conditions on different scales vary over time, and of how local effects can impact the situation, will be invaluable. The NWS can also extend our support using powerful tools such as NOAA's HYSPLIT transport and dispersion model.



Types of NWS support

- Provide observations or estimates of wind speed and direction, or other factors such as stability class or relative humidity for small or large atmospheric releases. This support can be accomplished remotely (i.e. phone calls, live virtual meetings, e-mail, etc) or by sending an NWS meteorologist to the site.
- In the event of a large atmospheric release (horizontal extent usually >6 miles) lasting more than an hour of some chemical, biological or radioactive contaminant, an emergency manager, first responder or government official may call the WFO and request atmospheric transport and dispersion (plume) information.



In order for the NWS to run its plume dispersion model (HYSPLIT), the following information is needed:

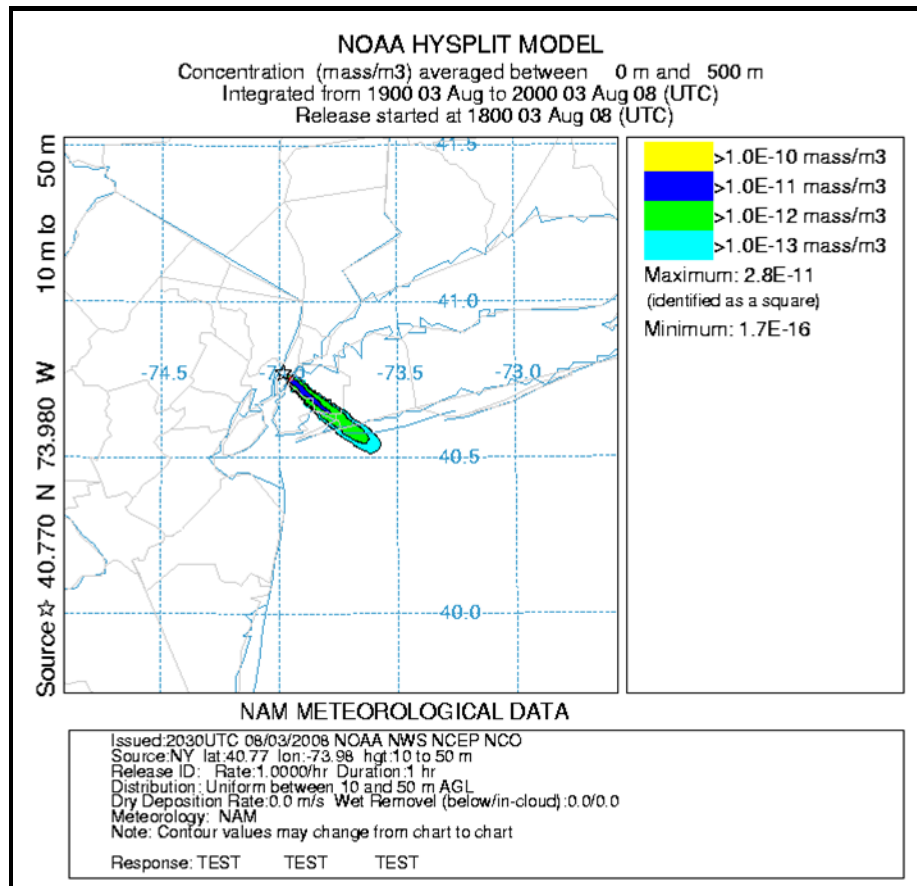
- Specific release location (latitude and longitude)
- Size and/or height of release
- Start and end time of release
- Type of contaminant (if known)
- An identifier for the incident which is mutually agreed upon by both the requestor and the NWS meteorologist
- How the output will be sent to the requestor (e-mail attachment, fax, FTP, etc.)
- Format of output - individual and looping GIF images, kmz files (Google Earth©), Postscript files (ideal for detailed printing), Geographical Information System (GIS) shapefiles in compressed tape archive (TAR) format.

Model results from HYSPLIT will usually be available to the user within about 10 to 15 minutes of submitting the model run. The issuance of severe weather warnings may have a higher priority than a request for a HYSPLIT plume forecast.

Additional information about NWS support and HYSPLIT can be found in this NWS Directive document: <http://www.nws.noaa.gov/directives/sym/pd01005018curr.pdf>

- The emergency manager, first responder, or government official may also request the broadcast of an emergency message, concerning the plume, on the NWS's NOAA Weather Radio All Hazards network. Please refer to the HAZCollect section in this guidebook for details.


Atmospheric transport and dispersion information provided by the NWS will consist of HYSPLIT (NOAA/Air Resources Laboratory Hybrid Single-Particle Lagrangian Integrated Trajectory) model output in graphical format. Below is a sample dispersion output.



Experimental Decision Support Webpage

http://www.wrh.noaa.gov/pdt/decision_maker/index.php

While not yet in every office, specialized decision support web pages are becoming more popular at local forecast offices. These pages provide specific information on types of hazards that may affect the forecast area.



National Weather Service Forecast Office

Pendleton, OR

HOME
NEWS
ORGANIZATION

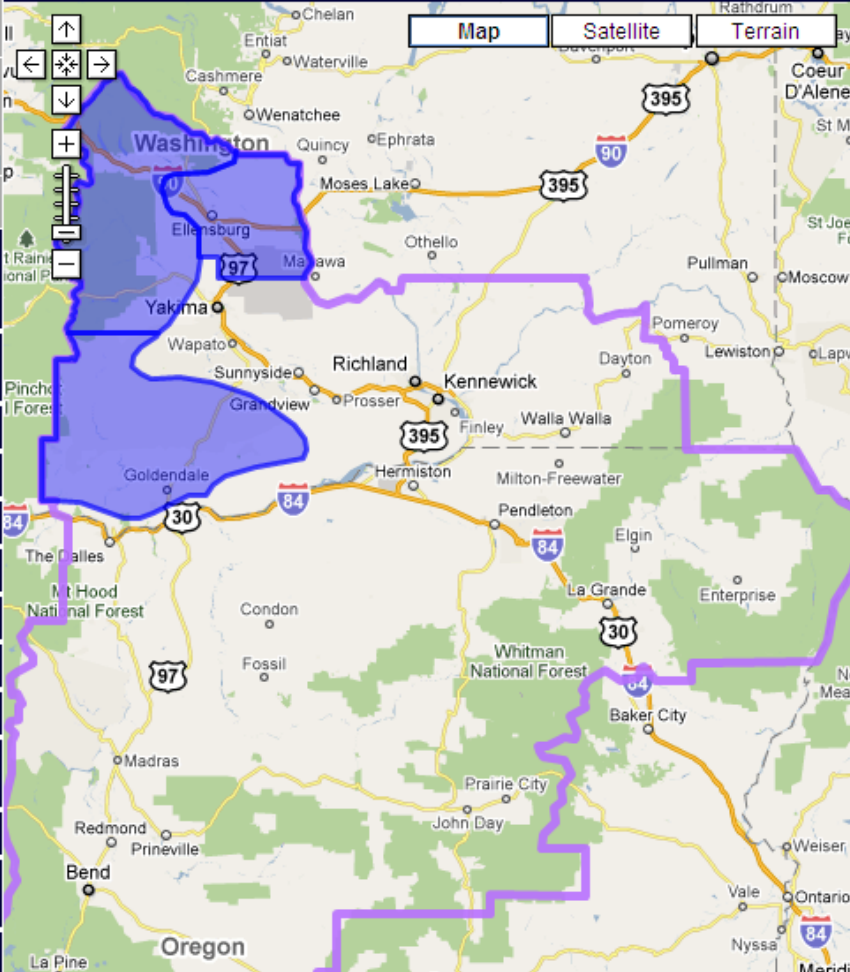
Experimental Decision Support Page

DISCLAIMER PLEASE LEAVE COMMENTS

Risk Analysis		
	Threat Probability is Low	Threat Probability is possible or occurring
Threat Potential	Through Tonight	Mon - Sun
Slight Risk of Severe Thunderstorms	🟢	🟢
Strong Thunderstorms	🟢	🟢
Thunderstorms	🔴	🟢
Flooding	🟢	🟢
Blowing Dust	🟢	🟢
Dense Fog	🟢	🟢
Smoke	🟢	🟢
Strong Wind	🟢	🟢
Heavy Rain	🟢	🟢
Excessive Heat	🟢	🟢
Dry Lightning	🟢	🟢
Fire Weather Watch	🟢	🟢
Red Flag	🟢	🟢

Select County:

THUNDERSTORMS



Fire Weather

- Graphical Ventilation Forecast
- Daily Dispersion Outlook
- SPC Fire Weather Forecast

Aviation

- Tactical Decision Aid

SPC Products

- Day 1 Convective Outlook
- Day 2 Convective Outlook

Winter Weather

- Wallowa Avalanche Center
- Snowfall Probability

Hydrology

- Rivers & Lakes AHPs
- Drought Information

Graphical Forecasts

- 0 to 7 Day
- 6 to 10 Day
- 8 to 14 Day
- Monthly / 3 Monthly Outlook

Integrated Warning Team

The Integrated Warning Team (IWT) is a relatively new concept within the NWS and is gaining popularity through more offices.

The IWT is a concept in which the agencies making up the team (Emergency Managers, Broadcast Media, and National Weather Service) view themselves as part of something bigger than any individual agency alone. This means each member agency should develop their severe weather plans and operations in ways which create synergy within the team. For example, do the messages communicated by various IWT agencies conflict with each other, or do they support and enhance each other? Communication conflicts could manifest themselves as things such as disparate community siren policies or varying degrees of threat emphasis from media outlets and NWS.



Local WFOs organize IWT workshops across a region or state. These workshops bring together IWT members from the local county warning area, as well as social scientists. A key aspect of IWT workshops has been the integration of societal research findings into IWT operations and planning.

The IWT follows concepts promoted through the Weather & Society Integrated Studies (WAS*IS) program, which is a movement that is changing the weather enterprise by integrating social science into meteorological research and practice in comprehensive and sustained methods. The WAS*IS program coordinates practitioners, researchers, and stakeholders around the world to build new relationships and to use new tools and concepts for more effective socio-economic applications and evaluations of weather information and products.



Over 100 participants gathered at Mahoney State Park, near Omaha, NE, for the two-day Integrated Warning Team workshop in September 2009. Emergency managers, broadcast meteorologists and NWS meteorologists and researchers learned how to work better together during times of severe weather.

HAZCollect

The NWS offers its NOAA Weather Radio (NWR) All Hazards network to government officials with public warning authority for the broadcast of non-weather emergency messages when seconds count to save lives. Specific information and instructions from emergency service sources gets out quickly when time counts.

Getting A Warning Onto NWR

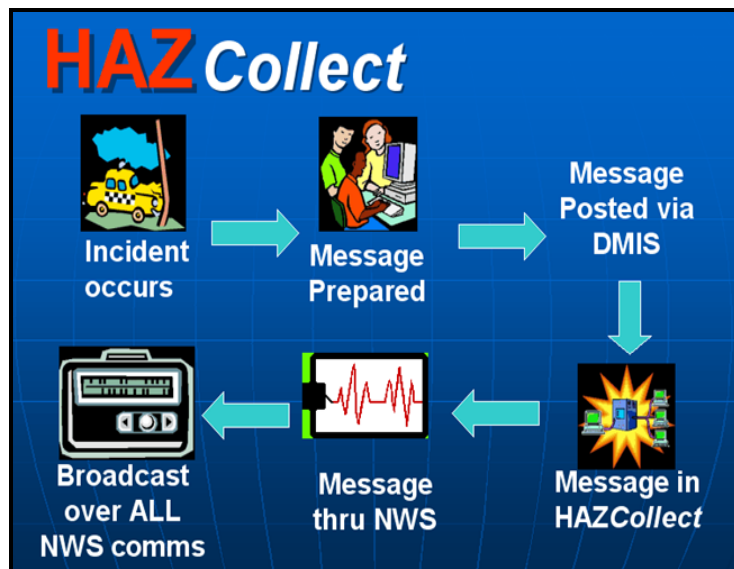
- **Most common dissemination system:** Current NWS systems address non-weather emergency messages (e.g., chemical spills, AMBER alerts and radiological events), but they must be manually transcribed by NWS staff. While currently operational, these messages are prone to processing delays and human error. In some areas, emergency managers manually create the text messages and then proceed to call or fax their local weather forecast offices. These messages that are currently created are subject to typographical and grammatical errors when further transcribed and composed upon reporting to the weather forecast office personnel.
- **New (as of 2009) All Hazards Emergency Message Collection Service (HAZCollect):** The HAZCollect service provides an automated capability to streamline the creation, authentication, collection and dissemination of non-weather emergency messages in a quick and secure fashion. The HAZCollect service is a comprehensive solution for the centralized collection and efficient distribution of Non-Weather Emergency Messages (NWEMs) to the NWS dissemination infrastructure, the Emergency Alert System (EAS) and other national systems. The image below illustrates the process utilizing HAZCollect. Disaster Management Interoperability Services (DMIS) and DMIS Tools are provided by FEMA at no charge to public safety organizations. This basic toolset supports dynamic collaboration among organizations working together to manage the consequences of an incident. They enable rapid alerting, including public alerts via the NWS HAZCollect service, sharing a map-centric common operating picture and logistics “conversations” regarding specific resource needs.

The use of HAZCollect is optional. Local public warning officials can still use the manual method (telephone or fax) of forwarding a non-weather emergency message to their local NWS office, either as a primary method or as a backup to HAZCollect.

Advantages of HAZCollect

HAZCollect was designed to quickly and efficiently gather all NWEMs and forward them to the appropriate local WFO for nearly instant broadcast on the appropriate NWR transmitter that covers the area of the emergency. Furthermore, human-induced errors and delays are eliminated, which ultimately leads to an accurate and timely, tone-alerted, NWEM on the NWS’s NOAA Weather Radio stations. Once the NWEM is within the HazCollect service, the automatic, tone-alerted broadcast of this message can not be stopped.

Do I have to use DMIS? Yes, you have to use DMIS in order to forward a NWEM to HazCollect. NWS and FEMA anticipate several third-party applications (software products) will become available to author NWEM messages. These applications are expected to be CAP-compliant and interoperable with the DM-Open Platform for Emergency Network and DMIS. It is not known when they will become available on the commercial market.



Registering for DMIS

For DMIS registration and training information, go to this web site: <http://www.fema.gov/about/programs/disastermanagement>. Click on the DMIS Tools link in the left-hand menu or in the “Public Safety Officials” section. In the “More about DMIS Tools” section, click on the “Get DMIS Tools / Register” link.

Registering for HAZCollect

Contact the WCM at your local WFO. For HAZCollect registration and training information, go to this website: <http://www.weather.gov/os/hazcollect/index.shtml>. You want to click on the “For Government” link for registration and the “Training” link. You must complete and pass an on-line, HAZCollect training course in order to be approved to use the HAZCollect service.

Message Types

ADR Administrative/Follow-up Message	LEW Law Enforcement Warning
CAE** Child Abduction Emergency	CDW Civil Danger Warning
LAE Local Area Emergency	CEM Civil Emergency Message
TOE 911 Telephone Outage Emergency	EQW Earthquake Warning
AVA Avalanche Watch	AVR Avalanche Warning
NUW Nuclear Power Plant Warning	EVI Evacuation Immediate
RHW Radiological Hazard Warning	FRW Fire Warning
SPW Shelter-in-Place Warning	HMW Hazardous Materials Warning
VOW Volcano Warning	DMO* Demonstration Message
NIC* National Information Center	NPT* National Periodic Test
NMN* Network Message Notification	RMT* Required Monthly Test
RWT* Required Weekly Test	

* These codes are used for administrative, demonstration or testing purposes.

** In some states, the State EAS plan does not allow for broadcast of CAEs on NWR

Additional Resources:

<http://www.weather.gov/directives/sym/pd01017008curr.pdf>

http://www.crh.noaa.gov/images/mkx/pdf/hazcollect/HazCollect_brochure.pdf

<http://www.nws.noaa.gov/ops2/ops24/hazcollect.htm>

NWS Damage Surveys

The damage survey is an important duty of the NWS. However, damage surveys are also conducted by Emergency Management and Tribal officials. Damage surveys enhance verification, which helps to improve warning services. The results are also used to document the event for legal purposes (*Storm Data*).

NWS data requirements include obtaining all available records that define the impact, extent, timing and intensity of significant natural hazard episodes such as floods, tropical cyclones, extra-tropical cyclones, tornadoes and other severe convective events, katabatic winds and tsunamis.

On-site inspections of damage areas, if needed, are usually done the same day of the event or the next available day. Debris clean-up can be accomplished rather quickly following an event and crucial evidence needed to differentiate between tornado and straight-line wind damage can be lost forever.

Usually, the decision on the need for a NWS survey will be made by the management of the WFO. In their absence, the Senior Forecaster will make the decision. Each situation is different; consequently, professional judgment must be exercised before sending someone out on a damage survey. The person who conducts the survey may be any staff member, as long as that individual, as a minimum, is familiar with the EF-scale and have completed appropriate training. The WCM is ultimately responsible for assigning an EF-rating to a tornado for *Storm Data* purposes.



Situations That Require a Damage Survey

1. All tornadoes suspected of producing EF2, EF3, EF4, EF5 damage
2. Any event resulting in considerable local media coverage
3. Any event resulting in national media attention
4. Any event that results in injuries, deaths or significant property damage
5. Conflicting/questionable reports making it difficult to remotely determine if it was a tornado or downburst wind event
6. There are several tornado reports and the emergency manager is on vacation

Situations That May Require a Damage Survey

1. Any tornado suspected of producing EF0 or EF1 damage. (If damage is light, an emergency manager may be able to conduct the survey)
2. Any event that would provide scientific evidence that meteorologists would find useful
3. Personal request from an emergency manager

Situations That Normally Would Not Require a Damage Survey

1. Event with minimal damage and/or little media coverage
2. Event with minimal impact requiring a one-way travel time of more than 1 hour
3. When documenting the event can be accomplished via email or by phone

GPS units, laptops with mapping software, digital cameras, various maps of the damage area with names of all roads, pencils, pens, notepaper, name/phone number of emergency manager of the affected county or Tribal nation, and the telephone number of that county's Sheriff Department (911 center) are items often used on a damage survey.

While on a damage survey, it is important to note GPS coordinates, take pictures, talk to people to get beginning and ending times of event (i.e. ask people for the time the trees came down or when the strongest winds occurred), determine extent and severity of damage, get names, telephone numbers and comments of eye-witnesses, sketch out the damage area on a map (perhaps showing which way the trees and debris were oriented).

Additionally, if time allows, close-up pictures of the base and top of failed walls, sub-floors, roof trusses, and anchoring devices should be taken. This evidence will help determine how well-built a structure was, and ultimately the EF-rating of the tornado.

Tornado or Straight-Line Winds

In some cases, damage surveys are needed to differentiate between damaging wind and tornado events. There are several questions NWS meteorologists need to answer to determine whether the damage occurred as a result of straight-line winds or a tornado.









Did radar indicate the presence of rotation?	
	Yes, then it may be either damaging winds or a tornado. Often the radar detects circulations not indicative of tornadoes because the atmosphere is a chaotic place and the air is always mixing. On any given day, circulations are present on radar. Unless the rotation is very strong, it is usually a clue that leads to inconclusive results.
	No, then it could be implied straight-line winds occurred unless other evidence provides reasonable doubt. Most tornadoes produce at least some rotation signatures on radar.
Is the damage arranged in a pattern or is it chaotic and strewn in different directions?	
	If the debris is aligned in one direction or diverges, it is a clear indicator of straight-line winds or a downburst.
	If the debris is strewn in all directions, or it concentrated in converging lines; or crops exhibit a herringbone pattern, then a tornado is most likely the cause.
Do witness accounts confirm this finding?	
	Often, people describe the sound of a tornado like a freight train.
	One resident may describe the wind blowing from one direction while another may describe it blowing in the opposite direction.

On-line, easy-to-use, damage survey guidelines can be found here:
<http://www.crh.noaa.gov/arl/?n=stormdamage>

Rating the Tornado Damage

Once it is determined a tornado indeed caused the damage, NWS meteorologists need to assign a strength rating. In 1971, Dr. Ted Fujita developed the Fujita Scale (F-Scale) as a method of rating the intensity of tornadoes. This method allowed meteorologists to assign a strength rating to tornadoes as they occur, zero to five, with five being the strongest. This method was widely accepted by meteorologists and engineers for more than 3 decades. However, limitations of this system were well known. For example, this method did not take into account the strength of a structure struck by the tornado, and it offered little guidance of how to deal with differing structures and comparing damage from one indicator versus another.

To combat this problem, the Enhanced Fujita rating system (EF-Scale) was proposed by the Wind Science and Engineering Center of Texas Tech University in 2006. A panel of public meteorologists, private meteorologists, academic meteorologists and wind engineers all contributed to the development of the scale. This EF-Scale allows meteorologists to gauge the severity of damage by using 28 different damage indicators (DI). These DIs, ranging from small barns or farm outbuildings, to one and two story residences, to strip malls, electrical transmission lines and even free-standing towers and trees can be easily identified in the field and assigned a wind speed based on the degree of damage (DoD) associated with that DI. That wind speed then corresponds to an EF-Scale rating.

Scale	Wind speed		Relative frequency	Potential damage	Descriptions based on F-Scale
	mph	km/h			
EF0	65–85	105–137	53.5%	<p>Minor damage.</p> <p>Peels surface off some roofs; some damage to gutters or siding; branches broken off trees; shallow-rooted trees pushed over.</p> <p>Confirmed tornadoes with no reported damage (i.e., those that remain in open fields) are always rated EF0.</p>	
EF1	86–110	138–178	31.6%	<p>Moderate damage.</p> <p>Roofs severely stripped; mobile homes overturned or badly damaged; loss of exterior doors; windows and other glass broken.</p>	
EF2	111–135	179–218	10.7%	<p>Considerable damage.</p> <p>Roofs torn off well-constructed houses; foundations of frame homes shifted; mobile homes completely destroyed; large trees snapped or uprooted; light-object missiles generated; cars lifted off ground.</p>	
EF3	136–165	219–266	3.4%	<p>Severe damage.</p> <p>Entire stories of well-constructed houses destroyed; severe damage to large buildings such as shopping malls; trains overturned; trees debarked; heavy cars lifted off the ground and thrown; structures with weak foundations blown away some distance.</p>	
EF4	166–200	267–322	0.7%	<p>Devastating damage.</p> <p>Well-constructed houses and whole frame houses completely leveled; cars thrown and small missiles generated.</p>	
EF5	>200	>322	<0.1%	<p>Extreme damage.</p> <p>Strong frame houses leveled off foundations and swept away; automobile-sized missiles fly through the air in excess of 100 m (300 ft); steel reinforced concrete structure badly damaged; high-rise buildings have significant structural deformation.</p>	

A best practice during a damage survey is to find as many DIs as possible to support a particular rating, however, there must be at least two DIs indicating the same DoD/wind range in order to classify a tornado at a particular rating (EF0 through EF5). The purpose of the new rating system was to make it easier for meteorologists to classify tornadoes and to limit the inconsistency of ratings. One requirement before this new system was implemented was to ensure the damage associated with a given tornado on the EF-Scale corresponds to the same level on the F-Scale to maintain consistency between the two databases.

More information about the EF-Scale can be found at: <http://www.spc.noaa.gov/efscale/> and <http://www.depts.ttu.edu/weweb/EFScale.pdf>

For all tornadoes suspected of producing greater than EF3 damage, a special Quick Response Team (QRT) may be dispatched by NWS Headquarters. Damage survey results from the QRT are shared with the affected WFO; however, the QRT damage survey is independent of the any damage survey conducted by the WFO staff.

Damage Loss Estimates

WFOs also conduct damage surveys to help estimate the monetary damage associated with severe weather. For all flood or flash flood events, a damage estimate is required for the publication of *Storm Data*. Each WCM is responsible for formulating a damage estimate by using any means at their disposal. For example, emergency management estimates, news reports, FEMA and USDA estimates and insurance claims are the most common sources for these numbers. However, some damage may not be reported to these sources; therefore, damage estimates could be considerably below actual values. Insurance industry studies suggest that the loss estimates in Storm Data are typically underestimates. Formulating a damage estimate is a very subjective process and can vary from office to office. However, a guideline for assigning monetary losses to various damaged objects is provided in the NWS Directive 10-1605 on Storm Data Preparation at <http://www.nws.noaa.gov/directives/sym/pd01016005curr.pdf>. Each NWS regional headquarters is ultimately responsible for these WFO estimates.



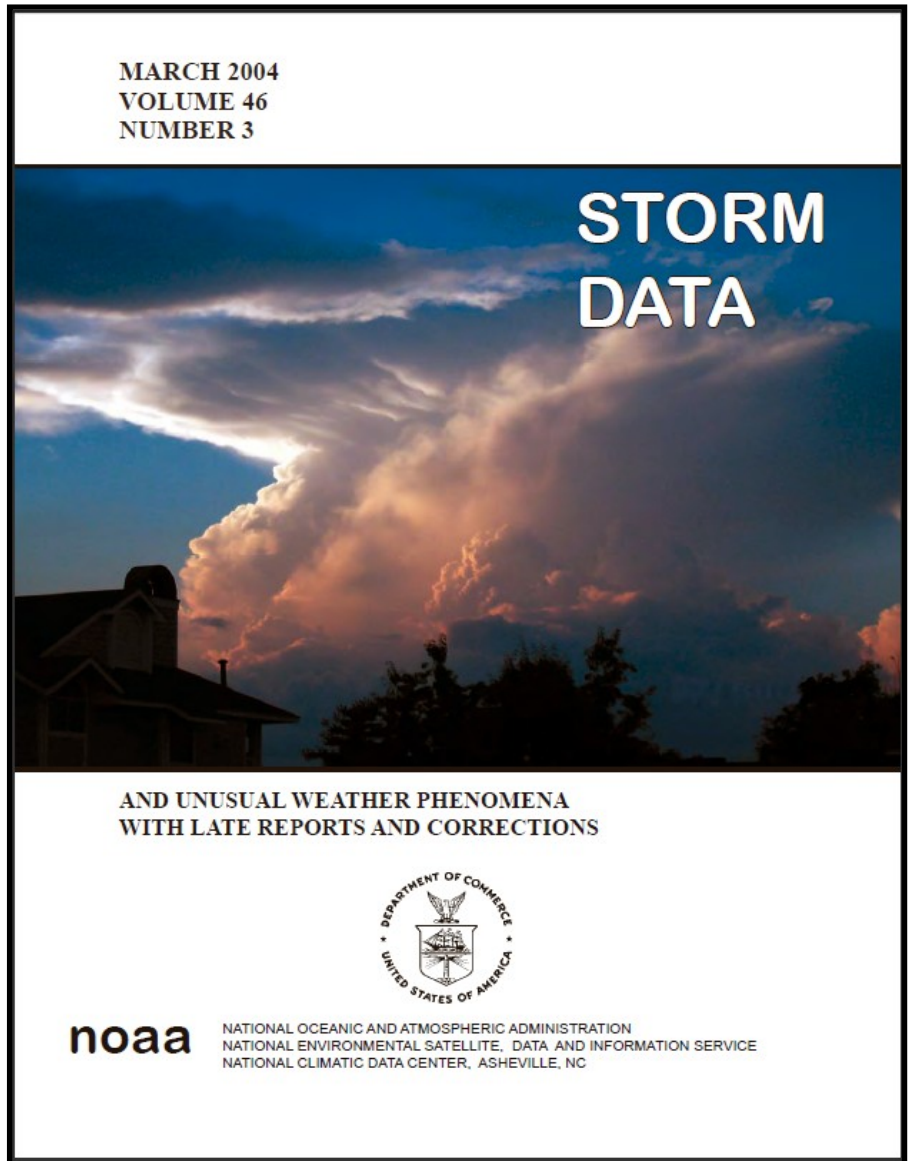
Flooding in Rock Springs, WI, in June 2008.

Storm Data

Overview: *Storm Data* is an official monthly publication of NOAA. The *Storm Data* publication contains a chronological listing, by state, of the occurrence of storms and other significant weather phenomena having sufficient intensity to cause loss of life, injuries, significant property damage and/or disruption to commerce. In addition, it is a partial record of significant meteorological events, including rare and unusual phenomena that generate media attention, as well as record maximum or minimum temperatures or precipitation that occurs in connection with another event.

Source of information: Much of the information appearing in *Storm Data* is provided by or gathered from sources outside the NWS, such as the media, law enforcement officials, fire fighters, other government or first-responder agencies, amateur radio operators, private companies and other individuals. Additionally, storm information is generated internally by NWS meteorologists, and storm damage surveys are conducted.

Accuracy of information: To improve the quality of this information, the NWS conducts free severe weather spotter training classes each year. Attendees are instructed on how to properly identify severe weather phenomena and format their reports in order to minimize mistakes.



An effort is made to use the best available information, but because of time and resource constraints, information from various spotter groups may be unverified by the NWS. Therefore, when using information from *Storm Data*, users should be cautious as the NWS does not guarantee the accuracy or validity of the information. Furthermore, when it is apparent information appearing in *Storm Data* originated from a source outside the NWS (credit is provided), *Storm Data* users requiring additional information should contact that source directly. In most cases, NWS employees will not have the knowledge to respond to such requests. In cases of legal proceedings, Federal regulations generally prohibit NWS employees from appearing as witnesses in litigation not involving the United States Government.

Compiler of Storm Data information at local NWS office: The person who gathers storm reports and compiles them into the monthly *Storm Data* contribution for that office is normally the WCM or their designee. However, the WCM is responsible for reviewing and certifying each month's *Storm Data* contribution.


Storm Data archiving agency: The National Climatic Data Center (NCDC) is the official custodian of NWS weather records including *Storm Data*. The NWS submits the monthly reports to NWS Headquarters approximately 60 days after the end of the data month. NWSHQ collects all of the data files from the 123 WFOs. The NWSHQ then uses several algorithms to convert the *Storm Data* files into an integrated database. The NCDC receives a copy of this database approximately 75-90 days after the end of the month in question. A publication and archive are produced and the online

Storm Events Database is then updated within 90-120 days after the end of the month. If you need an official copy of a *Storm Data* publication for legal purposes, contact NCDC at www.ncdc.noaa.gov or at 1-828-271-4800.

Some NWS offices also have a partial archive of past *Storm Data* monthly publications (considered unofficial) on their web sites. Contact the WCM at your local NWS office to find out where this information is found on their web site.

Example of a *Storm Data* entry:

Location	Date	Time Local/ Standard	Path Length (Miles)	Path Width (Yards)	Number of Persons		Estimated Damage		Character of Storm
					Killed	Injured	Property	Crops	
OHIO, Northwest Van Wert County 3.6 NE Willshire to 6.6 E Scott	10	1515EST 1543EST	21.6	880	2	17	30M		Tornado (F4)



This picture is from the back seats of the Twin Cinemas. Cars from the parking lot are shown in the front rows of the cinema and where the projection screen had been. Photo courtesy of Paul Van Dyke.

This tornado touched down in the southwest corner of Van Wert County about 4 miles northeast of Willshire and moved northeast across the western portion of the city of Van Wert, and then crossed U.S. 30 and continued northeast before exiting the county about 7 miles east of Scott. NWS ground and aerial surveys showed the tornado quickly intensified to F4 about 5 miles southwest of the city of Van Wert near Zook road, where a 75 year old male was killed in his home. The tornado continued moving northeast as an F4 into the city of Van Wert, where it hit the Twin Cinemas and the Vision Industrial Park. At this point the tornado was about one half mile wide. 60 persons watching a movie in the cinemas, mostly children, took shelter before the tornado hit, with only minor injuries. Vehicles from the parking lot were thrown into the seats where the children had been sitting. An 18 year old male driving past the cinemas was thrown from his vehicle and killed. The tornado then destroyed five industries in the Vision Industrial Park, before moving north of U.S. 30, producing F4 damage to additional businesses and homes. The tornado weakened to F3 as it moved northeast and crossed into Paulding county. 164 homes were damaged in Van Wert county, and 43 were totally destroyed. 27 businesses sustained damage, with 5 totally destroyed in Vision Park. Three county engineer buildings were destroyed, with one house used by a township. Total damage in Van Wert county was near 30 million dollars. M18VE, M75PH

Information Requests

Requests for Weather Data: Government agency and private party requests for weather data related to various types of accidents may go directly to any NWS office. In the interest of expediting service, the NWS office receiving the request may provide uncertified copies of weather information, which are a matter of public record (e.g., surface observations, forecasts and warnings) if readily available on-site. As an alternative, copies of official records are available within three to four days after the product valid time directly from the archives using the following URL: <http://hurricane.ncdc.noaa.gov/pls/plhas/has.dsselect>

Requests for Certified Weather Data: Nearly all of the information generated by the NWS is archived at NCDC. Please contact NCDC for official, certified copies (factor in a turn-around time). In general, NCDC information is free to .gov, .us, .edu, and .mil domains.

National Climatic Data Center
151 Patton Avenue
Asheville, North Carolina 28801-5001
Telephone No. (828) 271-4800
Email: ncdc.info@noaa.gov

Service of Subpoena: Under DOC regulations, NWS employees cannot produce records or testify in litigation not involving the government without the consent of NOAA's Office of General Counsel. NWS employees will accept a subpoena from the person serving the subpoena, since the delivering person has no authority to withdraw the subpoena. The NWS General Counsel's Office will usually send a letter informing the attorney/law firm about NOAA's procedures and policies and direct them to NCDC and/or the NWS listing of private certified consulting meteorologists for expert witness testimony.

Requests for Interpretation of Weather Data: Generally, state rules of evidence permit the admission of NWS certified records without authenticating testimony from an NWS employee. When interpretation of the records is required, a private meteorologist can interpret NWS records for the court. The NWS maintains a listing of private, certified meteorologists who can be retained to provide expert testimony. See <http://www.weather.gov/im/dirintro.htm>. The list is provided for informational purposes, with no express or implied endorsement.

Requests for Sunrise-Sunset Data: The U.S. Naval Observatory takes observations and generates sunrise and sunset data. The NWS is not the custodian of such data and cannot certify or authenticate such data. Contact information: U.S. Naval Observatory, ATTN: Code AA, 3450 Massachusetts Ave. N.W., Washington, D.C. 20392-5420. For more information: <http://www.usno.navy.mil/USNO/astronomical-applications/data-services>

Finding Rain, Snow, and Temperature Information on a WFO Website: You can quickly find weather data on each WFO's Climate (local) page. On the Climate (local) page, click on the tab entitled NOWData. Click on the appropriate parameter in order to retrieve data from official cooperative sites. Contact your local WFO for assistance. Data found in NOWData can be used by Emergency Management to determine if observed snow-fall meets or exceeds FEMA's guidelines used in the disaster declaration process. FEMA's snow policy can be found at: http://www.fema.gov/government/grant/pa/9523_1.shtm

3. Routine Products and Services

Every NWS office is responsible for providing forecasts for its CWA or AOR. The products issued by the forecast office can be broken down into seven separate groups: public, aviation, fire weather, marine, hydrology, climate and severe. Six of these groups will be described in this section along with routine products issued for each. The 7th group, severe weather, is described in more detail in the non-routine product section.

Public Forecasts

Public forecasts are the most widely known products issued by the NWS offices. These forecasts are for general weather conditions that appeal to a wide range of users. Many of these products are issued twice per day, around 3 or 4 a.m. and 3 or 4 p.m. every day, although some routine products are updated regularly on slightly different schedules.

Routine Public Products Issued By All WFOs	
AFD	Area Forecast Discussion
CCF	Coded Cities Forecast
HWO	Hazardous Weather Outlook
PFM	Point Forecast Matrix
ZFP	Zone Forecast Product
Routine Public Products Issued By Some WFOs or Seasonally	
AFM	Area Forecast Matrix
RWR	Regional Weather Roundup
RWS	Regional Weather Summary
SFP	State Forecast Product
SFT	Tabular State Forecast

Product Descriptions

Area Forecast Discussion (AFD): A text product that provides the latest reasoning for major decisions made during the forecasting process. It is a technical discussion, issued by the forecaster, explaining the forecast methodology. In certain cases it is simply a uniform discussion, but some offices may break down their discussion into individual sections, such as long term, short term, aviation, marine or climate. The AFD may be updated as frequently as deemed necessary by the forecasters on duty.

Area Forecast Matrix (AFM): A version of the 7-day forecast that is presented in a tabular format and is generated for individual counties, parishes or boroughs. It conveys the critical forecast information such as temperature, dewpoint, relative humidity, winds, clouds and precipitation chances, among other things. The first 48-60 hours are broken down into 3-hour intervals and the extended portion of the forecast is broken down into 6-hour intervals.

Coded Cities Forecast (CCF): A product that takes the forecast information and condenses it into a sequence of numbers for selected cities. It is not easily interpreted visually, but it is a short, compact text product that is easy for certain computer software programs to ingest. It is also used in the National Weather Service forecast verification program.

Hazardous Weather Outlook (HWO): Used to alert users (media, emergency managers, spotters and the public) of potential winter weather, severe weather, fire weather, non-precipitation or flood hazards that may occur within the next seven days. It is designed to act as a “heads up” of impending hazards and often briefly discusses some potential impacts of a particular hazard.

Point Forecast Matrix (PFM): A version of the 7-day forecast that is presented in a tabular format and is generated for individual specific points, usually major cities. It is presented in a similar format to the AFM.

Zone Forecast Product (ZFP): A descriptive 7-day forecast that is grouped by individual counties or by groups of counties. It provides detail on temperature, clouds, winds, precipitation type and precipitation chances. The text descriptions are based on what is created graphically in the Graphical Forecast Editor (GFE). For information on that, see next page.

Regional Weather Roundup (RWR): This product is issued every hour by certain offices. It lists the reported weather conditions at certain locations, mostly within a few hundred miles, and these are usually grouped by certain regions. Occasionally, the RWR will contain some weather conditions for cities far away from the particular WFO.

Regional Weather Summary (RWS): A plain language description of how the weather conditions are expected to evolve over the next several days. It provides some insight as to how certain fronts or low pressure centers will move, how areas of precipitation will evolve, etc.

State Forecast Product (SFP): Like the ZFP, but authored for an entire state. It provides detail on temperature, clouds, winds, precipitation type and precipitation chances for an entire state for the next seven days.

Tabular State Forecast (SFT): A tabular product, providing a 7-day forecast of predominant daytime weather from 6 a.m. to 6 p.m., forecast high and low temperatures and probability of precipitation for selected cities throughout a given state.

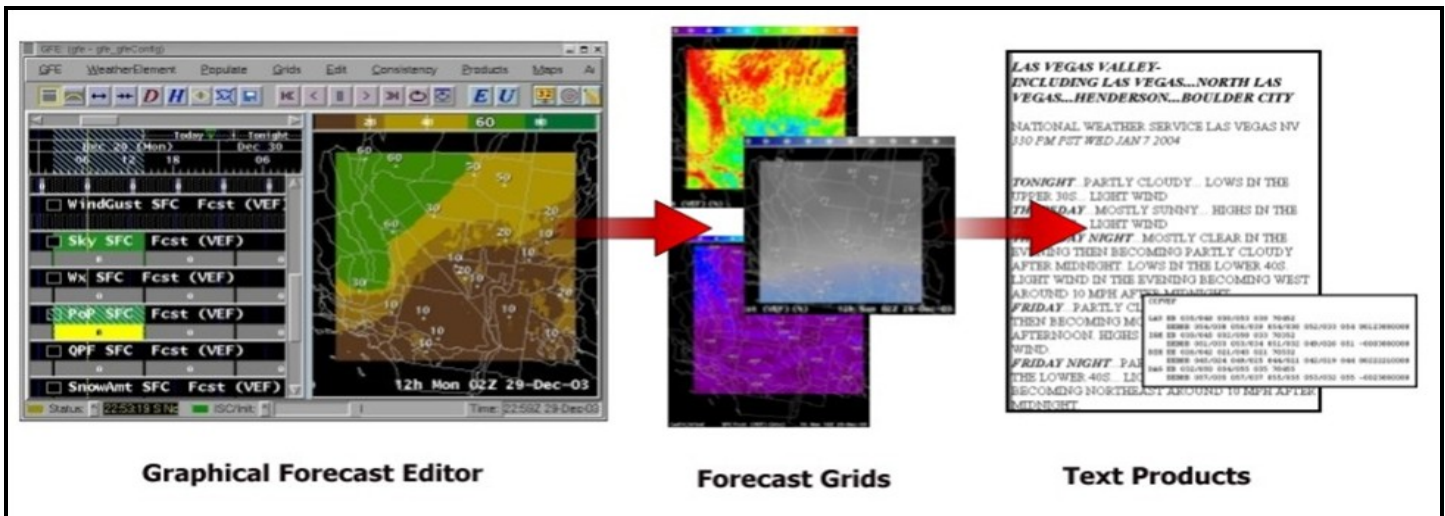
Creating a Digital Database: The Forecast Process

The Interactive Forecast Preparation System (IFPS) first became operational at NWS offices in 2002. It represented a transition from primarily text-based products to increasing digital sources of forecast information for a variety of users. IFPS has a number of advantages. It allows forecasters to quickly generate many useful text products. It also provides forecast information in very useful formats that are easy to understand and interpret.

How exactly do the forecast offices generate these digital forecasts? Meteorologists at each WFO import digital computer model data into a software program called the Graphical Forecast Editor (GFE). This digital data is then either manipulated by hand by the forecaster, or by complex “smart tools” that are coded into the software program. There are hundreds of individual “grids” – digital images that represent a certain weather element at a certain time in the forecast.

The tools used to edit the grids can be extremely sophisticated and account for things like terrain, climatology, surface type and diurnal variations. Once all of the grids are edited by the forecaster, they are interpolated and a complete hour-by-hour forecast emerges. The digital information is then saved and sent to the National Digital Forecast Database (NDFD), where it is available in a number of different formats on the NWS website. Anytime you use the point-and-click forecast feature, the activity planner, or the hourly weather graph, you are looking at the NDFD information.

A number of routine text products are generated from the digital forecast information as well. These products include the ZFP, AFM, PFM, SFT, CCF and marine forecasts, among others.

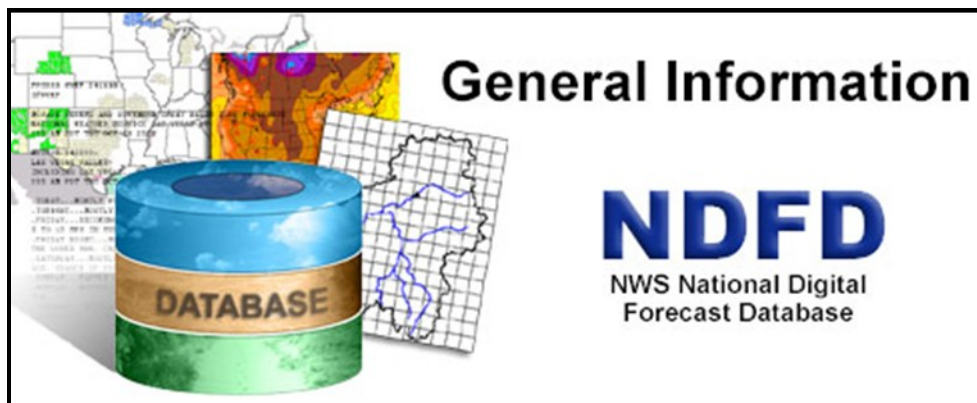


National Weather Service XML Data

<http://www.weather.gov/xml/>

The National Weather Service is striving to serve society's needs for weather information by evolving its services from a text-based paradigm to one based on making NWS information available quickly, efficiently and in convenient and understandable forms. The National Digital Forecast Database (NDFD) is one example of this transformation. NDFD Extensible Markup Language (XML) takes yet another step towards a digital services era by making NDFD data available for computer to computer transfer and processing. NWS customers and partners can then enhance the value of NDFD data through the creation of value added products. More information on NDFD can be found at:

<http://www.weather.gov/ndfd/>



NDFD XML is a service providing the public, government agencies, and commercial enterprises with data from the NWS's digital forecast database. This service provides NWS customers and partners the ability to request NDFD data over the internet and receive the information back in an XML format. NDFD XML contains forecasts for any combination of the following meteorological parameters: <http://www.weather.gov/ndfd/technical.htm#elements>

The request/response process is made possible by the NDFD XML Simple Object Access Protocol (SOAP) server: <http://www.w3.org/TR/soap/>. To see the details of the NDFD XML SOAP service, go to the following URL and click on the NDFDgen or NDFDgenByDay link: http://www.weather.gov/forecasts/xml/SOAP_server/ndfdXMLserver.php

If the web service description provided by the SOAP server does not meet your needs, similar information is available in the following Web Service Description Language (WSDL) document:

<http://www.weather.gov/forecasts/xml/DWMLgen/wSDL/ndfdXML.wSDL>

Other XML Services

Experimental XML/CAP 1.1 Feeds and Web Displays of Watches, Warnings and Advisories

<http://www.weather.gov/alerts-beta/>

XML Feeds of Current Weather Conditions

http://www.weather.gov/xml/current_obs/

XML/RSS Feeds of National Hurricane Center Data

<http://www.nhc.noaa.gov/aboutrss.shtml>

Experimental Storm Prediction Center Feeds

<http://www.spc.noaa.gov/aboutrss.html>

Radar Products

How Doppler Radar Works

As the radar antenna turns, it emits extremely short bursts of radio waves, called pulses. The transmitted radio waves move through the atmosphere at about the speed of light.

By recording the direction in which the antenna is pointed, the speed and direction of any given target is known as well. Generally, the better the target is at reflecting radio waves (i.e., more raindrops, larger hailstones, etc.), the more power that will be associated with the reflected radio waves.

This process of transmitting a pulse, and then “listening” for returned power, is repeated up to 1,300 times per second, with most of the time spent listening rather than transmitting. By keeping track of the time it takes the radio waves to leave the antenna, hit the target and return to the antenna, the radar can calculate the distance to the target. The returned power is converted to radar reflectivity. The changes between two returned pulses in rapid succession can be used to calculate the velocity.

Improving NWS Doppler Radar with Dual-Polarization Technology

Between now and the end of 2012, the entire fleet of WSR-88Ds (Weather Surveillance Radar -1998 Doppler) is scheduled for a major software and hardware upgrade. This upgrade, known as dual-polarization technology, will greatly enhance these radars by providing the ability to collect data on the horizontal and vertical properties of weather (e.g., rain, hail) and non-weather (e.g., insect, ground clutter) targets. For more information, please visit: www.wdtb.noaa.gov/courses/dualpol/outreach/

Types of Data Available On Our Website

There are six different types of images currently available for the NWS web radar display: Base Reflectivity, Composite Reflectivity, Base Velocity, Storm Relative Motion, One-hour Precipitation and Storm Total Precipitation.

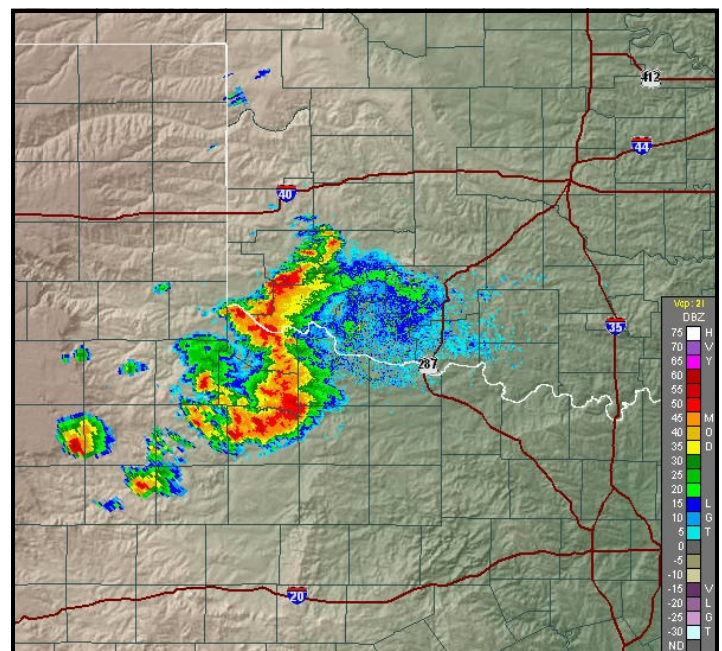
Base Reflectivity

Base Reflectivity is the intensity of returned power (reflectivity) measured in dBZ (decibels of Z, where Z represents the energy reflected back to the radar). Base reflectivity data are available at several different elevation angles (tilts) of the antenna and are used to detect precipitation, evaluate storm structure, locate atmospheric boundaries and determine hail potential.

The base reflectivity image on the NWS radar website is from the lowest "tilt" angle (0.5°). This means the radar's antenna is tilted 0.5° above the horizon. This small tilt is used to lessen the interference from ground targets like trees, buildings and even birds or bugs.

Composite Reflectivity

This display is the maximum echo intensity (reflectivity) from any elevation angle at every range from the radar. This product is used to reveal the highest reflectivity in all targets. When compared with base reflectivity, the composite reflectivity can reveal important storm structure features and intensity trends of storms.

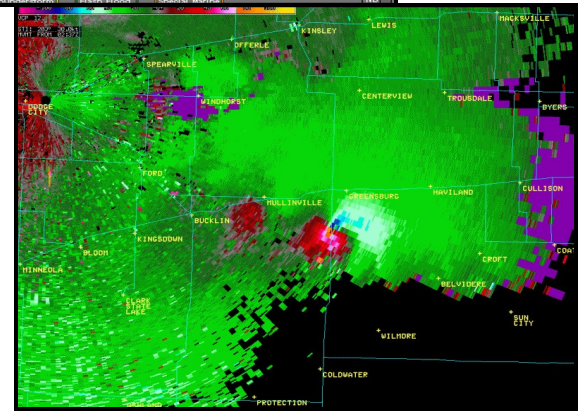
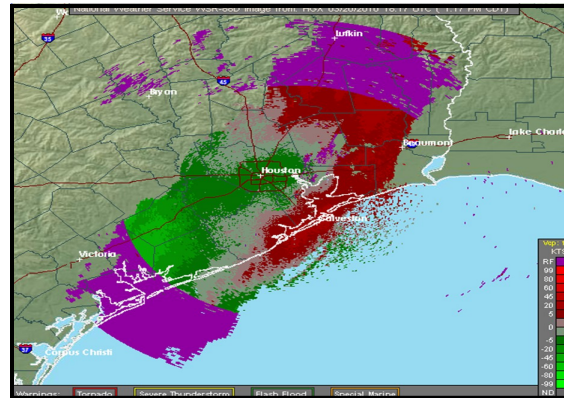


Base Velocity

This product is a display of the radial velocity representing the overall wind field. Green colors indicate wind moving **toward** the radar with red colors indicating wind moving **away** from the radar. The maximum range of this product is 124 nm (about 143 miles) from the radar location.

Storm Relative Motion

Radial velocity of the wind relative to the storm motion. The result is a picture of the wind as if the storms were stationary. This often unmask storms that rotate (supercells), which can be a precursor to the formation of tornadoes. Green colors indicate wind moving toward the radar with red colors indicating wind moving away from the radar. The maximum range of this product is 124 nm (about 143 miles) from the radar location. Two side-by-side, green and red “bulls-eye” centers would signify a “velocity-couplet” that is typically associated with a potentially tornadic circulations.



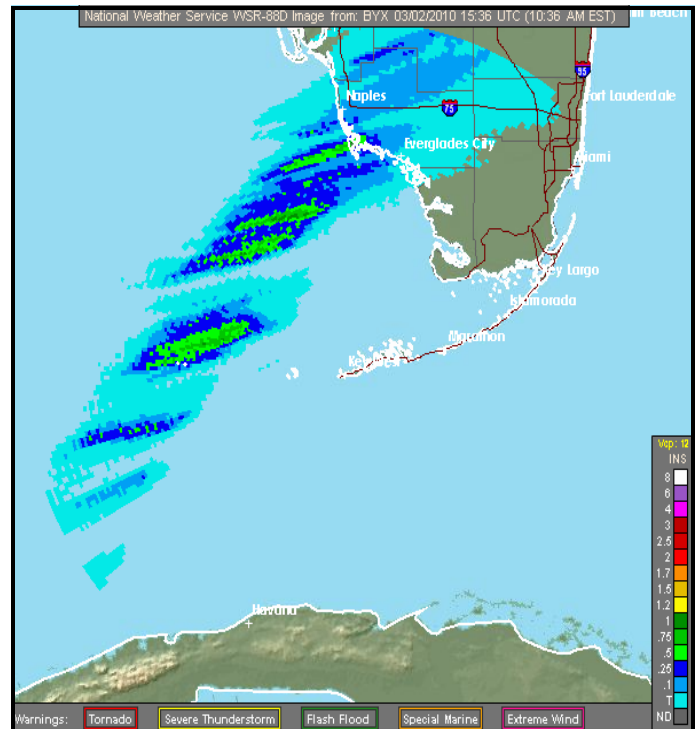
One-Hour Precipitation

Estimated one-hour precipitation accumulation. This product is used to assess rainfall intensities. The maximum range of this product is 124 nm (about 143 miles) from the radar location. This image will not display accumulated precipitation more distant than 124 nm, even though precipitation may be occurring at greater distances. To determine accumulated precipitation at greater distances you should link to an adjacent radar.

Storm Total Precipitation

Estimated accumulated rainfall, continuously updated, since the last one-hour break in precipitation. This image is used to locate flood potential over urban or rural areas, estimate total basin runoff and provide rainfall accumulations for the duration of the event.

The maximum range of this product is 124 nm (about 143 miles) from the radar location. This product will not display accumulated precipitation more distant than 124 nm, even though precipitation may be occurring at greater distances. To determine accumulated precipitation at greater distances link to an adjacent radar.



Hydrologic Services

Accurate hydrologic data and guidance is an essential part of the NWS mission. An extensive network of river gauges exists across the country to provide frequent readings of river levels and stream flow. This data is used by the [River Forecast Center](#) and local offices to make forecasts of expected river levels over a period ranging from a few hours to days or months. In some cases, forecasts will only be issued if flooding is occurring or expected to occur. The RFCs and WFOs work closely with the U.S. Geological Survey and U.S. Army Corps of Engineers.

River flooding is categorized into four different levels.

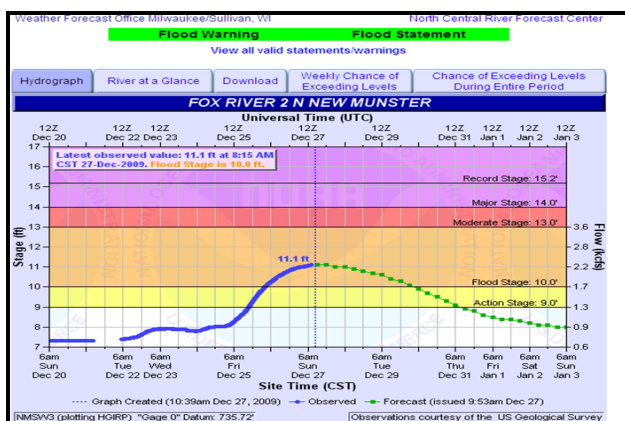
Action Stage (i.e. near flood stage): The river has reached its lowest natural bank and may be outside of this bank; however it is not impacting homes, businesses or most roadways. Once the river begins to have an impact on homes or businesses, it is in Minor Flood Stage. The flood stage is determined by local emergency management in cooperation with the NWS hydrologist.

Minor Flooding: Minimal or no property damage but possibly some public threat.

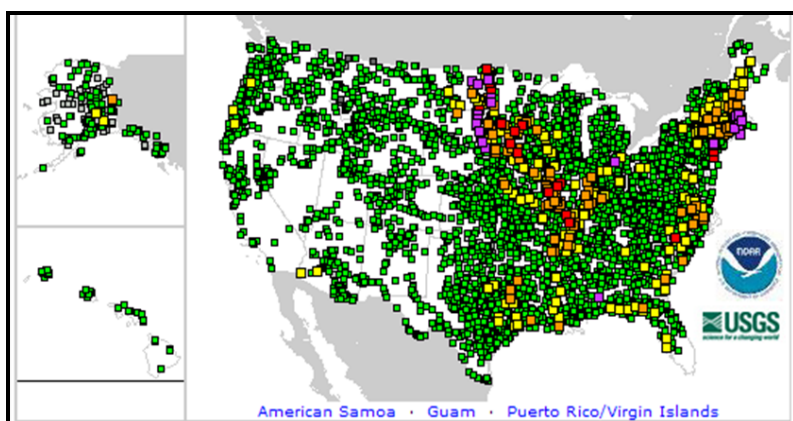
Moderate Flooding: Some inundation of structures and roads near stream. Some evacuations of people and/or transfer of property to higher elevations may be needed.

Major Flooding: Extensive inundation of structures and roads. Significant evacuations of people and/or transfer of property to higher elevations.

Flash Flooding is most commonly related to excessive rainfall that leads to a rapid rise in water levels in creeks or streams, or street flooding in urban areas. Flash flooding can also occur with the breach of levees or flood retainment walls.



Example of a river flooding chart with river over flood stage. Green dashed line is the forecast.



River gauge sites across the county. Green markers are not in action or flood, yellow is action stage, orange, red and magenta represent minor, moderate and major flooding, respectively.

Routine Hydrology Products Issued By Some WFOs

RVA	River / Hydrologic Summary
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Product Descriptions

River/Hydrologic Summary (RVA): This is a collection of the latest river and lake stages usually issued once per day in the morning hours, although some offices also issue the product in the evening. It consists of the latest stages in a particular county warning area.

See Also: [Non-Routine Hydrology Products](#) and [RFC](#)

Marine and Coastal Weather Services

The NWS provides forecast and warning information for the U.S. coastal and offshore waters, the Great Lakes and the open oceans. NWS marine weather forecasters issue wind, sea state and precipitation forecasts, as well as warnings and statements essential to conducting safe and efficient maritime operations and the protection of the marine public.

Marine weather observations are vital to accurate weather forecasting, especially over the waters where weather stations can be few and far between. Thousands of vessels worldwide help alleviate the problem as Volunteer Observing Ships (VOS) by submitting observations used by marine forecasters and computer modelers.

NWS marine forecasters also provide services as needed in aiding search and rescue operations, containment and cleanup of oil spills and support for other disasters such as airplane crash recovery operations.

The National Data Buoy Center, designs, develops, operates and maintains a network of data collecting buoys and coastal stations. The data collected from these buoys and stations is integral in assisting marine forecasters.



The Ocean Prediction Center (OPC) and the Tropical Analysis and Forecasting Branch (TAFB) of the NHC, issue marine warnings, forecasts and guidance in text and graphical format for maritime users. The OPC and TAFB also continually monitor and analyze maritime data and provide guidance of marine atmospheric variables for purposes of protection of life and property, safety at sea and enhancement of economic opportunity. OPC and TAFB forecasts cover the North Atlantic Ocean from the west coast of Europe to the U.S. and Canadian east coast, and the North Pacific Ocean from the U.S. and Canadian west coast to the east coast of Asia. TAFB also has responsibility to 20° south in the Pacific Ocean.

Marine Weather Service – www.weather.gov/om/marine/home.htm

Great Lakes Marine Portal – www.weather.gov/greatlakes

Ocean Prediction Center – www.opc.ncep.noaa.gov

Southeast U.S./Gulf of Mexico Marine Portal <http://forecast.weather.gov/mwp>

Routine Marine Products Issued By Some WFOs, Or Seasonally	
CWF	Coastal Waters Forecast
GLF	Great Lakes Forecast
NSH	Nearshore Marine Forecast
OFF	Offshore Forecast
SRF	Surf Forecast
TID	Tide Report

Product Descriptions

Coastal Waters Forecast (CWF): These are issued by WFOs that are adjacent to the Atlantic Ocean, Pacific Ocean or Gulf of Mexico. The coastal waters forecast consists of zones that extend from shore to varying distances offshore – including 40 nautical miles across the Eastern and Pacific Regions, 60 nautical miles across Southern and Western Regions and 100 nautical miles in Alaska. They provide information on winds, waves and expected weather conditions.

Great Lakes Forecast (GLF): These are issued by certain WFOs in the Great Lakes region. The Great Lakes Forecasts are issued for the open waters of the Great Lakes, or basically any section of the lake beyond five nautical miles from shore. They provide information on winds, waves and expected weather conditions.

Nearshore Marine Forecast (NSH): These are issued by any WFO that is adjacent to one of the Great Lakes. The Nearshore Marine Forecasts are issued for any section of a Great Lake that is within five nautical miles of shore. They provide information on winds, waves and expected weather conditions.

Offshore Forecast (OFF): These are issued by the Hawaii, Anchorage, Alaska and Guam forecast office for open water areas not covered by other marine forecast products. The OOF is also issued by the Ocean Prediction Center or [Hurricane Prediction Center](#) for the Atlantic, Pacific and Gulf of Mexico.

Surf Forecast (SRF): An alphanumeric product issued by select WFOs with coastal waters marine responsibility. The product provides information on surf, water, any potential marine hazards such as rip currents and the general weather conditions within the surf zone.

Tide Forecast (TID): This product provides a list of tide level and times issued by select WFOs with coastal waters marine responsibility.

See Also: [Non-Routine Marine Products](#)

NWS Ice Desk (WFO Anchorage, AK)

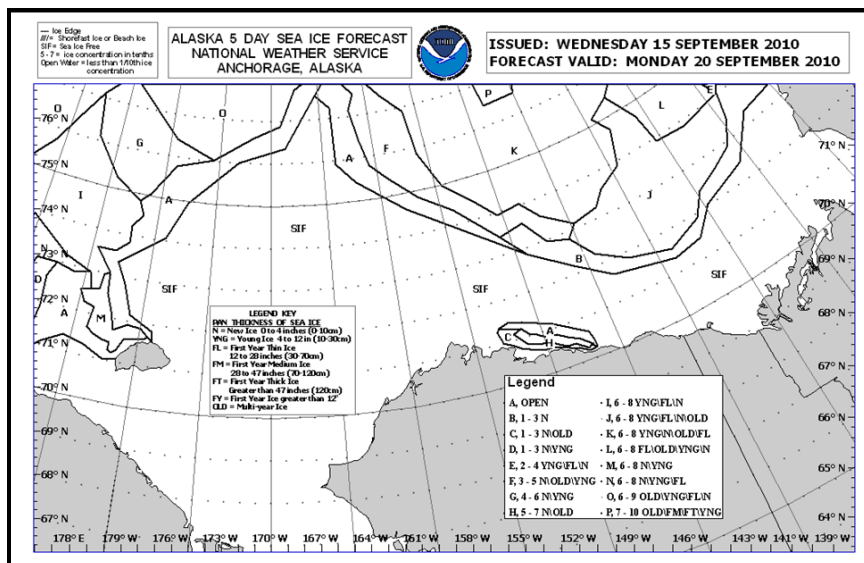
<http://pafc.arh.noaa.gov/ice.php>

The Anchorage, AK forecast office produces graphical analyses of sea surface temperatures and sea ice as well as five day sea ice forecasts year round. Scheduled sea ice analyses and 5-day sea ice forecasts are produced Monday, Wednesday and Friday. A sea surface temperature chart of Alaskan waters is produced Tuesday and Thursday. Annotated satellite analyses of sea surface temperatures and sea ice are produced when clear skies allow these features to be observed.

NWS Great Lake Ice Forecasts (WFO Cleveland, OH)

<http://www.weather.gov/greatlakes/>

Great Lakes Ice Outlooks are issued on Mondays, Wednesdays and Fridays during the ice season and cover all of the Great Lakes and their associated waterways (except Lake Ontario and the St. Lawrence Seaway). It contains a 5-day synopsis of weather elements, 36-hour forecast of winds, 5-day temperature outlook and expected ice conditions for the next 5 days. Additional data include temperature normals, accumulated freezing degree days and observed ice thickness.



Fire Weather Services

The NWS forecast offices provide a variety of fire weather forecasts to support fire suppression activities by various land management agencies. These forecasts are issued depending on the length of the forecast office’s fire weather season, which varies across the country.

Daily forecasts are produced within the fire weather season for the office. Additionally, fire weather watches and red flag warnings may be issued if conditions warrant. These two products are issued by the NWS office in conjunction with land management personnel.

During the summer months, when wildfire activity usually reaches its peak across the western United States, Incident Meteorologists (IMETs) are dispatched to large wildfires. The IMET is an NWS meteorologist who provides on-site forecasts for land management personnel. These forecasts are used by land management personnel to maximize safety of firefighters and the general public and to optimize resource allocation. IMETs can also be requested to support: prescribed burns that involve critical resources, land management coordination and dispatch centers, hazardous substance release or any special projects or incidents that the NWS is required to provide support.

Some of the agencies that the NWS fire weather program provides forecasts for include: National Interagency Fire Center, National Interagency Coordination Center, United States Department of the Interior Bureau of Land Management, United States Department of the Interior Bureau of Indian Affairs, United States Forest Service, United States Fish & Wildlife Service, National Park Service, National Wildfire Coordinating Group, numerous Geographic Area Coordination Centers and numerous state forestry and natural resources agencies.

National Weather Service Fire Weather Website:

<http://www.weather.gov/fire>

From here, local NWS fire weather websites can be accessed. In addition, the website provides fire weather observations, forecasts and other fire weather-related information.



Routine Fire Weather Products Issued By Some WFOs, Or Seasonally

FWF	Fire Weather Planning Forecast
FWM	Fire Weather Point Forecast
FWS	Fire Weather Spot Forecast

Product Descriptions

Fire Weather Planning Forecast (FWF): This is a specialized text product intended to provide useful forecast information tailored towards fire weather planning. It contains detailed forecast information that is designed for emergency managers, fire fighting officials, etc.

Fire Weather Point Forecast (FWM): A point forecast highlighting fire weather conditions. These forecasts are sometimes used to determine staffing.

Fire Weather Spot Forecast (FWS): This is an as-needed forecast for a specific location in the office CWA. The forecast is requested by land management personnel generally to aide in planning and maintenance of a prescribed burn. For more information on requesting a spot forecast see [Page 33](#).

See Also: [Non-Routine Fire Weather Products](#)

Aviation Weather Services

The National Weather Service (NWS) issues aviation products and services for the National Airspace System (NAS). Every NWS office has an aviation program to provide forecasts for large and small airports across the country. Aviation weather forecasts are used in planning and executing over 100,000 flights in the U.S. every day. The tremendous impact of weather conditions on takeoff and landing operations requires that forecasts always be as specific and timely as possible.

There are several entities within the NWS that support aviation weather services.

1. [Aviation Weather Center](#) (AWC)
2. [Center Weather Service Unit](#) (CWSU)
3. [NWS Weather Forecast Office](#) (WFO)
4. [Alaska Aviation Weather Unit](#) (AAWU)
5. [Weather Forecast Office Honolulu, HI](#) (HFO)

AWC, AAWU and the WFO in Honolulu, HI are also Meteorological Watch Offices (MWOs). MWOs are designated by the International Civil Aviation Organization to maintain a continuous watch over weather conditions that affect flight operations, and to issue necessary warnings and forecasts for the aviation community.

The **Aviation Weather Center (AWC)** is part of the NCEP program. More information can be found on [Page 83](#).

The **Center Weather Service Unit (CWSU)** is an NWS unit located inside each of the Federal Aviation Administration's (FAA) 21 Air Route Traffic Control Centers (ARTCC). CWSU meteorologists provide on-site, real-time weather support to air traffic control operations for airports and airspace within the control center's area of responsibility.

Meteorologists distribute information to decision-makers in the ARTCC and other FAA facilities about where, when, and what is expected in the ARTCC's various sectors. Special emphasis is given to weather conditions that could be hazardous to aviation or could impede the flow of air traffic in the National Airspace System. Dissemination is by computer products, incoming phone requests, as well as scheduled and unscheduled briefings. Rerouting of aircraft around hazardous weather is based largely on forecasts provided by the CWSU meteorologist.

CWSU issues two non-routine (weather-dependent) text products. The Center Weather Advisory (CWA) is a localized, short-term aviation weather warning for thunderstorms, icing, turbulence, and low cloud ceilings and visibilities. The Meteorological Impact Statement (MIS) is a 4 to 12-hour forecast for weather conditions which are expected to impact ARTCC operations.

NWS WFOs are responsible for several aviation weather services. The primary duties of the aviation forecaster at each office include:

- Maintaining a continuous weather watch across the County Warning Area
- Issuing regularly scheduled aviation forecasts
- Responding to anticipated changes in meteorological conditions by amending aviation forecasts

Meteorologists at each office regularly issue Terminal Aerodrome Forecasts (TAFs) for selected airport sites. A TAF is a 24-hour (or 30-hour for several larger airports) surface forecast for a five nautical mile radius around an airport. Each forecast includes the expected wind speed and direction, non-convective low level wind shear, visibility, weather and ceiling height in a concise format. In addition, the aviation forecasters continuously monitor the current weather conditions and issue amendments to the TAFs as meteorological conditions warrant and new forecast information becomes available.

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ZJX MIS 01 VALID 220130-221100
...FOR ATC PLANNING PURPOSES ONLY...
OVR ATLC WTRS ZJX
SCT TS MOV FM 24025KT. MAX TOPS FL350. TS OFF
FL PEN ECST MOVG OVR INTL WTRS BY 03Z. TS
REDVLPG OFF SC/GA/NNR FL COAST 06-07Z CONTG
THRU 11Z.
.
OVR SC/GA/FL ZJX
MOD TURB BTN FL240-FL400
MOD TURB BLW 080
LGT TO MOD RIME/MXD ICGICIP BTN 040-FL200
```

Example MIS for Jacksonville, FL

Routine Aviation Products Issued By WFOs

TAF	Terminal Aerodrome Forecast
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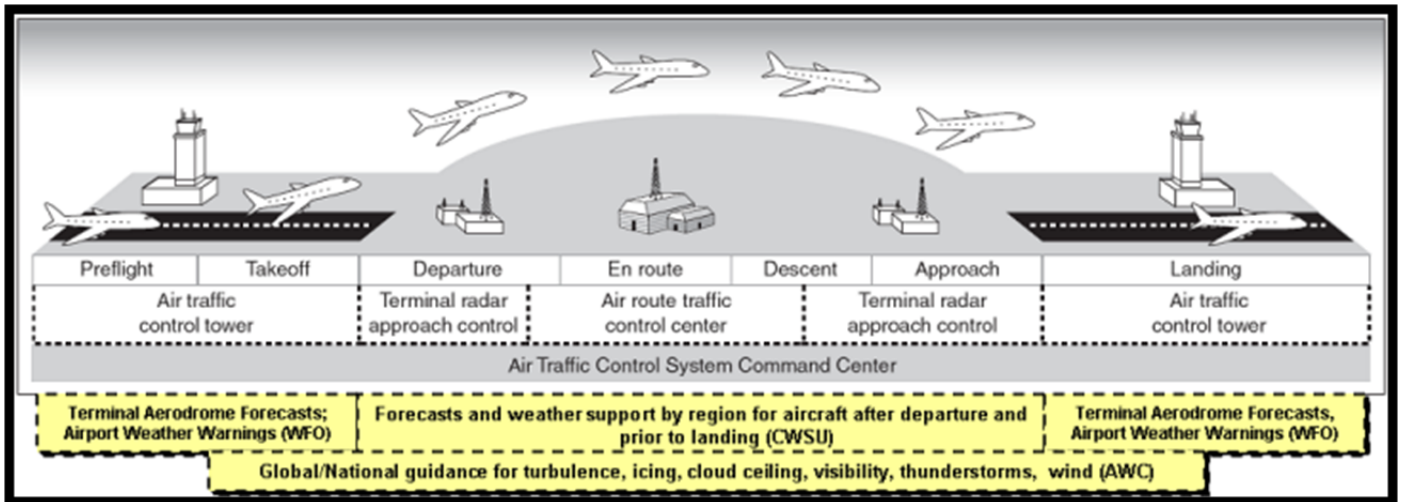
Product Descriptions

Terminal Aerodrome Forecast (TAF): A coded forecast describing, in detail, the expected conditions having an impact on aviation interests. The TAF is issued a minimum of 4 times per day with frequent updates during active weather. TAFs are 24 to 30 hours in length depending on the airport.

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KORD 191720Z 1918/2018 34009KT P6SM BKN050
FM200000 35008KT P6SM OVC035
FM200200 36007KT 6SM -RASN OVC025
FM200400 02009KT 3SM -SN SCT012 OVC020
FM200800 02009KT P6SM BKN025 OVC060
FM201500 03011KT P6SM OVC120=
    
```

Sample TAF for Chicago, IL (O'Hare)



Graphic Source: GAO-08-258, Aviation Weather

Related Links:

Each WFO has a website with a link to their aviation section in the left-hand menu of their homepage.

NWS Homepage: <http://www.weather.gov>

Aviation Weather Center Homepage: <http://aviationweather.gov>

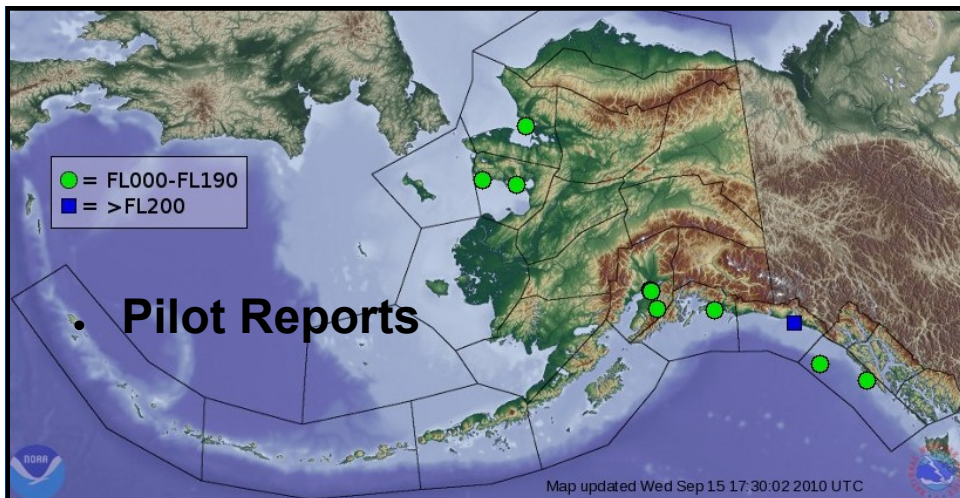
ADDS: <http://aviationweather.gov/adds>

Tactical Decision Aid: <http://www.srh.noaa.gov/zhu/www/TDA.php?sid=MKE>

Center Weather Service Unit Location Map: <http://www.weather.gov/organization.php?task=cwsu.php#task>

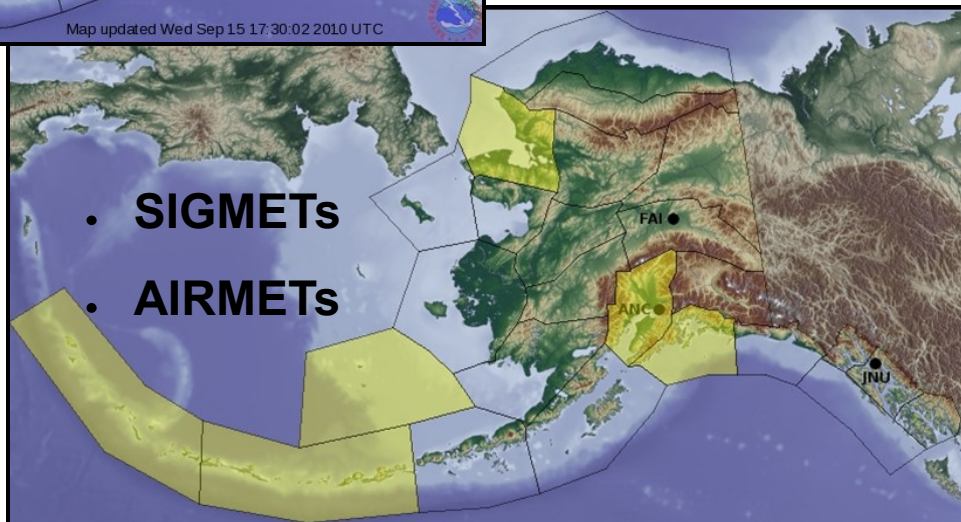
Federal Aviation Administration: <http://www.faa.gov>

The **Alaska Aviation Weather (AAWU)** is a meteorological watch office (MWO) providing Alaska aviation weather products and services to the flying community. The AAWU is responsible for issuing Area Forecasts (FAs), AIRMETs, and SIGMETs for the Anchorage Flight Information Region (FIR). In addition, the AAWU serves as the Anchorage Volcanic Ash Advisory Center (VAAC). The Anchorage VAAC is one of nine international offices providing forecasts and analyses of volcanic ash plumes for eastern Russia and Alaska. There are over 100 historically active volcanoes along the North Pacific “ring of fire” that are monitored by the Anchorage VAAC.

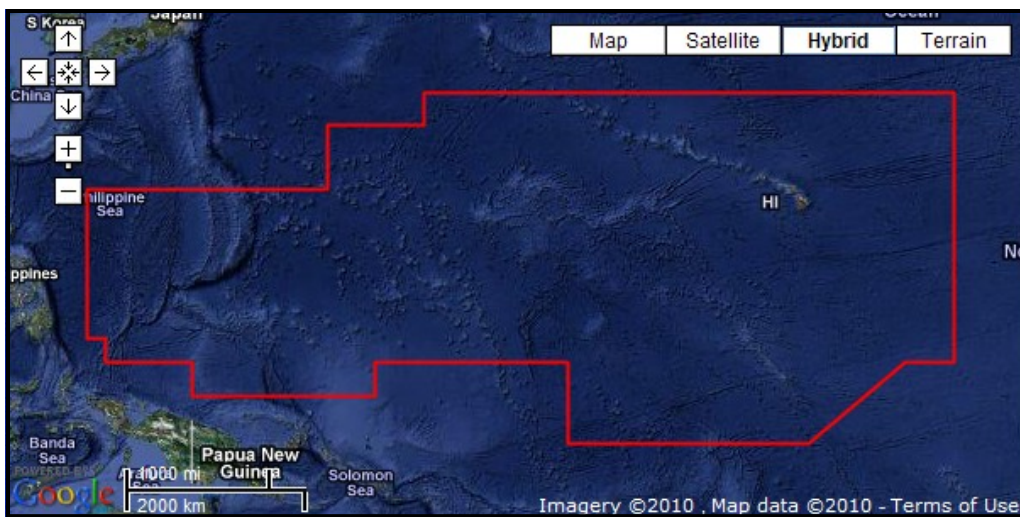


Although the AAWU provides state-wide coverage of Area Forecasts, FA's are organized by geographical divisions. The FA for southeast Alaska (Juneau - the panhandle) extends from the Eastern Gulf Coast through the Southeast Panhandle.

The FA for the northern half (Fairbanks) of the mainland extends south to the Alaska Range, north to the Coastal Arctic Slope, and west to St. Lawrence Island, including Norton and Kotzebue Sounds. The FA for south central Alaska extends north to the Alaska Range, south to the Central Gulf Coast, west to Adak, east to the Copper River Basin.



The **Weather Forecast Office in Honolulu, HI (HFO)** is also one of the three MWOs in the U.S. and maintains a meteorological watch across more than eight million square miles of the central and western Pacific. This area of responsibility covers the portion of the Oakland Oceanic Flight Information Region south of 30° N and west of 140° W.



HFO issues many aviation forecasts for domestic and international travel. For the immediate Hawaii area, products issued include TAFs, area forecasts, upper level wind and temperature forecasts and AIRMETs (AIR pilots METeological information) for low clouds, turbulence, and icing. In addition, the Honolulu forecast office forecasts an area that covers approximately 8,650,800 square miles.

Climate Services

Each NWS forecast office provides daily climate data for select cities in their CWA. Their climate reports contain information on the high and low temperatures, precipitation and wind. Other information, including records and sunrise and sunset times are also included on the daily report.

These products can be found on WFO websites in the local climate section. This data is not considered official. If certified data is required, the data should be requested from the National Climate Data Center.

National Climatic Data Center
Federal Building
151 Patton Avenue
Asheville NC 28801-5001

Phone Number: (828) 271 – 4800

Fax Number: (828) 271 - 4876

Further Contact Information can be found at <http://www.ncdc.noaa.gov/oa/about/ncdccontacts.html>

Local offices do not produce official climate forecast products. These forecasts and products are developed at the Climate Prediction Center. More information can be found on [Page 80](#).

Routine Hydrology Products Issued By Some WFOs	
CLI	Daily Climate Report
CF6	Preliminary Monthly Climate Data
CLM	Monthly Climate Report
RTP	Regional Temp and Precipitation Table
SCD	Supplementary Climatological Data

Product Descriptions

WFO Monthly/Daily Climate Data (CF6): A product providing climatological information for certain cities for individual months. The data is updated daily to reflect the new climate data. In addition to providing the climate data for each day, it also provides running averages and extremes for that particular month and other climate information.

Daily Climatological Report (CLI): Provides a detailed look at an individual day's climatological data listing what actually occurred, the normal values, and the record values for measurable variables like temperature and precipitation. You could think of the CF6 as a condensed collection of a month's worth of CLI products. There are also other similar but less frequently issued climate reports such as the CLA (annual), CLQ (quarterly) and CLS (seasonal).

Monthly Climatological Report (CLM): Official monthly climate report. Similar to the CLI, but a summary for the entire month.

Regional Max/Min Temp and Precipitation Table (RTP): A listing of the highs, lows and recorded precipitation at a number of selected locations in a county warning area.

Supplementary Climatological Data (SCD): A supplemental, manual observation taken by one of the NWS employees on duty. It is generally taken four times per day, at 06Z, 12Z, 18Z and 00Z. It is disseminated in a coded format.

4. Specialty Centers

In addition to the local NWS offices, there are many other NWS and NOAA organizations that provide support for meteorological/hydrologic forecasts, products and services. Most of these organizations are specialized and offer services in a small section of the entire umbrella of NWS/NOAA services.

NOAA Specialty Centers

Aviation Weather Center (AWC) (more information on [Page 83](#))

Website: <http://aviationweather.gov/>

Location: Kansas City, MO

Mission: Delivers consistent, timely and accurate weather information for the world airspace system. The office consists of a team of highly skilled people dedicated to working with users and partners to enhance safe and efficient flight.

NCEP Central Operations (NCO)

Website: <http://www.ncep.noaa.gov/>

Location: Camp Springs, Maryland

Mission: Delivers national and global weather, water, climate and space weather guidance, forecasts, warnings and analyses to its partners and external user communities.

The National Centers for Environmental Prediction (NCEP) provide a wide range of national and international products to a diverse group of recipients including but not limited to NWS offices, government agencies, emergency managers, private sector meteorologists as well as numerous meteorological organizations and societies. Nine offices make up NCEP, covering all aspects of weather and climate forecasting. These offices provide a basis unto all weather forecasts around the nation. In addition, almost all meteorological data collected across the planet is archived within one of the NCEP offices, allowing for continual analysis and developments.

River Forecast Centers (RFC) (more information on [Page 74](#))

Website: (See [Page 73](#) for list of websites)

Location: There are 13 River Forecast Centers across the U.S.

Mission: To save lives and decrease property damage by the issuance of flood guidance and river stage forecasts. Provide basic hydrologic forecast information for the nation's economic and environmental well being. Provide extended forecast information for water resources management.

Climate Prediction Center (CPC) (more information on [Page 80](#))

Website: <http://www.cpc.ncep.noaa.gov/>

Location: Camp Springs, Maryland

Mission: Delivers climate prediction, monitoring and assessment products on timescales from weeks to years to the nation and the global community for the protection of life and property and the enhancement of the economy.

The CPC is comprised of two branches: operations and development. By analyzing dynamical, empirical and statistical procedures, the operations branch is able to formulate long range outlooks (from one week to a year in advance). In addition, the operations branch maintains stratospheric monitoring and UV forecasts. The development branch performs the necessary research, exploring the physical factors accountable for the climate fluctuations as well as monitoring the coupled ocean-atmosphere climate system.

Environmental Modeling Center (EMC)

Website: <http://www.emc.ncep.noaa.gov/>

Location: Camp Springs, Maryland

Mission: 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, other government agencies and the international scientific community. The EMC is composed of three main branches: Global Climate and Weather Modeling, Mesoscale Modeling and Marine Modeling/Analysis.

Hydrometeorological Prediction Center (HPC) (more information on [Page 81](#))

Website: <http://www.hpc.ncep.noaa.gov/>

Location: Camp Springs, Maryland

Mission: Delivers weather and water forecast guidance products and services in support of the daily activities of the NWS and its users. The HPC strives to be a leader in the NWS collaborative forecast process and recognized as a center of excellence by providing high-quality weather and water forecast guidance and analyses. The HPC exists to meet the real-time weather and water information needs of a growing group of users including NWS field offices, other governmental agencies, the media, the private sector, academic institutions, the international community and the general public.

Ocean Prediction Center (OPC)

Website: <http://www.opc.ncep.noaa.gov/>

Location: Camp Springs, Maryland

Mission: Issuance of marine warnings, forecasts and guidance in text and graphical format for maritime users. OPC 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.

The OPC provides five day forecasts for the North Atlantic Ocean extending from Europe west to the U.S. east coast and the North Pacific Ocean, extending from the U.S. and Canadian west coast to eastern Asia. The forecasts serve an important role for commercial ships and other vessels making trans-ocean crossings.

Space Weather Prediction Center (SWPC) (more information on [Page 82](#))

Website: <http://www.swpc.noaa.gov/>

Location: Boulder, CO

Mission: The nation's official source of space weather alerts, watches and warnings. The SWPC provides real-time monitoring and forecasting of solar and geophysical events which impact satellites, power grids, communications, navigation and many other technological systems. The SWPC explores and evaluates new models and products and transitions them into operations. The SWPC is the primary warning center for the International Space Environment Service.

Storm Prediction Center (SPC) (more information on [Page 68](#))

Website: <http://www.spc.noaa.gov/>

Location: Norman, OK

Mission: Exists solely to protect life and property of the American people through the issuance of timely and accurate watch and forecast products dealing with severe weather, wildfires and other hazardous mesoscale weather phenomena.

Tropical Cyclone Warning Centers (more information on [Page 71](#))

National Hurricane Center

Website: <http://www.nhc.noaa.gov/>

Location: Miami, FL

Mission: To save lives, mitigate property loss and improve economic efficiency by issuing the best watches, warnings, forecasts and analyses of hazardous tropical weather and by increasing understanding of these hazards through global outreach.

The NHC provides analysis and forecasts of tropical weather. The center issues warnings and forecasts for the Atlantic Ocean basin, including the Caribbean Sea and Gulf of Mexico. The NHC also issues warnings and forecasts for the eastern North Pacific Ocean basin. There are three units within the NHC: the Technical Support Branch (TSB), the Tropical Analysis and Forecast Branch (TAFB) and the Hurricane Specialist Unit (HSU). From June 1 to November 30, the main focus remains on any tropical cyclone development, however, additional tropical weather discussions and marine forecasts are provided on a year-round basis.

Central Pacific Hurricane Center

Website: <http://www.prh.noaa.gov/hnl/cphc/>

Location: Honolulu, HI.

The Central Pacific Hurricane Center, co-located with the WFO in Honolulu, HI, provides information concerning tropical cyclones in the Central Pacific basin, between 140 degrees West to the International Dateline. The Joint Typhoon Warning Center monitors the Pacific Region west of the International Dateline as well as the Indian Ocean.

WFO Guam

Location: Guam

WFO Guam issues tropical cyclone products for cyclones in the western North Pacific basin within their area of responsibility.

National Severe Storm Laboratory (NSSL)

Website: <http://www.nssl.noaa.gov/>

Location: Norman, OK

Mission: To enhance NOAA's capabilities to provide accurate and timely forecasts and warnings of hazardous weather events such as blizzards, ice storms, flash floods, tornadoes and lightning. NSSL accomplishes this mission, in partnership with the NWS, through a balanced program of research to advance the understanding of weather processes, research to improve forecasting and warning techniques, development of operational applications and transfer of understanding, techniques and applications to the NWS and other public and private sector agencies.

The NSSL is divided into three research divisions: Forecast, Radar and Warning. These three divisions together work in developing enhancements to existing weather radar, designing and testing new radar systems, developing and testing tools to improve forecasts and warnings, develop tools for severe storm monitoring and prediction and carry out field research to improve the basic understanding of severe storm processes.

Spaceflight Meteorology Group (SMG)

Website: <http://www.srh.noaa.gov/smg/>

Location: Houston, TX

Mission: Provides unique world-class weather support to the U.S. human spaceflight effort by providing weather forecasts and briefings to the National Aeronautical and Space Administration (NASA) personnel. Provides pre and post spaceflight weather analysis and documentation. Advises the Johnson Space Center (JSC) community of adverse weather impacting the JSC complex. Serves as meteorological consultants to the JSC community for current and future spaceflight endeavors, and develops tools and techniques to enhance SMG's weather support and to improve the science of meteorology. SMG strives for quality, accuracy, timeliness, user satisfaction and safety.

Tsunami Warning Centers (TWC) (more information on [Page 84](#))

Website: <http://tsunami.gov/>

Location: Palmer, AK and 'Ewa Beach, HI

Mission: To provide reliable tsunami detection, forecasts, and warnings and to promote community resilience. The primary operational warning system objectives for carrying out this mission are to rapidly locate, size, and otherwise characterize major earthquakes, determine their tsunamigenic potential, predict tsunami arrival times, predict coastal flooding when possible, and disseminate appropriate warning and informational products based on this information.

The NWS maintains two Tsunami Warning Centers, with the responsibility of issuing warnings, advisories and watches based upon seismic and sea level data provided by NOAA and other agencies.

West Coast/Alaska Tsunami Warning Center (WC/ATWC)

<http://wcatwc.arh.noaa.gov/>

Forecasts for all the U.S. coastal states except Hawaii, the Canadian coast line, Puerto Rico and the Virgin Islands.

Richard Hagemeyer Pacific Tsunami Warning Center (PTWC)

<http://www.prh.noaa.gov/pr/ptwc/>

Forecasts for Hawaii and countries along the Pacific and Indian Oceans and the Caribbean Sea.

National Climatic Data Center (NCDC) (more information on [Page 78](#))

Website: <http://www.ncdc.noaa.gov>

Location: Asheville, NC

Mission: The NCDC is the world's largest active archive of weather data. Its mission is to provide access and stewardship to the nation's resource of global climate and weather-related data, and also to assess and monitor climate variation and change. This effort requires the acquisition, quality control, processing, summarization, dissemination and preservation of a vast array of climatological data generated by the national and international meteorological services.

National Operational Hydrologic Remote Sensing Center (NOHRSC) (more information on [Page 86](#))

Website: <http://nohrsc.noaa.gov/>

Location: Chanhassen, MN

Mission: The NOHRSC provides remotely-sensed and modeled hydrology products for the conterminous U.S. and Alaska for the protection of life and property and enhancement of the national economy. NOHRSC airborne, satellite, and modeled snow data and products are used by NWS RFCs, WFOs, as well as other federal, state and local government agencies, the private sector and the public to support operational and research hydrology programs across the nation.

The Office of Hydrological Development (OHD)

Website: <http://www.nws.noaa.gov/oh/>

Location: Silver Spring, MD

The OHD enhances NWS products by infusing new hydrologic science, developing hydrologic techniques for operational use, managing hydrologic development by NWS field offices and providing advanced hydrologic products to meet needs identified by NWS users.

The OHD is comprised of multiple units that enable it to accomplish its goals.

Advanced Hydrological Prediction Services (AHPS)

<http://www.nws.noaa.gov/oh/ahps/>

Provides new information and products through the infusion of new science and technology. This service improves flood warnings and water resource forecasts to meet diverse and changing user needs.

Planning, Programming, and Coordination Group (PPC)

<http://www.nws.noaa.gov/oh/ppc/>

Leads the planning, acquisition, tracking and resource analyses for NOAA and NWS hydrology programs.

Hydrology Laboratory (HRL)

<http://www.nws.noaa.gov/oh/hrl/>

Conducts studies, investigations and analyses leading to the application of new scientific and computer technologies for hydrologic forecasting and related water resources problems. HRL personnel provide training and implementation support on hydrologic forecasting techniques in support of the NWS Hydrologic Service Program.

RFC Development Management

<http://www.nws.noaa.gov/oh/rfcdev/>

Responsible for managing science and software development among RFCs to ensure the efficient and economical use of NWS resources to support the NWS Hydrologic Service Program.

Community Hydrologic Prediction System

<http://www.nws.noaa.gov/oh/hrl/chps/index.html>

Enables NOAA's research and development enterprise and operational service delivery infrastructure to be integrated and leveraged with other federal water agency activities, academia and the private sector to form the backbone of a national water information system.

Office of Operational Systems

Website: <http://www.weather.gov/oos/>

Location: Silver Spring, MD

Mission: Supervises operational systems and provides engineering software management, facilities, communications and logistical services, develops policy for implementation, operations, support and evaluation of operational weather systems. In addition, the OOS prepares the budget as well as managing office operations.

The OOS is composed of four divisions that enable it to achieve the purpose of the office (listed below.)

Radar Operations Center (ROC)

<http://www.roc.noaa.gov/WSR88D/>

The ROC provides support, guidance and maintenance of the WSR-88D systems. With increasing technology advances, the ROC oversees the modifications of the systems, enabling it to provide the best services to the NWS and to the public.

National Data Buoy Center (NDBC)

<http://www.ndbc.noaa.gov/>

The NDBC develops, operates and maintains the data buoy network and coastal stations across the globe. Data collected is provided to the NWS in assisting with marine forecasts.

Field Systems Operations Office

<http://www.weather.gov/ops2/>

This office serves as the primary operator for the AWIPS system and NOAA Weather Radio by developing the operating standards and procedures as well as maintaining and improving the systems.

Operations Division

<https://www.ops1.nws.noaa.gov/index.htm>

Oversees the general operations of all software and systems used by the NWS.

Office of Climate, Weather and Water Services

Website: <http://www.weather.gov/os/>

Location: Silver Spring, MD

Mission: To lead the NWS effort to sustain and enhance climate, water and weather services; to establish NWS operational requirements; to evaluate customer satisfaction; and to train the workforce.

The OOS is composed of eight divisions, most of which are broken down into branches (listed below.)

Operations and Requirements Division

Integrated Operations Branch

Requirements/Change Management Branch

Meteorological Services Division

Marine and Coastal Weather Services Branch

Fire and Public Weather Services Branch

Aviation Weather Services Branch

Hydrologic Services Division

Services Branch

Support Branch

National Operational Hydrologic Remote Sensing Center

Climate Services Division

N/A

Program Performance and Awareness Division

Performance Branch

Awareness Branch

Training Division

NWS Training Center

Warning Decision Training Branch

Forecast Decision Training Branch

Observing Services Division

N/A

Storm Prediction Center (SPC) Products

<http://www.spc.noaa.gov/>

Products created by the SPC detail the threat of non-severe and severe thunderstorms for the coming week. These are described in each of the **Convective Outlook** products. The Convective Outlook is compiled of both a graphic representation and text wording, broken down into Day 1 (today), Day 2 (tomorrow), Day 3 and Day 4-8.

The text wording supplies a synoptic overview using technical terms to describe the situation at hand while providing information about timing and locations. Below is a truncated example of the text product associated with Day 1.

Forecast Discussion

DAY 1 CONVECTIVE OUTLOOK
NWS STORM PREDICTION CENTER NORMAN OK
0257 PM CDT FRI JUL 02 2010

VALID 022000Z - 031200Z

...THERE IS A SLGT RISK OF SVR TSTMS FROM MT TO ND...

...THERE IS A SLGT RISK OF SVR TSTMS FROM NERN CO ACROSS THE ADJACENT CENTRAL/NRN PLAINS...

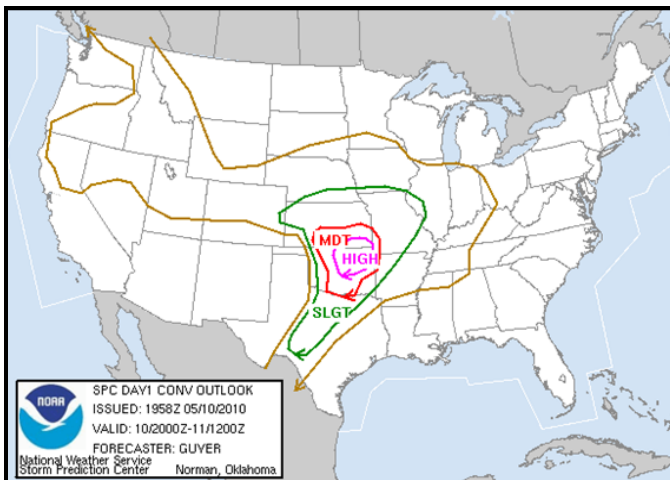
...MT...

WRN EXTENT OF THE SLIGHT RISK IN SWRN TO CENTRAL MT HAS BEEN SHIFTED EWD GENERALLY 25-55 MILES TO ACCOUNT FOR THE E/SEWD ADVANCEMENT OF THE COLD FRONT. EARLY AFTERNOON SURFACE ANALYSIS INDICATED THIS BOUNDARY EXTENDED SWWD FROM NORTH CENTRAL MT /E OF HVR/ THROUGH SWRN MT INTO SRN ID AND NWRN NV. OTHERWISE...PREVIOUS OUTLOOK FOR MT INTO WRN/NRN ND REMAINS ON TRACK WITH STORMS BEGINNING TO DEVELOP OVER SWRN/SOUTH CENTRAL MT. FARTHER ENE...STRONG CAP PER 18Z GGW SOUNDING WITH WARMING IN THE 600-750 MB LAYER SINCE 12Z TODAY SUGGESTS TSTM DEVELOPMENT WILL BE DELAYED UNTIL ACTIVITY SPREADS INTO THIS REGION FROM THE W/SW WITH THE APPROACH OF THE COLD FRONT.

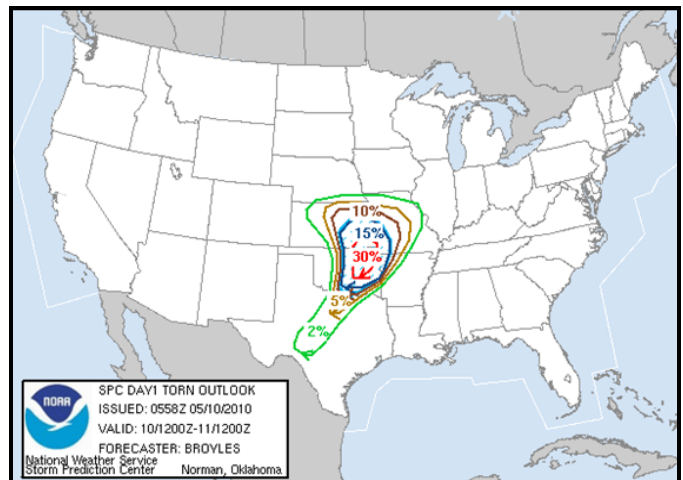
Day 1 Convective Outlook

The first of the Day 1 Convective Outlook graphics below shows an overall risk of severe weather. SLGT (slight) lines are green, MDT (moderate) lines are red, and HIGH risk lines are purple. The brown outlined area is an area of general thunderstorms. The next Day 1 graphic depicts the percentage chances of a tornado occurring. SPC also produces similar graphics for severe hail and thunderstorm wind gusts, broken down individually.

Categorical Outlook



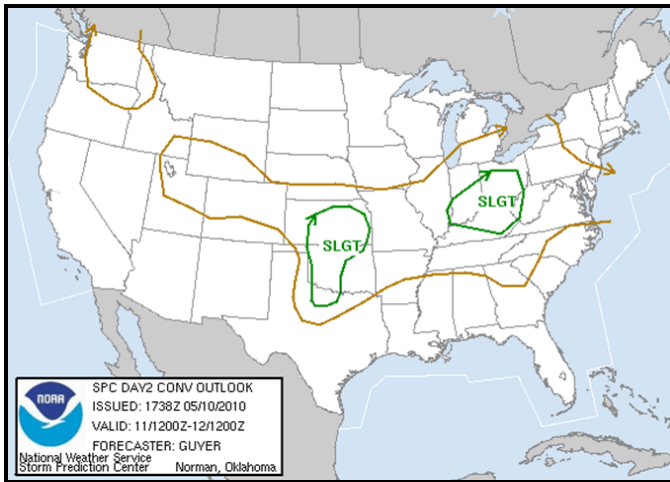
Probabilistic Tornado Outlook



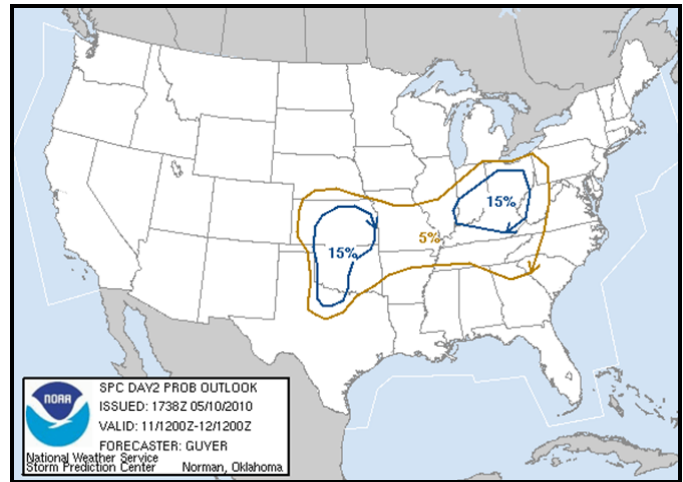
Day 2 and 3 Convective Outlook

Days 2 and 3 show an overall risk of severe weather, but the other associated graphics depict the combined probabilities of severe wind gusts, hail and tornadoes.

Categorical Outlook



Probabilistic Outlook



Day 4-8 Convective Outlook

The Days 4-8 graphic will only show areas that have a 30% probability of being impacted by severe weather.

If a “SEE TEXT” label covers an area of a day 1-3 map, there is a 5% probability of severe weather occurring, but over too small an area to warrant a slight risk. NOTE: All discussions of wind and hail is in reference to severe weather criteria (winds greater than 58 mph and hail greater than 1 inch).

For more information about what slight, moderate and high risks mean, please visit the following website:

http://www.spc.noaa.gov/misc/SPC_Prob_Conv_Otlk_Change_20060214.html

Mesoscale Discussions

In addition to providing the convective outlooks, the SPC issues other short term products. These include Mesoscale Discussions (MCD) and severe weather watches. Mesoscale Discussions are issued when conditions are rapidly changing and thunderstorm development is ongoing or expected soon. These are typically issued 1-3 hours prior to a severe thunderstorm or tornado watch. It details what is currently happening and what is expected over the next couple of hours. It also discusses where the watch is expected by citing meteorological reasoning for the concern. The MCD may also be issued to suggest that although storms are developing, widespread severe weather is not expected and a watch is unlikely. The SPC can also issue MCDs for winter weather, such as for heavy snow, blizzard or freezing rain threats.

Below is a truncated example of an MCD:

```
MESOSCALE DISCUSSION 0840
NWS STORM PREDICTION CENTER NORMAN OK
0907 AM CDT MON JUN 07 2010
AREAS AFFECTED...CENTRAL KS
CONCERNING...SEVERE POTENTIAL...WATCH UNLIKELY
VALID 071407Z - 071530Z
BOUNTS OF SEVERE HAIL WILL REMAIN POSSIBLE THROUGH LATE MORNING
ACROSS CENTRAL KS. WITH THE SEVERE THREAT EXPECTED TO GRADUALLY WANE
OVER THE NEXT FEW HOURS...A SEVERE WATCH IS NOT ANTICIPATED.
SEVERE STORMS INCLUDING ELEVATED SUPERCELLS WILL CONTINUE OVER THE
NEXT FEW HOURS MAINLY ACROSS CENTRAL KS. BASED ON THE 12Z DODGE CITY
```

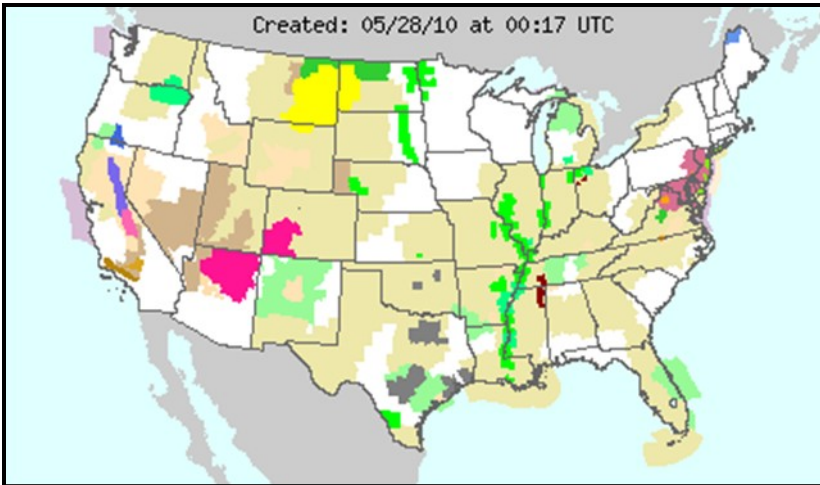

Severe Thunderstorm or Tornado Watches

When the conditions become favorable for severe weather formation, either a thunderstorm or tornado watch is issued. Watches allow the general public to become aware of the potential for severe weather and provide lead time to media, emergency management and spotters.

The SPC issues watches in collaboration with the WFO. The local NWS offices issue warnings if needed.

Tornado watches will be yellow on the map graphic below and severe thunderstorm watches salmon (colors may vary on from other sources). To access this graphic (for all watches, warnings, and advisories) refer to this web page:

<http://www.weather.gov/view/nationalwarnings.php?map=on>



The image to the left shows a tornado watch across Montana and North Dakota (in yellow) and a severe thunderstorm watch across New Jersey, Maryland, Virginia and Delaware (salmon colored).

On the “watches” page of SPC’s website, there is a map showing the current watches in effect and a watch archive feature that has a graphical representation of past watches. This graphic depicts individual counties in the watch and an associated radar image at the time the watch was issued.

Some watches are classified as a PDS or “Particularly Dangerous Situation” watch. These watches are issued when conditions are favorable for widespread significant severe weather or multiple, long-lived, strong or violent tornadoes.

PDS watches are issued, when in the opinion of the forecaster, the likelihood of significant events is boosted by very volatile atmospheric conditions. Usually this decision is based on a number of atmospheric clues and parameters, so the decision to issue a PDS watch is subjective. There is no hard threshold or criteria. In high risk convective outlooks, PDS watches are issued most often.

In general, Significant severe weather is: EF2 or stronger tornado, thunderstorm wind gusts 75 mph or higher, or hailstones 2” in diameter, or larger.

Below is an abbreviated example of a PDS watch.

EFFECTIVE THIS THURSDAY MORNING AND EVENING FROM 1135 AM UNTIL
1000 PM CDT.

...THIS IS A PARTICULARLY DANGEROUS SITUATION...

DESTRUCTIVE TORNADOES...LARGE HAIL TO 2.5 INCHES IN DIAMETER...

THUNDERSTORM WIND GUSTS TO 80 MPH...AND DANGEROUS LIGHTNING ARE

POSSIBLE IN THESE AREAS.

For further information on all of the SPC products, please visit these webpages:

<http://www.spc.noaa.gov/products/>

<http://www.spc.noaa.gov/misc/about.html>

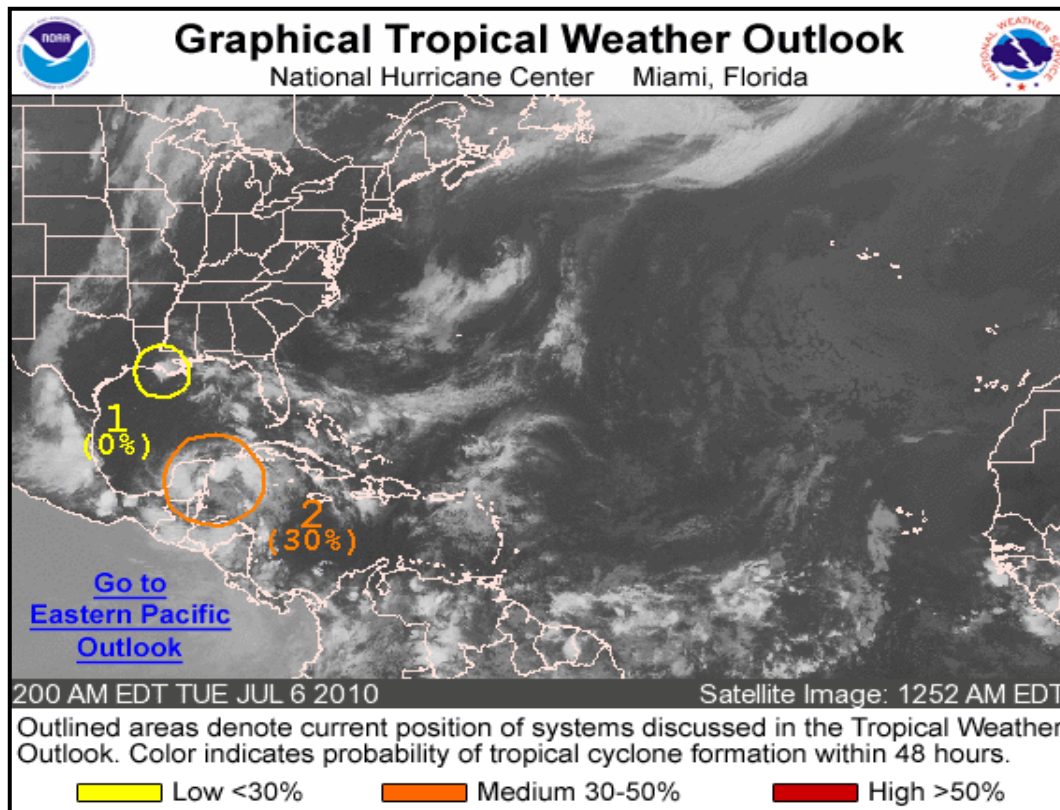
National Hurricane Center (NHC) Products

<http://www.nhc.noaa.gov>

The NHC in Miami, FL, provides year round forecasts of the Atlantic and Eastern Pacific Basins.

The NHC provides a tropical weather discussion, which details major synoptic weather features and significant areas of disturbed weather in the tropics. This discussion also includes information about any tropical waves, cyclones and the position of the Intertropical Convergence Zone (ITCZ).

On the main page for the NHC, a graphic shows active tropical cyclones and other areas of interest. The NHC produces a Graphical Tropical Weather Outlook that depicts these areas of disturbed weather and shows the probability of their development into a tropical cyclone within two days.



A Graphical Tropical Weather Outlook is also available for the Eastern Pacific Ocean basin. This can be obtained by clicking on the link in the lower left of the graphic above.

At the bottom of the graphic above, areas circled in yellow have a less than 30% chance of developing into a tropical cyclone during the ensuing 48 hours. Areas circled by orange have a 30-50% chance and areas in red have a greater than 50% chance of developing within 48 hours. A text explanation accompanies the graphic, which provides the synoptic overview and the forecaster expectation for tropical cyclone development.

When a cyclone develops (tropical depression/storm/hurricane), the NHC will begin issuing advisories every six hours. These advisories provide an overview of the storm: the current location, the estimated central pressure, the maximum wind speed and gust and the size (in radii) of the tropical cyclone. The advisories also provide a forecast path and intensity for the next five days. If watches or warnings are in effect for the coastal areas of the U.S. or its territories, public intermediate advisories are issued every two or three hours.

Included in the advisory package is a public advisory, which is a text product detailing the movement of the storm, conditions to be expected, time and location, and any watches and warnings currently in effect.

Example of an NHC Public Advisory (abbreviated):

WTNT31 KNHC 302036
TCPAT1
BULLETIN
HURRICANE ALEX ADVISORY NUMBER 21
NWS TPC/NATIONAL HURRICANE CENTER MIAMI FL AL012010
400 PM CDT WED JUN 30 2010

...ALEX HEADING TOWARD NORTHEAST MEXICO WITH 90 MPH WINDS...

SUMMARY OF 400 PM CDT...2100 UTC...INFORMATION

LOCATION...24.5N 96.8W
ABOUT 80 MI...130 KM NE OF LA PESCA MEXICO
ABOUT 105 MI...170 KM SSE OF BROWNSVILLE TEXAS
MAXIMUM SUSTAINED WINDS...90 MPH...150 KM/HR
PRESENT MOVEMENT...W OR 270 DEGREES AT 13 MPH...20 KM/HR
MINIMUM CENTRAL PRESSURE...959 MB...28.32 INCHES

WATCHES AND WARNINGS

CHANGES WITH THIS ADVISORY...

NONE.

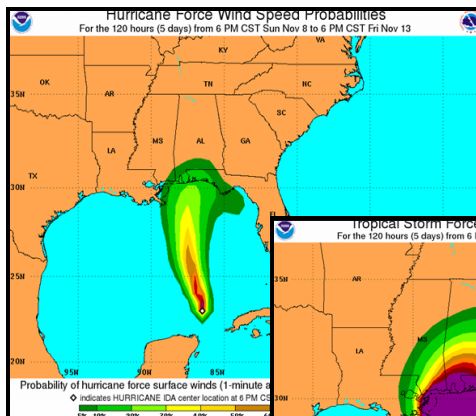
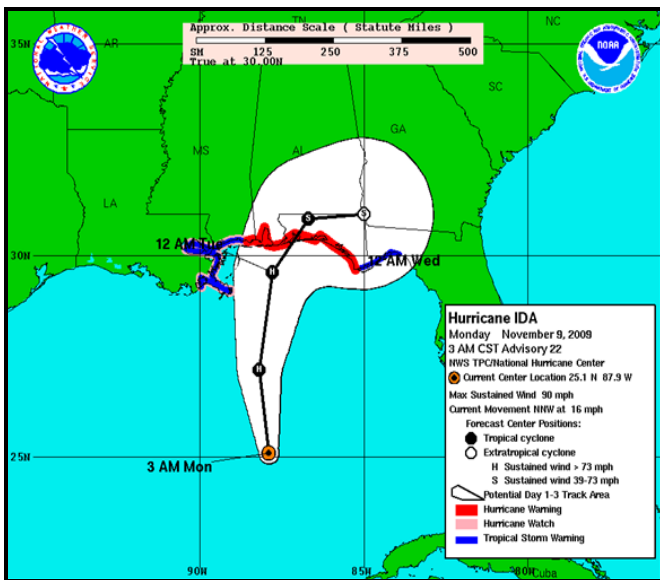
SUMMARY OF WATCHES AND WARNINGS IN EFFECT...

A HURRICANE WARNING IS IN EFFECT FOR...
* THE COAST OF TEXAS SOUTH OF BAFFIN BAY TO THE MOUTH OF THE RIO GRANDE
* THE COAST OF MEXICO FROM THE MOUTH OF THE RIO GRANDE TO LA CRUZ

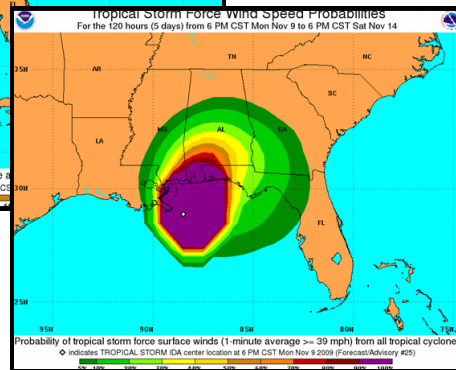
(TEXT CONTINUES)

In addition to the text products, the NHC creates multiple graphical products to depict the path and conditions expected of the storm. A three and five day cone are created, as shown below. Other graphics below show probabilities of receiving tropical storm force winds (39 mph or greater) and hurricane force winds (74 mph or greater) at specific locations during the next five days.

3-day cone



Hurricane and Tropical Storm Force Wind Probabilities



The **Tropical Analysis and Forecast Branch** creates products detailing conditions on numerous bodies of water. Some examples of the products include:

High Seas: Used mainly by large transoceanic vessels but can also be used by smaller vessels or those on shorter voyages. It gives an overview of winds and waves, as well as any convective activity. This product will include any marine warnings for the area.

Offshore Water Forecast: Provides forecast and warning information to mariners who travel the oceanic waters adjacent to the U.S. and its territorial coastal waters. This forecast serves users who operate from the coastal waters to several hundred nautical miles from shore with 10 different products issued by the National Hurricane Center, the Ocean Prediction Center, the Honolulu Weather Forecast Office, the Anchorage Weather Forecast Office and the Juneau Weather Forecast Office.

Marine Weather Discussion: A semi-technical product, analogous to the Area Forecast Discussion (AFD) issued by the local National Weather Service Forecast Offices, primarily used as a means to explain the scientific rationale behind the Offshore Waters Forecast and to summarize the warnings in effect. The Marine Weather Discussion is used to convey forecast and warning information to federal agencies, weather-sensitive officials and the media.

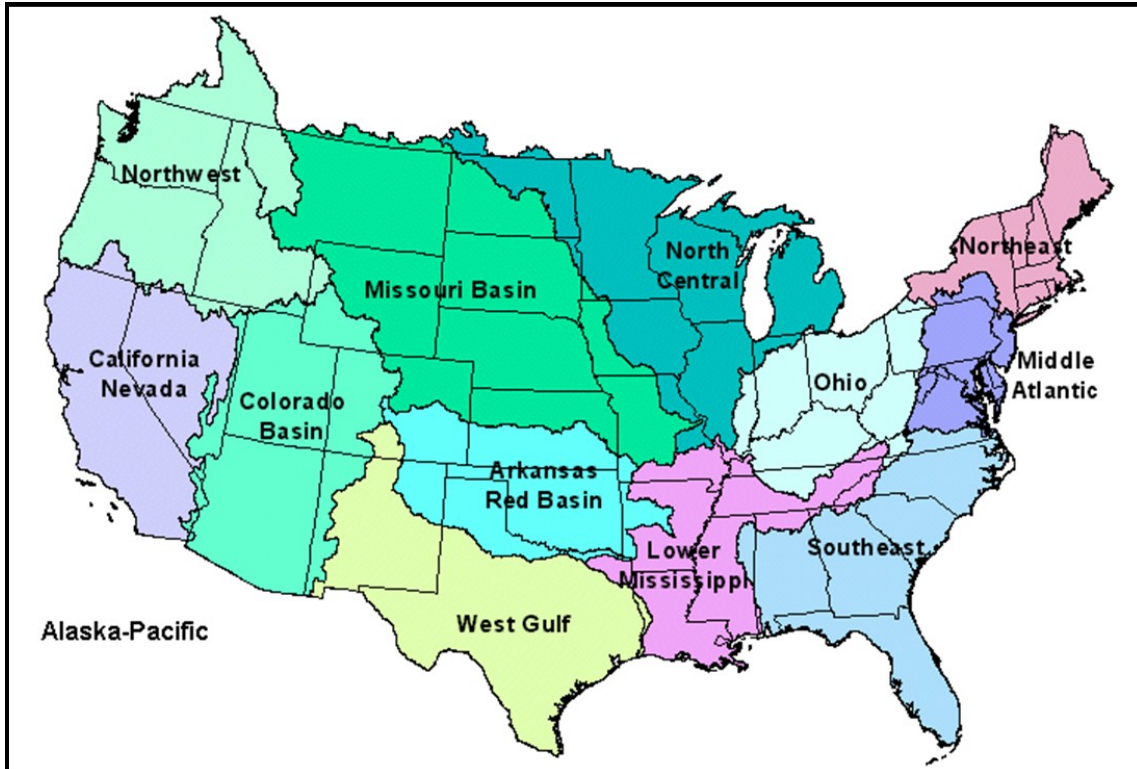
Tropical Surface Analysis: Created every six hours to depict the current state of the atmosphere, specifically the sea level pressure field and any relevant synoptic surface features. The Tropical Surface Analysis is attached to surface analyses over North America, the North Atlantic Ocean, the North Pacific Ocean and the Western Pacific Ocean to create the National Weather Service Unified Surface Analysis.

For more information on all the products generated, please visit the following site:

<http://www.nhc.noaa.gov/abouttafbprod.shtml#MIM>

River Forecast Center (RFC) Products

Thirteen RFCs provide hydrologic/hydrometeorologic forecast and guidance products along with other forms of technical support to NWS offices in its area of responsibility. The RFC also provides forecast and guidance products to an increasing number of users outside the NWS, especially water management agencies. In doing so, the RFC serves as a major reference point for these users. The role of the RFC staff is to prepare stage, flow, volume and velocity forecasts for the next three to four days; extended range stage, flow, volume and ice melt forecasts for more than one week into the future; flash-flood guidance; and related types of products. Forecasts of seasonal snow melt or water-year runoff are prepared monthly in areas where snow is the principal source of stream flow. Additionally, RFC activities include calibrating hydrologic models, maintaining real-time hydrometeorological databases and being involved in interagency planning activities, such as forecast coordination and data exchange.



River Forecast Centers

Alaska-Pacific RFC - Anchorage, AK

<http://www.weather.gov/aprfc/>

Arkansas-Red Basin RFC - Tulsa, OK

<http://www.weather.gov/abrfc/>

California-Nevada RFC - Sacramento, CA

<http://www.cnrfc.noaa.gov/>

Colorado Basin RFC - Salt Lake City, UT

<http://www.cbrfc.noaa.gov/>

Lower Mississippi RFC - Slidell, LA

<http://www.weather.gov/lmrfc/>

Middle Atlantic RFC - State College, PA

<http://www.weather.gov/marfc/>

Missouri River Basin RFC - Pleasant Hill, MO

<http://www.weather.gov/mbrfc/>

North Central RFC - Chanhassen, MN

<http://www.weather.gov/ncrfc/>

Northeast RFC - Taunton, MA

<http://www.weather.gov/nerfc/>

Northwest RFC - Portland, OR

<http://www.nwrfc.noaa.gov/>

Ohio RFC - Wilmington, OH

<http://www.weather.gov/ohrfc/>

Southeast RFC - Peachtree City, GA

<http://www.weather.gov/serfc/>

West Gulf RFC - Fort Worth, TX

<http://www.weather.gov/wgrfc/>

RFC products are broadly grouped into three categories: (1) forecast products, (2) support/guidance products, (3) data products.

Deterministic Hydrologic Forecast (RVF): RFCs use the deterministic hydrologic forecast product to provide routine and event-driven hydrologic forecasts. Information provided in this product includes short-term hydrologic forecasts and river ice forecasts. The RVF is a guidance product from the RFC, but the official forecasts/warnings are issued only by local NWS WFOs.

Contingency River Forecast (CRF): This product is provided for impending flood or high water events when the future impact of one or more numerical model solutions. The CRF product contains river forecasts based on a variety of model solutions that represent scenarios different from the one used in the “official” or “most likely” deterministic forecast. For example, if the official deterministic forecast uses 18 hours of QPF, a CRF could be produced with a full three days of QPF. Alternatively, it could contain a range of QPFs (e.g., 1, 2, 3, 4, and 5 inches.) This internal product is not distributed over NWS-supported public dissemination pathways, but may be provided to partners through secure mechanisms.

Assimilated Data Fields: RFCs assimilate remotely-sensed precipitation estimates, QPF, and other hydrometeorological information for use in their hydrologic forecast operations. This assimilated information may be forwarded to other offices inside and outside the NWS. The image to the right is an example of gridded multi-sensor precipitation estimation from the NCRFC.

Streamflow Guidance (ESG): The ESG product is generally used by RFCs to provide hydrologic forecast information of an advisory or descriptive nature. Information provided in this product includes flood potential outlooks/guidance and discussions of medium and long-term hydrologic forecasts.

Extended-Range Streamflow Prediction (ESP):

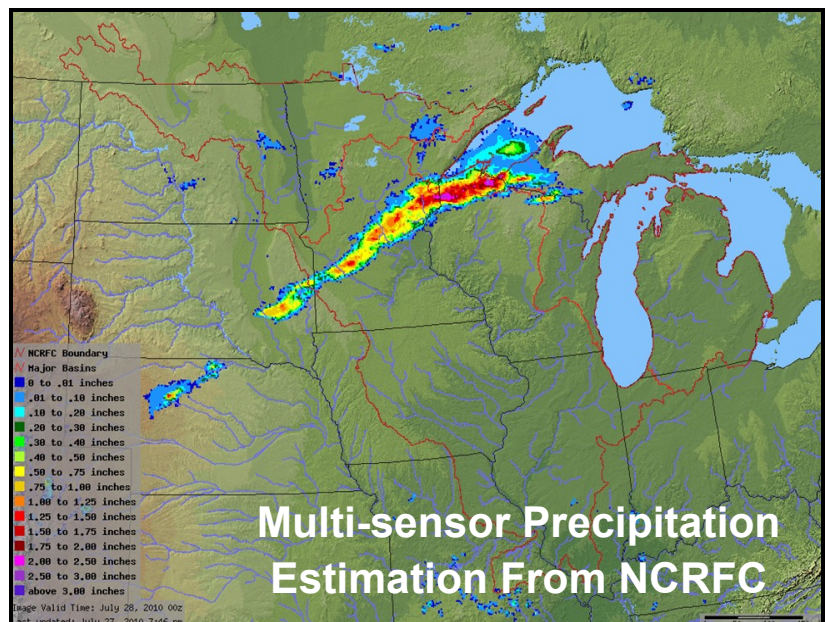
The ESP product is for long-term/extended-range hydrologic forecast information generally of a numeric or probabilistic nature. Information distributed under this category includes water supply forecasts, drought and water resources guidance and long-term probabilistic forecast information. This product is distributed over NWS-supported public dissemination pathways and posted on the Internet.

Flash Flood Guidance (FFG): Flash flood guidance is a numerical estimate of the average rainfall over a specified area (or pre-defined grid) and time interval required to initiate flooding on small streams. FFG products are distributed over NWS-supported public dissemination pathways and posted on the Internet.

Headwater Flash Flood Guidance (FFH): Headwater flash flood guidance is a numerical estimate of the average rainfall over a specified small stream basin and time interval required to initiate flooding on the stream. FFH products are distributed over NWS-supported public dissemination pathways and posted on the Internet.

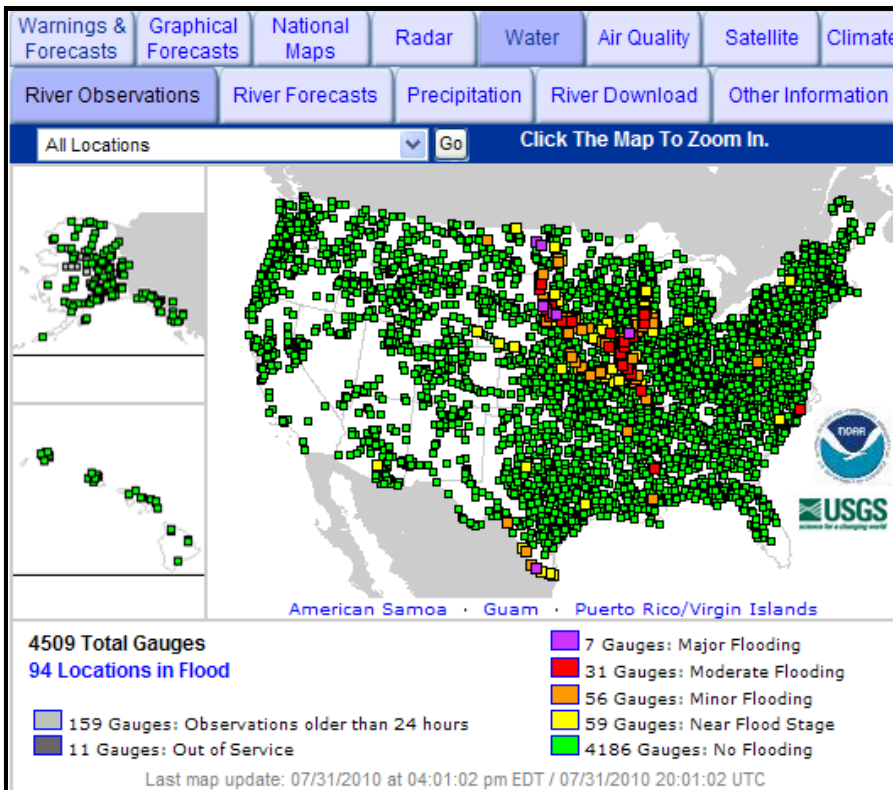
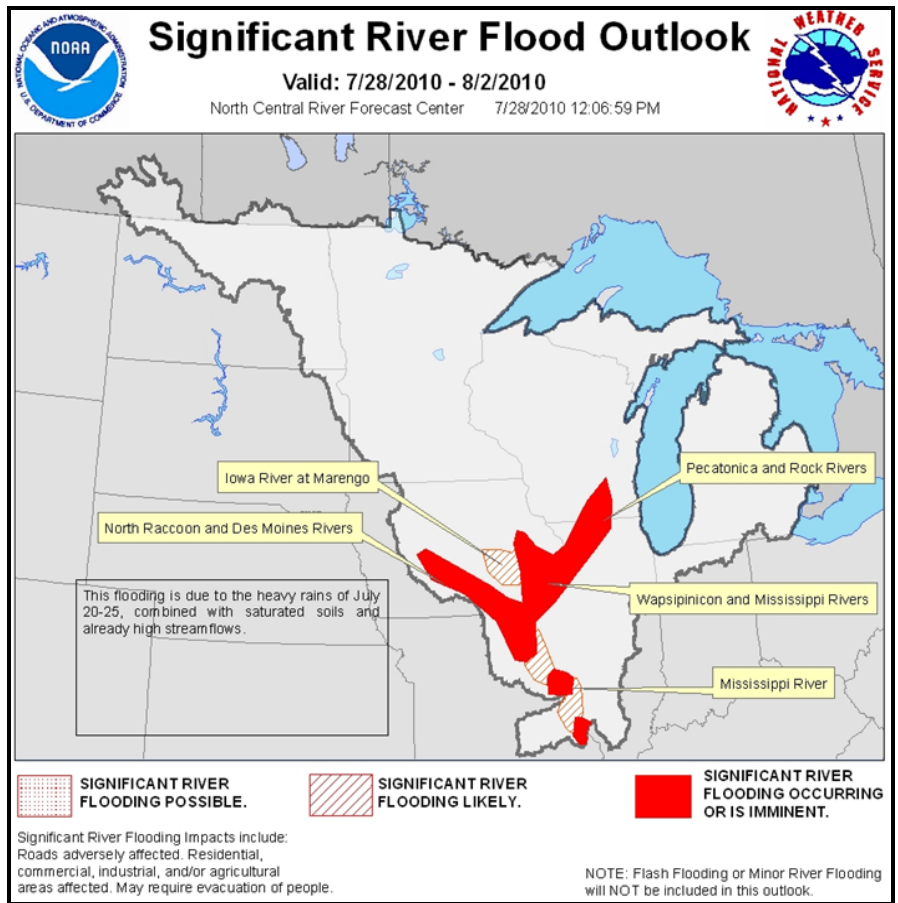
Hydrometeorological Discussion (HMD): Hydrometeorological discussions provide a hydrology-oriented overview of the current and expected hydrometeorological situation across the RFC area.

Hydrometeorological Data Products (RRx): These products contain precipitation and other hydrometeorological data from various networks, including the NWS Cooperative Network, flood warning systems, ASOS, and networks operated by partnering agencies.



Significant River Flood Outlook Product

This graphical product broadly identifies areas where potential exists for significant river flooding during the next five days. "Significant flooding" is defined as flooding which falls in the moderate and major categories. Each RFC posts their significant river flood outlook product on their web server and the CONUS RFCs transmit their product to Hydrometeorological Prediction Center (HPC) at the NCEP. The significant river flood outlook product can be used as guidance by WFOs when they prepare local hydrologic outlooks. The significant river flood outlook product helps the NWS meet its mission by graphically depicting areas of river flood potential. This helps partners and other users focus and optimize their flood mitigation activities.



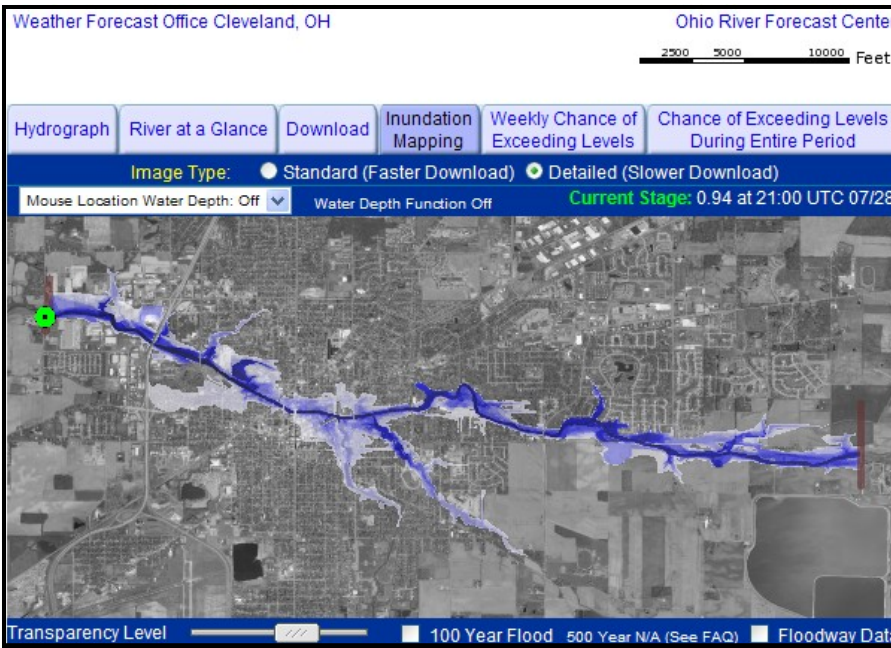
Advanced Hydrologic Prediction Service

The hydrologic forecast information and observed data contained in products described in the previous sections, as well as additional output from WFO and RFC hydrologic modeling systems, are incorporated into graphical products and a forecast information database. These graphical products provided through the Internet and other mechanisms, the forecast information database from which they are derived, and improvements to the underlying hydrologic science and forecasting technology form the core of the Advanced Hydrologic Prediction Service (AHPS).

AHPS Web Link:

<http://water.weather.gov/>

Other examples of RFC products:

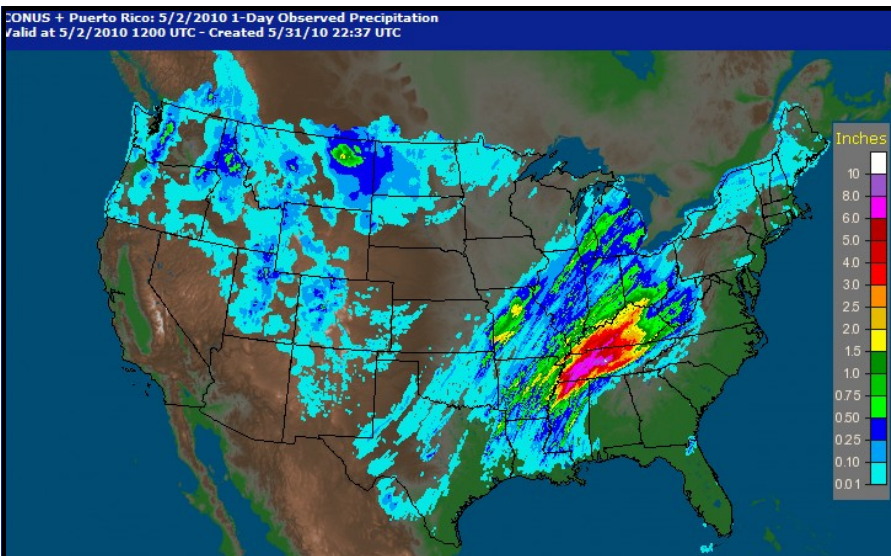
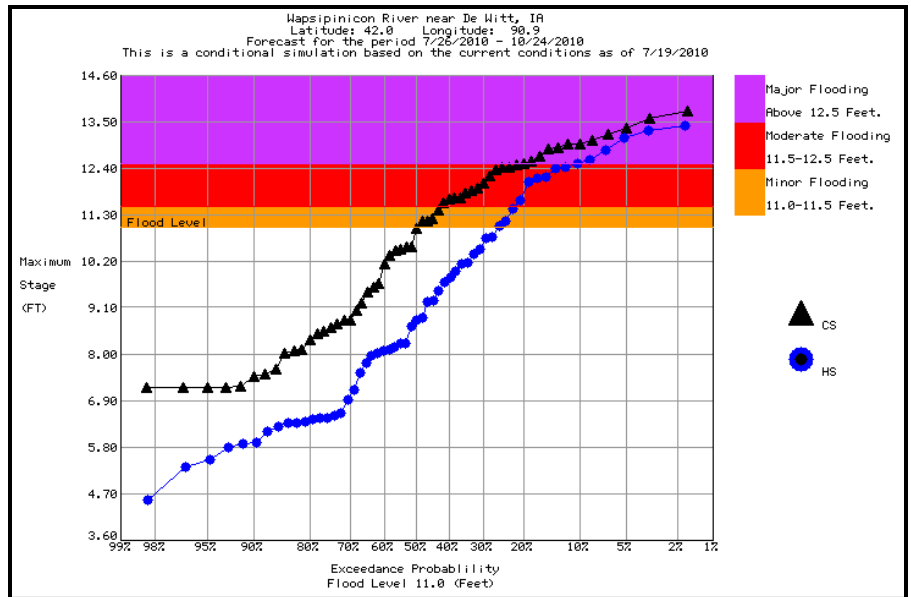


Flood Inundation Mapping

<http://water.weather.gov/ahps/inundation.php>

Probabilistic Flood Forecasts

<http://water.weather.gov/>



Quantitative Precipitation Estimation

<http://water.weather.gov/precip/>

National Climatic Data Center (NCDC)

<http://www.ncdc.noaa.gov>

The NCDC collects and archives nearly 99 percent of all NOAA's data from not only local observers but global offices as well. The center contains over 150 years of data, including 320 million paper records, 2.5 million microfiche records and 1.2 petabytes of digital data. Data can be received in many forms, including but not limited to satellites, radar, NWS COOP (cooperative observers), aircraft, ships, radiosondes, wind profilers, rocketsonde and NWS forecast/warning/analysis products.

The NCDC can be contacted by either accessing their website or contacting the office personally by mail, email or phone. It may take a few days to receive requested documents, so contact the NCDC right away if you have a time sensitive need for the data. Even though a person can request the data from a WFO, it is only considered official data when obtained from the NCDC.

A large amount of free climatological data can be found at <http://www7.ncdc.noaa.gov/IPS/>. However, a fee will be included for access to some of the datasets. Included are:

- Local Climatological Data: Summaries from major airport weather stations. Includes temperature, degree days, precipitation and winds taken at hourly intervals. Lag time of one to two months.
- Climatological Data: Station maximum and minimum temperatures and precipitation. May also include snow fall amount and soil temperatures. Lag time of six months.
- Hourly Precipitation Data: Hourly Precipitation data from NWS offices, FAA and COOP stations. Lag time of four to six months.
- Storm Data: Monthly publication of storm occurrences by state.
- Monthly Climate Data for the World: Includes temperatures, pressure, precipitation, vapor pressure, hours of sunshine, wind and dew point depressions. Lag time of four to six months.
- COOP Data: Temperature and precipitation measured at COOP sites across the country. Lag Time of one to two months.
- Climatological Data National Summary: General summary of weather conditions across the nation, extreme temperature and precipitation records, heating and cooling degree days, flood data, storm summaries, upper air data and sunshine and solar radiation.

Mailing Address:

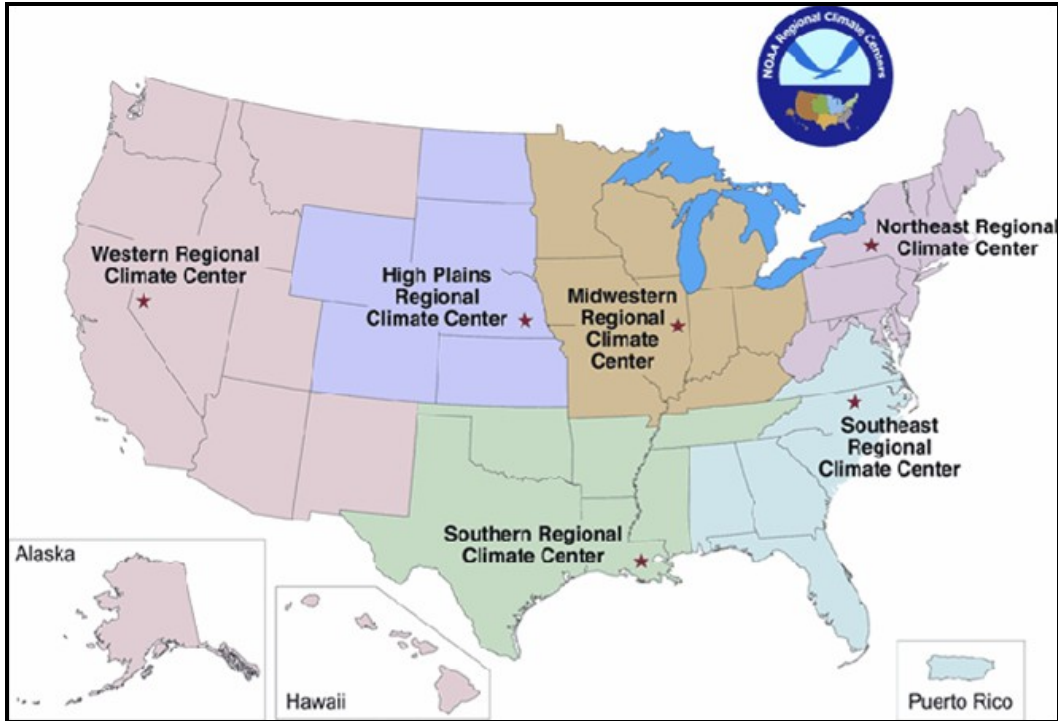
National Climatic Data Center
Federal Building
151 Patton Avenue
Asheville NC 28801-5001

Phone Number: (828) 271 – 4800

Fax Number: (828) 271 - 4876

Further contact information can be found at <http://www.ncdc.noaa.gov/oa/about/ncdccontacts.html>

Regional Climate Data Centers

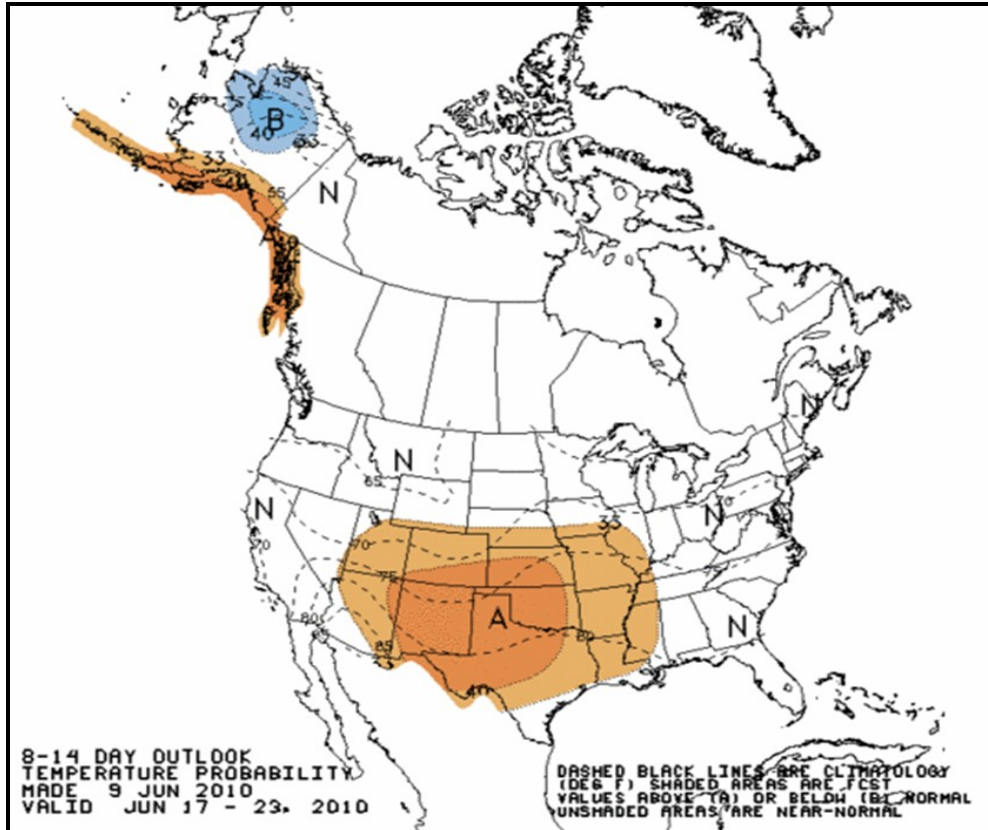


High Plains Regional Climate Center Location: Lincoln, NE Website: http://www.hprcc.unl.edu/	Southeast Regional Climate Center Location: Chapel Hill, NC Website: http://www.sercc.com/
Midwestern Regional Climate Center Location: Champaign, IL Website: http://mrcc.isws.illinois.edu/	Southern Regional Climate Center Location: Baton Rouge, LA Website: http://www.srcc.lsu.edu/
Northeast Regional Climate Center Location: Ithaca, NY Website: http://www.nrcc.cornell.edu/	Western Regional Climate Center Location: Reno, NV Website: http://www.wrcc.dri.edu/

Climate Prediction Center (CPC) Products

<http://www.cpc.noaa.gov>

The Climate Prediction Center produces long range forecasts of temperature and precipitation anomalies across the U.S. The main products are outlooks for 6-10 days, 8-14 days, 1 month and 3 months.



A graphic depicting the 8-14 day temperature outlook. Note the “A” (in orange) refers to above normal temperatures forecasted, “B” (in blue) refers to below normal temperatures expected and the “N” relates to normal temperatures.

The outlook provides a graphic representation of what can be expected for temperatures and precipitation. The temperature graphic will show the probability that the temperature will be above normal (shades of orange and red) and below normal (shades of blue). The same is done for the precipitation, with above normal forecasts depicted with shades of green and below normal values depicted with shades of brown. Both temperature and precipitation forecasts are created for days 6-10 and 8-14, as well as for one month (monthly outlook) and for the next three months (seasonal outlook). Additionally, a drought outlook and a graphic of hazards relating to temperature/wind (extreme heat or cold), precipitation (heavy rain/flooding) and soil/wildfire (drought) are available.

Within the outlooks, the chance of the temperature or precipitation being above or below normal is broken down into percentage of occurrence. In the month and three month outlooks, the temperature and precipitation chances are broken down into percentages as well, though rather than stating a normal chance, these areas are defined by “EC” or equal chance. Equal chance means there is an equal chance (33.3%) of the temperature/precipitation being above, below or near normal levels.

Hydrometeorological Prediction Center (HPC) Products

<http://www.hpc.ncep.noaa.gov/>

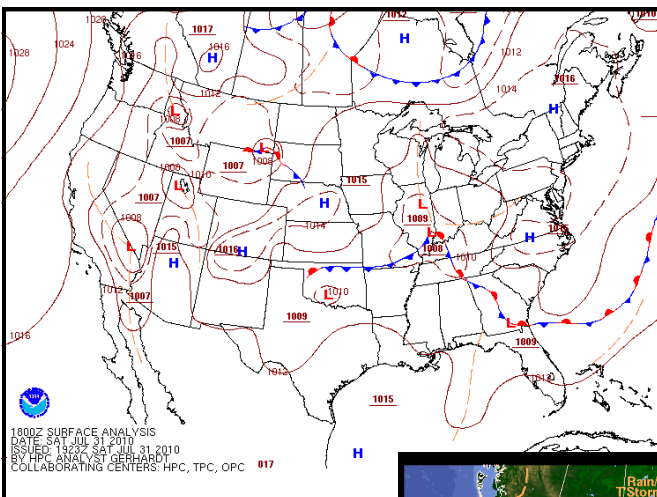
HPC is located in the World Weather Building in Camp Springs, MD and is one of the nine National Centers for Environmental Prediction (NCEP). The HPC exists to meet the real-time weather information needs of a growing group of users including NWS field offices, other governmental agencies, the media, the private sector, academic institutions, the international community, and the general public. The HPC helps support the NWS mission of protecting lives and property and enhancing the national economy.

List of HPC text products:

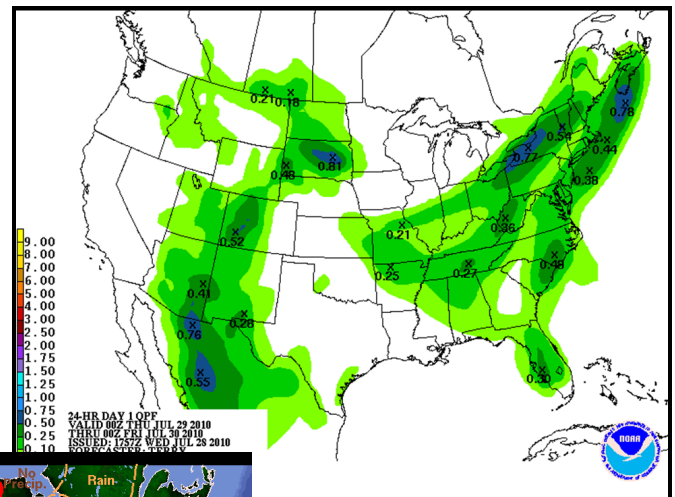
- Short Range Public Forecast Discussion (PMDSPD)
- Preliminary Extended Forecast Discussion (PREEPD)
- Final Extended Forecast Discussion (PMDEPD)
- Quantitative Precipitation Forecast Discussion (QPFDPD)
- Excessive Rainfall Discussion (QPFERD)
- Heavy Snow Discussion (QPFHSD)
- Model Diagnostic Discussion (PMDHMD)
- NAM Air Quality Diagnostic Discussion
- Hawaiian Message (PMDHI)
- Alaskan Extended Forecast Discussion
- South American Synopsis (PMDSA)
- South American Model Discussion (PMDSA)
- Caribbean Narrative (PMDCA)
- Storm Summaries
- Tropical Public Advisories - Atlantic
- Tropical Public Advisories - Pacific

<http://www.hpc.ncep.noaa.gov/html/discuss.shtml>

Other examples of HPC products:

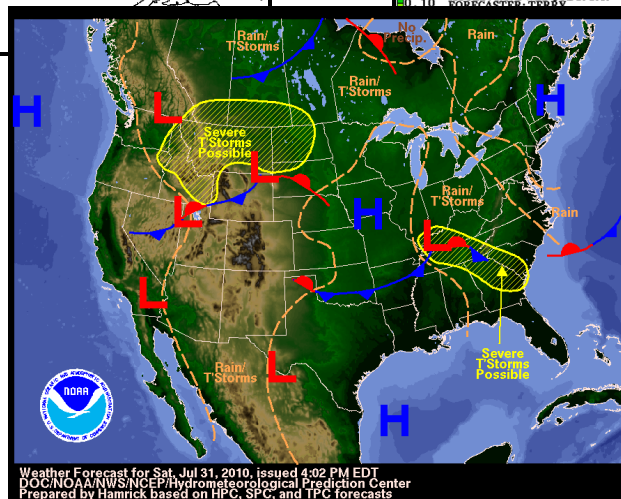


Surface Analysis Maps



Quantitative Precipitation Forecasts

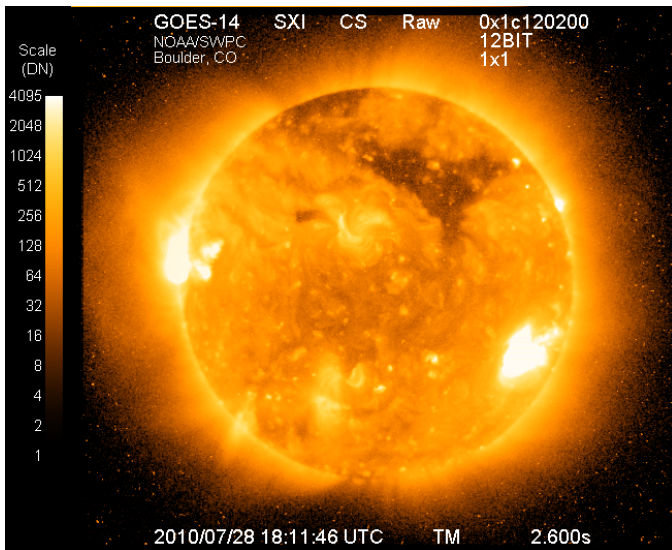
Surface Analysis and Forecast MAPS



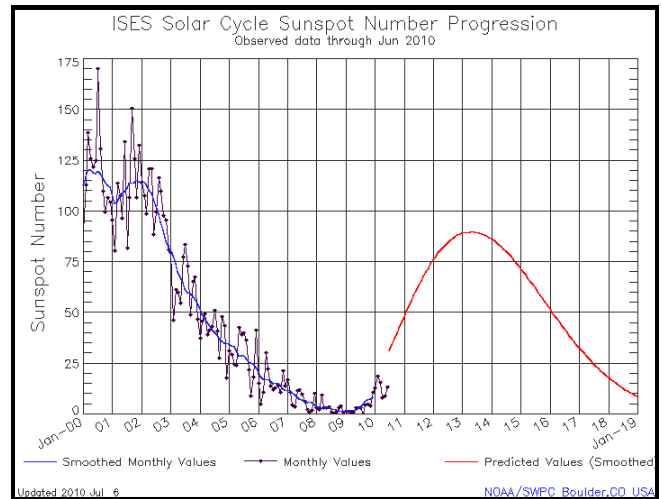
Space Weather Prediction Center (SWPC) Products

<http://www.swpc.noaa.gov/>

The SWPC provides real-time monitoring and forecasting of solar and geophysical events that impact satellites, power grids, communications, navigation and many other technological systems. SWPC also explores and evaluates new models and products and transitions them into operations. SWPC is the primary warning center for the International Space Environment Service and works with many national and international partners with whom data, products and services are shared.



Alerts and Forecasts



Example of SWPC Bulletin:

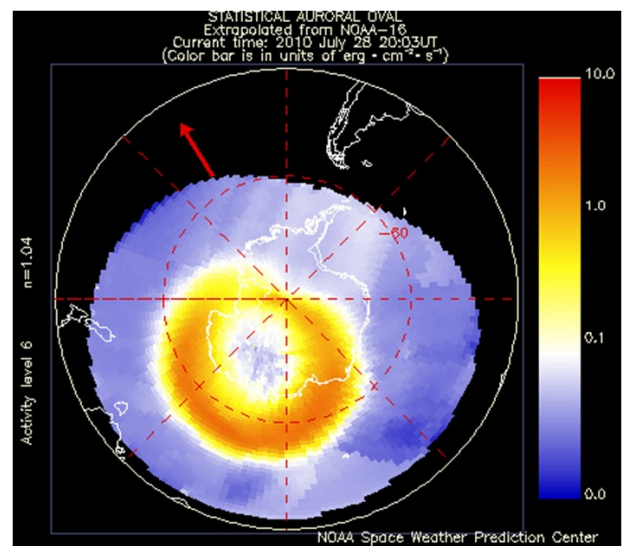
SPACE WEATHER ADVISORY BULLETIN #10- 1
2010 April 05 at 12:13 p.m. MST (2010 April 05 1213 UTC)

**** STRONG GEOMAGNETIC STORM IN PROGRESS ****

A geomagnetic storm began at 05:55 AM EST Monday, April 5, 2010. Space weather storm levels reached Strong (G3) levels on the Geomagnetic Storms Space Weather Scale. The source of the storming is an Earth-directed Coronal Mass Ejection associated with a weak solar flare that occurred in Active Region 1059 on April 3 at 05:54 AM EST. This is expected to be an isolated storm that should subside quickly. Other than the flare and CME erupting on April 3, this active region has not produced any significant activity. Systems that can be affected include electric power systems, spacecraft operations, high-frequency communications, GPS, and other navigation systems.

Other Products and Services:

- **SWPC Reports and Summaries (example below)**
 - *Solar Activity Forecast: Solar activity is expected to be at very low levels. However, there will be a chance for an isolated C-class flare from Region 1089.*
 - *Geophysical Activity Forecast: Geomagnetic field activity is expected to decrease to quiet to unsettled levels during days 1 - 2 (28 - 29 July) as the coronal hole high-speed stream gradually subsides. Quiet conditions are expected on day 3 (30 July).*
- **Space Weather Models**
- **Solar and Geometric Indices**
- **Instrument Measurements**



Aviation Weather Center (AWC) Products

<http://aviationweather.gov/>

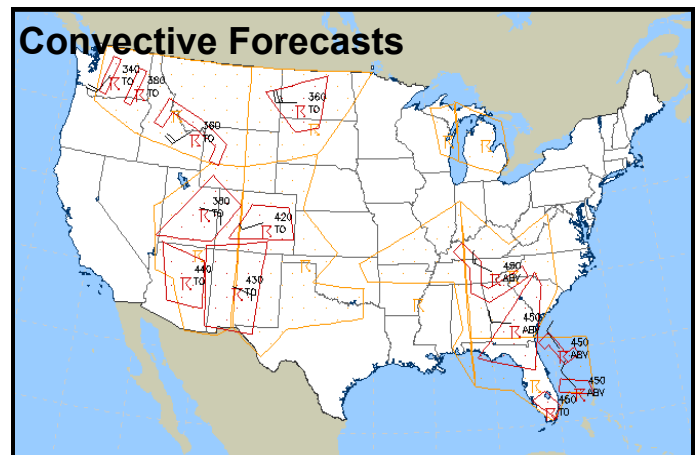
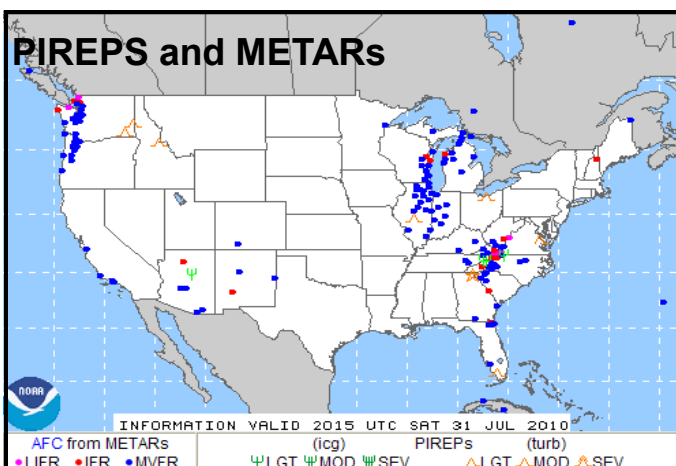
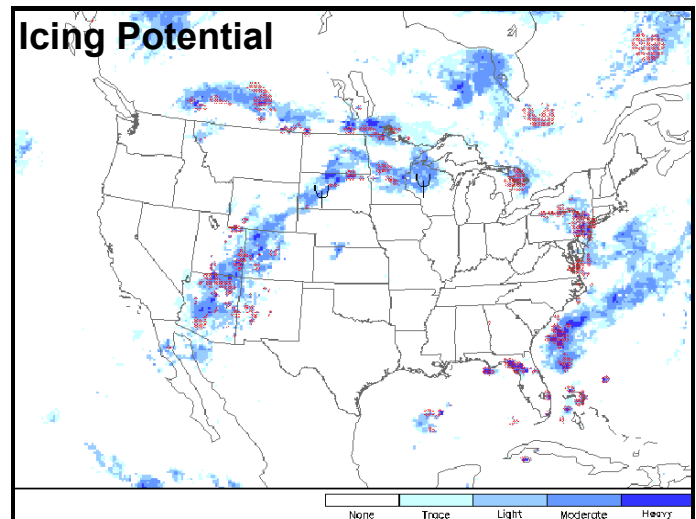
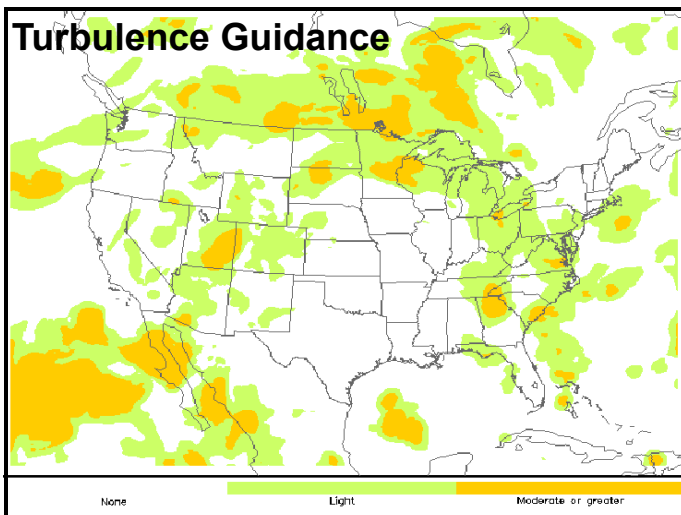
The primary responsibility of the AWC is to provide guidance and products for aviation planning purposes. The AWC issues warnings that cover the conterminous United States and extend over large portions of the North Pacific and North Atlantic airspace.

The AWC issues two primary text products:

- **AIRMET** (Airmen's Meteorological Information): Information on icing, turbulence, mountain obscuration, low-level wind shear, instrument meteorological conditions, and strong surface winds.
- **SIGMET** (Significant Meteorological Information)
 - Convective:** Issued for an area of thunderstorms affecting an area of 3,000 square miles or greater, a line of thunderstorms at least 60 mi long, and/or severe or embedded thunderstorms affecting any area that are expected to last 30 minutes or longer.
 - Non-convective:** Issued for severe or greater turbulence, severe or greater icing, or instrument meteorological conditions due to dust, sand, or volcanic ash (over 3,000 square mile areas).

The AWC also produces several graphical products including analysis and prognostic charts, graphical wind and temperature charts, and turbulence guidance.

In addition to these products, the AWC, in a joint effort with several organizations, provides a comprehensive website for the aviation community. The [Aviation Digital Data Service \(ADDS\)](#) makes text, digital and graphical forecast products, weather analyses and observations of aviation-related weather variables available in one location on the web.



Tsunami Warning Center (TWC) Products

<http://tsunami.gov/>

NOAA's tsunami mission is to provide reliable tsunami detection, forecasts and warnings and to promote community resilience. The primary objectives for carrying out this mission are to rapidly locate, size, and otherwise characterize major earthquakes, determine their tsunamigenic potential, predict tsunami arrival times, predict coastal flooding when possible, and disseminate appropriate warning and informational products based on this information.

The primary recipients of tsunami messages are coastal state/province departments of emergency services, the Federal Emergency Management Agency, National Weather Service offices, Canada's Atlantic Storm Prediction Center, the U.S. Coast Guard, and military bases. While these agencies are considered primary, the bulletins are available through a variety of means.

The TWC issue warnings, watches, advisories, and information statements. Each has a distinct meaning relating to local emergency response. In summary:

Warning -> Inundating wave possible -> Full evacuation suggested

Watch -> Danger level not yet known -> Stay alert for more info

Advisory -> Strong currents likely -> Stay away from the shore

Information -> Minor waves at most -> No action suggested

Tsunami Warning: A tsunami warning is issued when a potential tsunami with significant widespread inundation is imminent or expected. Warnings alert the public that widespread, dangerous coastal flooding accompanied by powerful currents is possible and may continue for several hours after arrival of the initial wave. Warnings also alert emergency management officials to take action for the entire tsunami hazard zone. Appropriate actions to be taken by local officials may include the evacuation of low-lying coastal areas and the repositioning of ships to deep waters when there is time to safely do so. Warnings may be updated, adjusted geographically, downgraded or canceled. To provide the earliest possible alert, initial warnings are normally based only on seismic information.

Tsunami Watch: A tsunami watch is issued to alert emergency management officials and the public of an event which may later impact the watch area. The watch area may be upgraded to a warning or advisory, or canceled, based on updated information and analysis. Therefore, emergency management officials and the public should prepare to take action. Watches are normally issued based on seismic information without confirmation that a destructive tsunami is underway.

Tsunami Advisory: A tsunami advisory is issued due to the threat of a potential tsunami which may produce strong currents or waves dangerous to those in or near the water. Coastal regions historically prone to damage due to strong currents induced by tsunamis are at the greatest risk. The threat may continue for several hours after the arrival of the initial wave, but significant widespread inundation is not expected for areas under an advisory. Appropriate actions to be taken by local officials may include closing beaches, evacuating harbors and marinas and the repositioning of ships to deep waters when there is time to safely do so. Advisories are normally updated to continue the advisory, expand/contract affected areas, upgrade to a warning or cancel the advisory.

Tsunami Information Statement: A tsunami information statement is issued to inform emergency management officials and the public that an earthquake has occurred, or that a tsunami warning, watch or advisory has been issued for another section of the ocean. In most cases, information statements are issued to indicate there is no threat of a destructive tsunami and to prevent unnecessary evacuations as the earthquake may have been felt in coastal areas.

Example of a Tsunami Warning:

PZZ535-530-545-560-455-540-450-356-353-350-255-250-210-110-
156-153-150-130>135-CAZ006-506-508-509-514-505-002-001-ORZ022-
002-021-001-WAZ503-506>511-001-514>517-021-312022-
/X.NEW.PAAQ.TS.W.0063.090131T1922Z-000000T0000Z/
COASTAL AREAS BETWEEN AND INCLUDING POINT SUR CALIFORNIA TO
THE WASHINGTON-BRITISH COLUMBIA BORDER
1122 AM PST SAT JAN 31 2009

...A TEST TSUNAMI WARNING IS IN EFFECT WHICH INCLUDES THE
COASTAL AREAS OF CALIFORNIA - OREGON AND WASHINGTON FROM
POINT SUR CALIFORNIA TO THE WASHINGTON-BRITISH COLUMBIA BORDER...

TSUNAMI WARNINGS MEAN THAT A TSUNAMI WITH SIGNIFICANT WIDESPREAD
INUNDATION IS IMMINENT OR EXPECTED. TSUNAMIS ARE A SERIES OF
WAVES POTENTIALLY DANGEROUS SEVERAL HOURS AFTER INITIAL ARRIVAL
TIME. ESTIMATED TIMES OF INITIAL WAVE ARRIVAL FOR SELECTED
SITES IN THE WARNING ARE PROVIDED BELOW.

CRESCENT CITY-CA 1144 PST JAN 31 WESTPORT-WA 1258 PST JAN 31
CHARLESTON-OR 1208 PST JAN 31 SAN FRANCISCO-CA 1304 PST JAN 31
SEASIDE-OR 1247 PST JAN 31 NEAH BAY-WA 1308 PST JAN 31

FOR ARRIVAL TIMES AT ADDITIONAL LOCATIONS SEE
WCATWC.ARH.NOAA.GOV

Example of Other Information Included Tsunami Products:

RECOMMENDED ACTIONS

IT IS NOT KNOWN - REPEAT NOT KNOWN - IF A TSUNAMI EXISTS BUT A
TSUNAMI MAY HAVE BEEN GENERATED. PERSONS IN LOW-LYING COASTAL
AREAS SHOULD BE ALERT TO INSTRUCTIONS FROM THEIR LOCAL EMERGENCY
OFFICIALS. EVACUATIONS ARE ONLY ORDERED BY EMERGENCY RESPONSE AGENCIES.

- PERSONS IN TSUNAMI WARNING COASTAL AREAS SHOULD MOVE INLAND TO
HIGHER GROUND.
- PERSONS IN TSUNAMI ADVISORY AREAS SHOULD MOVE OUT OF THE
WATER... OFF THE BEACH AND OUT OF HARBORS AND MARINAS.

THIS MESSAGE IS BASED MAINLY ON EARTHQUAKE DATA. AS MORE
INFORMATION BECOMES AVAILABLE THE WARNING AND ADVISORY AREAS
WILL BE REFINED.

PRELIMINARY EARTHQUAKE PARAMETERS

MAGNITUDE - 7.7

TIME - 1015 AKST JAN 31 2009

1115 PST JAN 31 2009

1915 UTC JAN 31 2009

LOCATION - 42.0 NORTH 124.0 WEST

85 MILES/137 KM N OF EUREKA CALIFORNIA

255 MILES/410 KM SW OF PORTLAND OREGON

DEPTH - 6 MILES/10 KM

THE PACIFIC TSUNAMI WARNING CENTER IN EWA BEACH HAWAII WILL
ISSUE MESSAGES FOR HAWAII AND OTHER AREAS OF THE PACIFIC
OUTSIDE THE STATES AND PROVINCES LISTED ABOVE.

National Operational Hydrologic Remote Sensing Center (NOHRSC)

<http://www.nohrsc.nws.gov/>

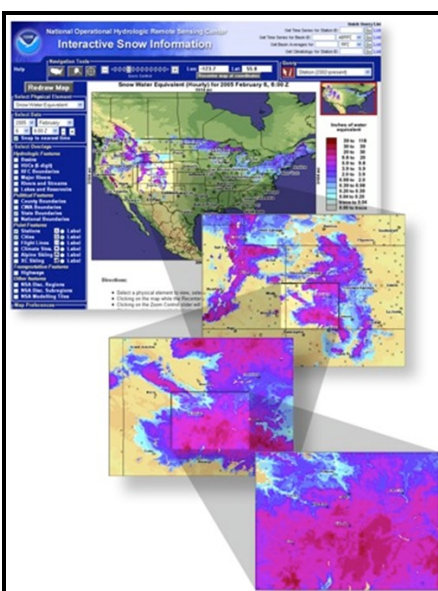
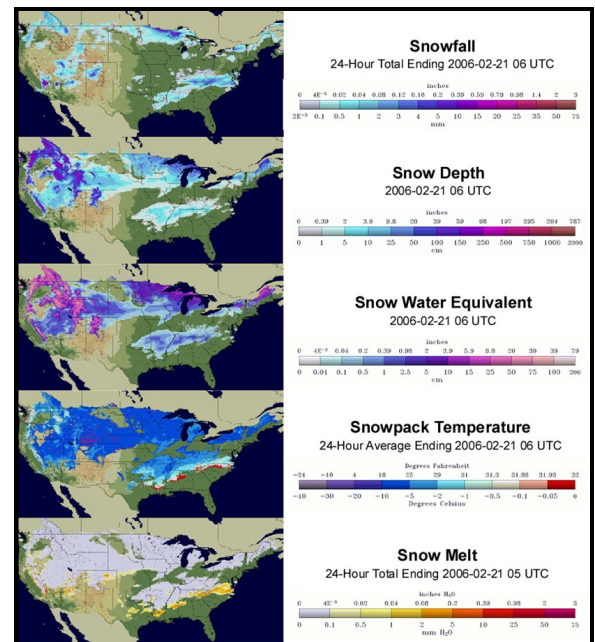
National Snow Analysis

The NOHRSC produces a daily National Snow Analysis (NSA) for the conterminous U.S. using a physically-based energy-and-mass-balance model operated on a 1-km spatial scale with hourly temporal scale. The NOHRSC snow model ingests all available ground-based, airborne and satellite snow observations and assimilates these observations into the snow model state variables to provide the most up-to-date estimates of snowpack properties. The NSA provides estimates of snow water equivalent, snow depth, surface and profile snowpack temperatures, snowmelt, surface and blowing snow sublimation, snow-surface energy exchanges and precipitation. NSA product formats include: (1) daily national and regional maps for nine snowpack characteristics, (2) seasonal, two-week, and 24 hour movie-loop animations for nine snowpack characteristics, (3) text summaries, (4) a suite of interactive maps, text, and time series products including weather observations and (5) gridded snow products for the CONUS.

Airborne Snow Survey Program

The NOHRSC has developed, and currently maintains, an operational Airborne Gamma Radiation Snow Survey Program to make airborne snow water equivalent (SWE) and soil moisture measurements. Airborne SWE measurements are integrated into the NOHRSC NSA and are used by WFOs and RFCs when issuing river and flood forecasts, water supply forecasts and spring flood outlooks. Local emergency managers, in turn, use this information when planning for flood events.

The NOHRSC pilots assist local and regional NWS offices by taking aerial photographs during snow surveys and publishing them to the NOHRSC webpage. During emergencies, when aircraft availability permits, NOHRSC pilots can conduct aerial surveys of flood extent, ice jam extent and even photograph damage from natural disasters such as tornadoes.



5. Communication Channels

The forecasts and various products that the NWS develops would be of no use without proper communication channels to get this information to the users of the products. This section will list and discuss the numerous ways the forecast and other products are disseminated throughout the country.

NWS Website (www.weather.gov)

With emerging technologies, the most widely accessible venue for receiving forecast information as well as watches/warnings and other hydrology and climatology data has grown to be the local office websites. Nearly all products developed by the NWS office are available on individual websites. Local office websites are examined in detail in the [web section](#).

NOAA Weather Radio

NOAA Weather Radio All Hazards (NWR) is a nationwide network of radio stations broadcasting continuous weather and water information directly from the nearest forecast office. NWR broadcasts official Weather Service warnings, watches, forecasts and other hazard information 24 hours a day, seven days a week.

Working with the Federal Communication Commission's (FCC) Emergency Alert System, NWR is an "All Hazards" radio network, making it your single source for comprehensive weather and emergency information. In conjunction with Federal, state and local emergency managers and other public officials, NWR also broadcasts warning and post-event information for all types of hazards, including natural (such as earthquakes or avalanches), environmental (such as chemical releases or oil spills) and public safety (such as AMBER alerts or 911 telephone outages).

Known as the "Voice of NOAA's National Weather Service," NWR is provided as a public service by NOAA. NWR includes 1000 transmitters, covering all 50 states, adjacent coastal waters, Puerto Rico, the U.S. Virgin Islands and the U.S. Pacific Territories. NWR requires a special radio receiver or scanner capable of picking up the signal. Broadcasts are found in the VHF public service band at these seven frequencies (MHz):



<http://www.nws.noaa.gov/nwr/>

162.400	162.425	162.450	162.475	162.500	162.525	162.550
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Most NOAA Weather Radio All Hazards receivers have a tone-alert feature that can be set to alert mode for automatic activation when certain watches and warnings are issued. Higher grade models can be programmed to activate for user specified counties. All NWS products have the capability of being tone-alerted. To prevent unnecessary alerts and to maintain the proper hierarchy of products, most WFOs only choose to alert short-fused headlines that require urgent action to protect lives and property, such as tornado watches and warnings, severe thunderstorm watches and warnings, flash flood warnings, hurricane headlines and tsunami headlines. Some offices choose to tone-alert certain winter weather headlines such as blizzard warnings and ice storm warnings.

Emergency Alert System (EAS)

The NWR network is the NWS entry-point into the Emergency Alert System (EAS), which is composed of AM, FM, TV broadcast stations and cable television operators on an organized basis during emergencies at national, state, Tribal, and local levels. It provides an efficient means for the dissemination of standardized emergency information through the use of participating broadcast stations and cable operators. EAS is designed so that agencies and Tribal governments with an emergency message only need to transmit the message once to be received by all area broadcasters and cable operators simultaneously. For more details, refer to your state EAS plan and/or contact members of your state EAS committee. A listing of all event codes that generate EAS activations can be found in the state plan.

National-level Activation

At the national level, the President of the United States, in a national emergency, can direct activation of the EAS via the use of the EAN event code (Emergency Alert Notification or National EAS Activation). FCC rules dictate that broadcaster participation at the national level is mandatory.

State-level Activation

Each state has the ability to direct activation of the EAS via their State Emergency Operations Center, utilizing the capabilities of designated State-Relay (SR) broadcast stations. SR stations would also re-broadcast EAS alerts. Typically the message would originate from the Governor's office.

Local Activation

Locally, county officials or Tribal government officials may originate a local EAS activation assuming that county has an approved EAS plan that has been reviewed by the state EAS committee.

FCC rules dictate that broadcaster EAS participation at the state and local level is voluntary.

Individual broadcast stations monitor designated Local Primary (LP-1 and LP-2) broadcast stations for EAS activations.

National Weather Service Activation

Convective, short-fuse warnings, such as Tornado Warnings, allow the NWS to be an EAS message originator. However, the current NWR network is an "open loop" in the EAS communications web, since it does not have the capability of automatically relaying EANs or state, Tribal, or local EAS messages. Each NWS office transmits an EAS-type code using the NWR SAME encoder (Specific Area Message Encoder) feature, which will be detected by broadcast station EAS decoders. NWR will send EAS codes for all short-fuse, convective weather warnings, watches and statements.

Each NWS office sends a test EAS as a Required Weekly Test (RWT) or as a Required Monthly Test (RMT).

Alerts received via [HazCollect](#) are considered EAS alerts.

NOAA Weather Wire Service (NWWS)

The NWS mission to protect life and property and to enhance the national economy, is carried out by timely delivery through the NWWS of text and graphical products, including warnings, watches, forecasts and other relevant weather, hydrologic, climate and critical non-weather-related information.

NWWS is designed to deliver high priority watch and warning products to users within 10 seconds, and all other products within 30 seconds.

The NWWS is a satellite-based data collection and dissemination system operated by the NWS.

Users have three options for receiving NWWS information: C-band satellite, Ku-band satellite and the Internet, each with its specific advantages, depending on user needs. All NWWS users, including the NWS uplink sites, receive the entire NWWS data stream as part of the outgoing satellite broadcast. Commercial software is available for users to select, manipulate, alarm, display and archive information they require on various devices.

The national master database list managed by the NWS Office of Operational Systems and maintained by the contractor includes all products transmitted on the NWWS. Representative products, each in text format and some in graphical format, include weather warnings, watches, advisories and forecasts; critical non-weather-related warnings; national public weather summaries and tables; and such routine locally prepared products as state, zone and short-term forecasts; weather summaries, climate data and local observations; marine forecasts and other information, and fire pre-suppression forecasts.

Current directive: <http://www.nws.noaa.gov/directives/sym/pd01017015curr.pdf>

Family of Services (FOS)

The Family of Services (FOS) was established to make weather information available to external users. The FOS provides external users access to near real-time weather data and information on the NWS Telecommunications Gateway NOAAnet Multi Protocol Label Switching System (MPLS) Network.

The objective of the FOS is to provide the commercial meteorological community, the academic community and other Federal agencies with access to near real-time weather information.

Current Directive: <http://www.nws.noaa.gov/directives/sym/pd06010curr.pdf>

Additional Information:

[http://www.weather.gov/datamgmt/doc/NOAAnet%20-%20TG%20Customer%20Communications%202009%](http://www.weather.gov/datamgmt/doc/NOAAnet%20-%20TG%20Customer%20Communications%202009%20)

National Warning System (NAWAS)

The National Warning System (NAWAS) is a comprehensive party-line network of telephone circuits connecting state and Federal warning points throughout the United States. It is funded by the Federal Emergency Management Administration (FEMA). Although NAWAS is a national system, the day-to-day operation is under the control of individual states. Each state has its own plan for the use of NAWAS during weather emergencies. NWS offices use this circuit in accordance with individual state plans. Normally, all warnings and watches will be disseminated on the appropriate NAWAS by the issuing office.

Emergency Managers Weather Information Network (EMWIN)

<http://www.weather.gov/emwin/>

Emergency Managers Weather Information Network (EMWIN) offers an economical way to receive all products available on the NWWS, plus graphical forecasts and select satellite data. Compared to the NWWS, an additional broadcast delay of 5 to 20 seconds can be expected for watches and warnings. The EMWIN system is monitored 24 hours a day, 7 days a week, and has an estimated availability of at least 99%. The service itself is free. As a satellite broadcast system, there are short outages of several minutes duration (60 minutes worst case) during a 3 to 4 day satellite eclipse period, which occurs in the Spring and Fall. The NWWS has backup provisions for such occurrences, whereas EMWIN does not. A backup data source, such as the internet, might be considered during such scheduled outages.

EMWIN is a nonproprietary operational dissemination system developed in the NWS Office of Operational Systems (OPS) primarily for the emergency management community. It provides a continuous, dedicated low speed data broadcast of up to 5,000 pages per day using an audio signal from the GOES satellite or terrestrial retransmitter. The EMWIN data stream consists of:

- Real-time weather warnings, watches, advisories, forecasts
- A subset of alphanumeric products for each state
- A limited suite of non-value added graphical products
- Satellite imagery

End user software provides a friendly environment to monitor the weather, set alarms, auto-print, etc., from a personal computer.

The EMWIN data stream was designed to run at minimal cost to the NWS and at no recurring costs to users in range of the signal. Basic software developed, but unsupported, by the NWS to meet minimum needs of users is available for free and can be downloaded. The EMWIN data stream can effectively meet the needs of public safety managers, schools, and special needs groups such as the deaf and hearing impaired for direct and timely access to large amounts of weather and warning information. NWS has identified EMWIN as one of a number of dissemination technologies in a multi-layered approach that the NWS must use to meet its goal of maximizing the dissemination of its warning and forecast information.

Interactive Weather Information Network (IWIN)

<http://www.weather.gov/view/national.php?thumbs=on>

Interactive Weather Information Network (IWIN) is an internet site with real-time data very similar to EMWIN data. It is open to any and all users and contains real-time warnings in addition to many routine NWS products. IWIN depends on the availability of the internet, which is not always reliable during major weather events, due to connection problems either at the user end or at NOAA/NWS due to current Internet bandwidth limitations. The types of data available on IWIN include all standard warnings, watches, advisories and routine data, including state forecasts, short term forecasts (nowcasts), zone forecasts, graphical forecasts, select satellite data and most routine NWS products.

iNWS

<http://inws.wrh.noaa.gov/>

iNWS Alerts allow users to configure and receive text message alerts and e-mail message alerts when the NWS issues a watch, warning or advisory that affects them.

Users can configure their alert preferences geographically and by weather phenomena.

iNWS is intended for members of community emergency planning and response management (i.e. emergency managers, law enforcement managers, fire and emergency response managers, transportation and safety managers, public officials), Skywarn Net Control operators and government partners of NWS offices.

iNWS is not currently available to the general public.

NOAAPORT

The *NOAAPORT* broadcast system 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.

NWSChat

<https://nwschat.weather.gov/>

NWSChat is a relatively new tool developed as a means of direct communication between the NWS office and television meteorologists, emergency managers, DNR and other specific partner organizations. The goal of NWSChat is for the users to pass on important information about current weather situations. For example, if a viewer calls a TV station to report baseball size hail, the meteorologists at that station can quickly relay the report onto the NWS office. The NWS office can also provide information to the partners in chat that may be useful, but won't be specifically worded in a warning or other public product. Warnings and other products issued by the office are also automatically piped into the chat for quick viewing. At this time, use of NWSChat is limited to a few very specific organizations (e.g., broadcast meteorologists, emergency managers, law enforcement). For information about signing up for NWSChat, contact your local office WCM.

Social Networking

The NWS is in the beginning stages of endeavoring into social networking. At this time, there is a national NWS Facebook page where interesting/important information is posted nationally. Some movement is also being made into Twitter as a storm report utility. Further development into social networking is expected in the coming years.

6. Website Navigation

The NWS website is one of the most powerful tools available to disseminate information to NWS partners and the public. An immense amount of information can be found on the website; the trick is in knowing where to find it. This section will point out some of the most requested information from the sites.

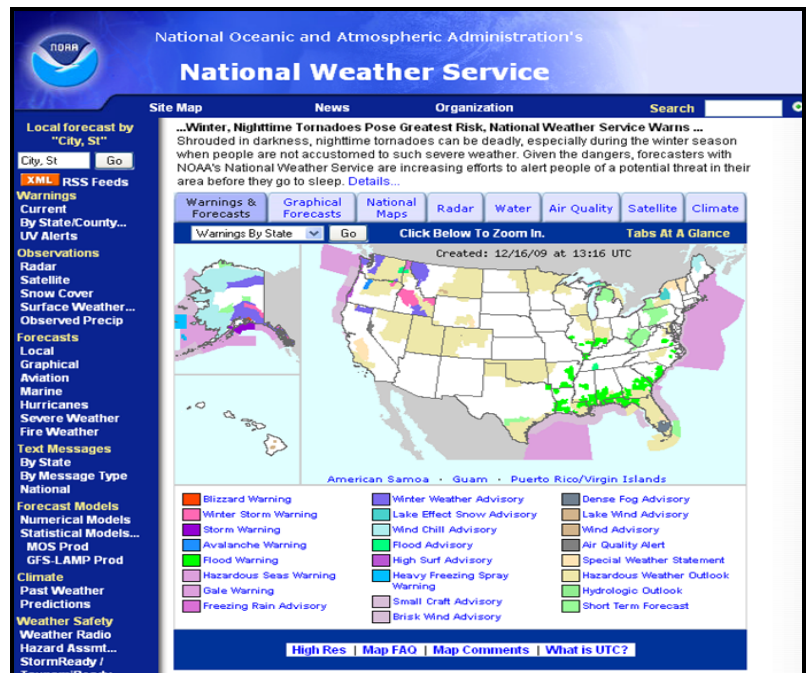
WWW.WEATHER.GOV or MOBILE.WEATHER.GOV

NWS websites provide a great deal of useful information for anyone looking for national and local weather data.

The information in the following pages will describe the www.weather.gov website. A slimmed down version is available for mobile use, but is different from the information shown here.

The main NWS website has national information including graphical forecasts, surface maps, national radar and plenty of other information.

Local office websites are accessible from this page by clicking an area on the map. Local websites are also available by using the www.weather.gov address followed by / and either the office identifier, or for most sites, the name of a major city in the county warning area.



Most local office websites all have the same general design with a clickable map for point-and-click forecasts, the local radar and weather story. They also have a menu on the left for more information. Offices outside of the conterminous

The area map on every site is color coded for any headline or pertinent weather information for each county. In this example, the tan color represents hazardous weather outlooks that are in effect for the highlighted counties. See: [Display Organization on Page 98](#).

Also note at the top of many sites are news stories that can provide additional information on current weather and water issues, past events and summaries or other useful detail.

Your National Weather Service forecast

Louisville KY

Enter Your "City, ST" or zip code

NWS Louisville, KY Mobile Weather Information | En Español
 Point Forecast: Louisville KY Last Update: 3:13 pm EDT Jul 30, 2010
 38.24°N 85.72°W (Elev. 499 ft) Forecast Valid: 9pm EDT Jul 30, 2010-6pm EDT Aug 6, 2010

Forecast at a Glance

Tonight	Saturday	Saturday Night	Sunday	Sunday Night	Monday	Monday Night	Tuesday	Tuesday Night
20% Slight Chc Showers Lo 69 °F	30% Chance Tstms Hi 89 °F	30% Chance Tstms Lo 72 °F	Hi 91 °F	Lo 74 °F	Hi 95 °F	Lo 75 °F	Hi 97 °F	30% Chance Tstms Lo 74 °F

The National Center for Atmospheric Research (NCAR) will be conducting a survey in Fall 2010 to ask people's opinions about this web page. This survey is not being conducted by the National Weather Service (NWS) or any other government entity. If you are willing to be contacted by email to participate in this web-based survey, please click [here](#) (you will be redirected to an NCAR web page).

Detailed 7-day Forecast

Tonight: A 20 percent chance of showers after 2am. Partly cloudy, with a low around 69. East wind around 5 mph becoming calm.

Saturday: A chance of showers, with thunderstorms also possible after 2pm. Mostly cloudy, with a high near 89. Calm wind becoming southeast around 6 mph. Chance of precipitation is 30%.

Saturday Night: A chance of thunderstorms before 8pm. Partly cloudy, with a low around 72. Light east wind. Chance of precipitation is 30%.

Sunday: Mostly sunny, with a high near 91. North wind between 3 and 5 mph.

Sunday Night: Mostly clear, with a low around 74. Northeast wind around 6 mph.

Monday: Sunny and hot, with a high near 95.

Monday Night: Partly cloudy, with a low around 75.

Current Conditions

(Move Down) [view Yesterday's Weather](#)

Louisville, Bowman Field Airport
 Lat 38.23 Lon: -85.67 Elev: 540
 Last Update on Jul 30, 7:53 pm EDT

Fair
 82 °F
 (28 °C)

Humidity:	46 %
Wind Speed:	E 5 MPH
Barometer:	29.95" (1013.5 mb)
Dewpoint:	59 °F (15 °C)
Heat Index:	82 °F (28 °C)
Visibility:	10.00 mi.
More Local Wx:	3 Day H ¹

Radar and Satellite Images

Clicking a location on the map from a local office page or typing in a city name or zip code will bring up the **point-and-click forecast** for the specific location selected. This forecast is a detailed text and graphic forecast for a 2.5 or 5km block, including the exact point selected.

A quick view of the forecast is across the top of the page with graphic displays of the forecasted weather condition for each period.

Below this on the left will be a list of any active headlines or other non-routine products for the location. In addition, more detailed forecast information is available.

Also, in this view are the current conditions for the closest observing site (usually an airport), a link to the local radar and a national satellite picture.

All forecast products found on the website are based on a daytime period of 6 a.m. to 6 p.m., and nighttime period of 6 p.m. to 6 a.m.

Numbered items on this page will be explained further in the following pages.

At the bottom of the point-and-click page are some additional useful links. The maps on the left of this bar are links to the national digital forecast database. This database is explained in more detail in the following pages. Also found here are links to the zone forecast, the area forecast discussion, hourly weather graphs, a tabular hour-by-hour forecast, as well as some other text and graphic products. The numbered items in the graphics on this page will be explained further.

National Digital Forecast Database	Additional Forecasts & Information
	Zone Area Forecast for Jefferson County, KY
	Forecast Discussion ⁴ Air Quality Forecasts
	Printable Forecast Text Only Forecast
	Hourly Weather Graph ⁵ Tabular Forecast
	Quick Forecast
	International System of Units About Point Forecasts
	Local Climatology Digital Forecast
	Graphical Forecasts Home Hazardous Weather Outlook
	River Info / AHPS Science / Technology
	Preparedness Severe Weather Data
	WFO Louisville Home Long Term Forecasts

From the point-and-click forecast page, just below the current conditions (labeled 1 on previous page), is a link to the **3-day observation history** for the nearest site.

The 3-day history page lists all regular observations, decoded into plain language. Wind, visibility, weather, sky condition, temperature, dew point, altimeter and sea level pressure are all listed. In addition, the 6-hour maximum and minimum temperatures are listed. Some stations will also report the amount of liquid precipitation that fell during the time period. In general, NWS [ASOS](#) (automated surface observing stations) will report precipitation, and privately or state owned [AWOS](#) (automated weather observing stations) will not.

Some regions are transitioning to a new version of this page with graphs, but the information is all the same.

www.srh.noaa.gov

Weather observations for the past three days

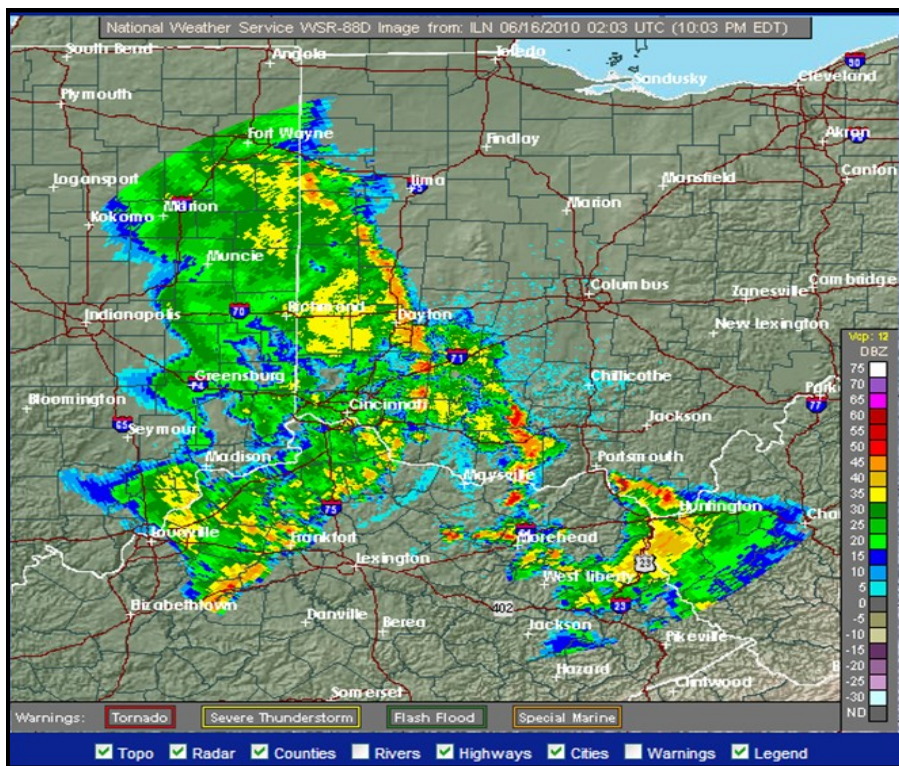
Jacksonville, New River, Marine Corps Air Station

Enter Your "City, ST" or zip code en español

Date	Time (edt)	Wind (mph)	Vis. (mi.)	Weather	Sky Cond.	Temperature (°F)				Pressure		Precipitation (in.)		
						Air	Dwpt	6 hour		altimeter (in.)	sea level (mb)	1 hr	3 hr	6 hr
								Max	Min					
15	20:56	E 12	10.00	A Few Clouds	FEW060	82	75			30.03	1017.1			
15	19:56	SE 9	10.00	Fair	CLR	84	77	99	84	30.01	1016.3			
15	18:56	SE 7	10.00	Fair	CLR	87	72			30.00	1016.0			
15	17:56	SE 6	10.00	Light Rain	BKN040 BKN080	86	73			29.99	1015.6			
15	16:56	SE 10	10.00	Mostly Cloudy	BKN065	94	74			29.98	1015.2			
15	15:56	S 9	10.00	Mostly Cloudy	BKN065	93	75			29.96	1014.8			
15	14:56	NW 6	10.00	A Few Clouds	FEW060	97	70			29.97	1015.1			
15	13:56	Calm	10.00	A Few Clouds	FEW050	96	71	96	78	29.98	1015.5			
15	12:56	Calm	10.00	Partly Cloudy	FEW025 SCT120	94	74			29.99	1015.7			
15	11:56	N 6	10.00	Partly Cloudy	SCT140	92	72			29.99	1015.8			
15	10:56	Calm	10.00	Mostly Cloudy	BKN140	86	73			29.99	1015.7			
15	09:56	W 6	10.00	Mostly Cloudy	SCT120 BKN200	82	73			29.98	1015.4			
15	08:56	NW 3	10.00	Fair	CLR	80	71			29.98	1015.2			
15	07:56	N 5	10.00	Partly Cloudy	SCT120	80	70	80	72	29.96	1014.8			
15	06:56	Calm	10.00	A Few Clouds	FEW120	74	70			29.95	1014.4			
15	05:56	Calm	10.00	Fair	CLR	72	70			29.94	1013.9			
15	04:56	W 3	10.00	Fair	CLR	72	69			29.93	1013.6			

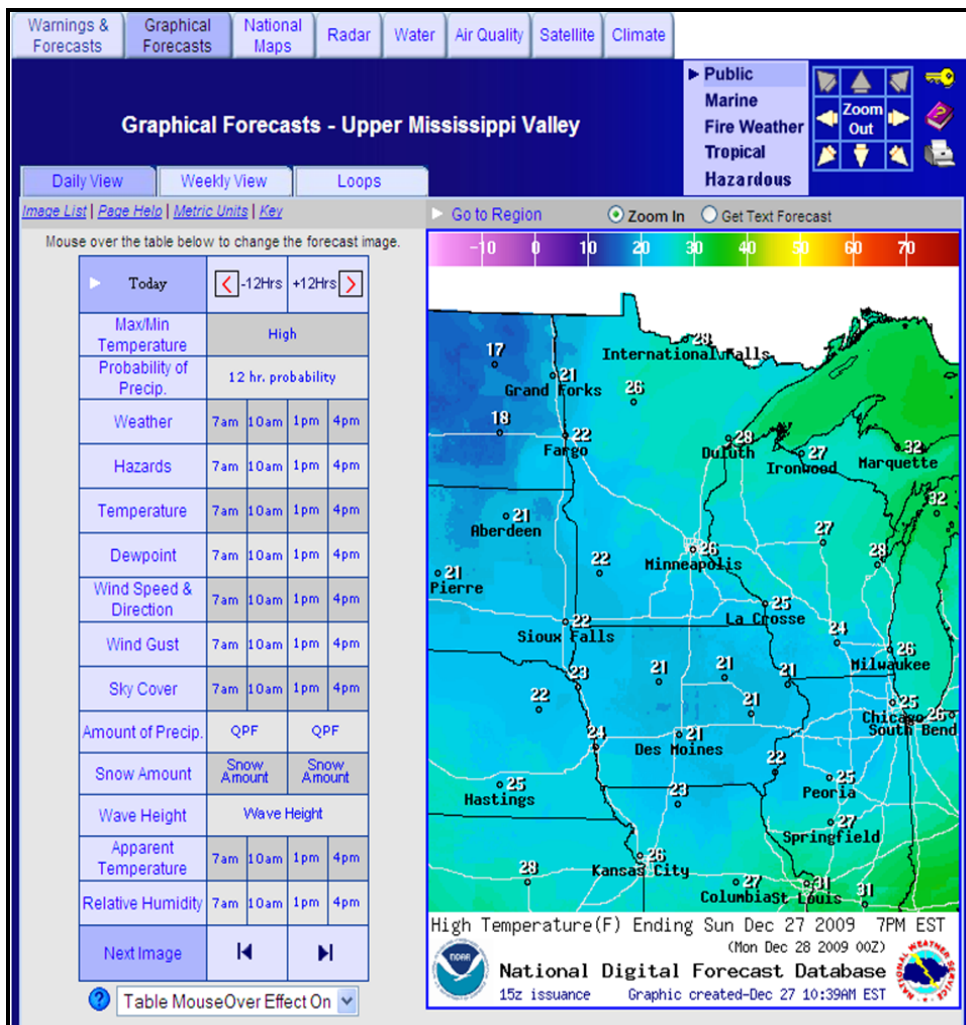
One of the most popular tools on NWS websites is the **radar display**—labeled 2 on the previous page. Clicking on the link will bring up a still image of base reflectivity. To loop this image, click on loop after Base under the Reflectivity heading in the menu to the left of the display. The loop is an animation of about one hour of radar images. While in loop mode, controls will be at the bottom of the image to start or stop the loop, set it to “rock” back and forth, or change the loop speed. The user can also step through the images, or omit certain images from the loop.

Also available from the menu bar on the left are velocity images and loops as well as 1-hour and storm total precipitation data. Links to other regional radar views are also located in this menu. At the top of the menu, using the arrows, the user can move quickly to adjacent radar sites.



The page also has options that can be toggled on and off, located at the bottom of the radar image. Terrain, counties and highways are a few of the features that can be turned on and off.

The radar image itself can appear different based on settings controlled at the local office. In particular, the radar may be set to “clear air mode” or one of a number of precipitation modes. Clear air mode is used when there is no precipitation, or when precipitation is light and reflectivity values are small. Drizzle or snow is frequently sampled better in a clear air mode. Besides the colors on the image, the other noticeable difference for most users is the frequency of samples. Image update frequency ranges from around 4 to around 10 minutes.



The **National Digital Forecast Database graphical forecast**, labeled 3 on the [earlier image](#), is a tool that allows the user to quickly visualize the weather across the state or region, not just a single point. This view is very similar to what the forecaster sees as he or she is preparing the forecast. The view can be zoomed to a state view by clicking on the map.

Controls for this page are left of the map. The user will mouse over the forecast hour and parameter of interest. Near the top of the control panel, are arrows to move forward or back between forecast periods as well. Another viewing option is to use the weekly viewer from the tab near the top of the page, or the image loop.

Also, holding a mouse pointer over one of the forecast sample points on the map will bring up more detail for that specific point.

The **area forecast discussion** or AFD, number 4 on the [earlier image](#), is a fairly technical discussion designed to give some insight into what the challenges of the forecast were and share the thoughts of the forecaster as he or she was preparing the forecast.

Often, abbreviations or short-hand wording is used as well as technical terms and it can be difficult to read. To help, there is a glossary option at the top of the discussion page, that if turned on will highlight many of these abbreviations and technical terms. Clicking on the highlighted word will link to its definition.

Additionally, a short list of some of the more common abbreviations is on [Page 132](#) of this guidebook.

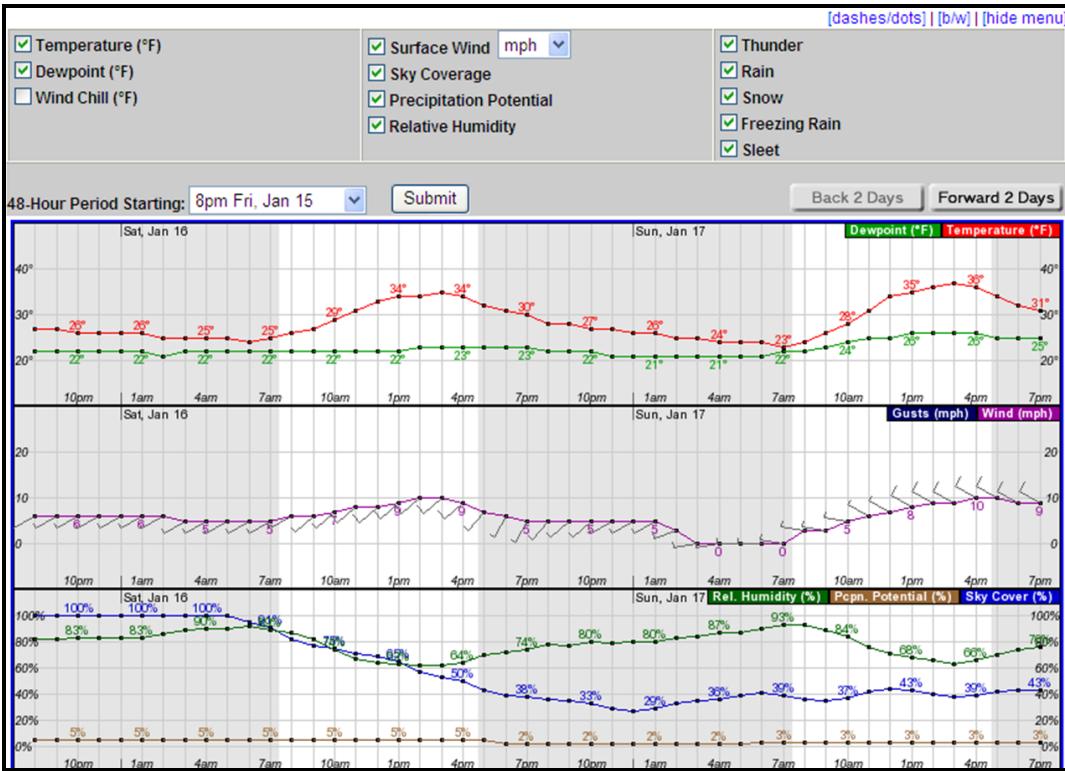
AREA FORECAST DISCUSSION
 NATIONAL WEATHER SERVICE PHOENIX AZ
 936 AM MST WED OCT 20 2010

.SYNOPSIS...
 A SLOW MOVING **LOW PRESSURE SYSTEM** OVER ARIZONA AND SOUTHERN CALIFORNIA WILL LEAD TO AN INCREASE IN SHOWER AND **THUNDERSTORM** CHANCES TODAY AND TONIGHT. BRIEF HEAVY RAIN...SMALL **HAIL**...AND STRONG WINDS WILL BE POSSIBLE WITH THE THUNDERSTORMS. RAIN CHANCES WILL DECREASE FROM WEST TO EAST ON THURSDAY AS THE SYSTEM MOVES EASTWARD INTO NEW MEXICO. DRY CONDITIONS CAN BE EXPECTED FRIDAY THROUGH TUESDAY. TEMPERATURES WILL BE WELL BELOW **NORMAL** TODAY AND THURSDAY BEFORE A GRADUAL WARMING TREND TAKES PLACE FRIDAY THROUGH EARLY NEXT WEEK.

..

.DISCUSSION...
UPPER LEVEL LOW PRESSURE CENTERED OVER SOUTHERN CALIFORNIA CONTINUES TO BRING **SCATTERED** SHOWERS TO THE REGION THIS MORNING. THE AXIS OF SHOWERS HAS BEEN PRIMARILY LOCATED FROM CASA GRANDE TO WICKENBURG...WITH A SECONDARY AREA OF SHOWERS ACROSS NORTHERN LA PAZ COUNTY. OTHERWISE CONDITIONS WERE MAINLY DRY UNDER CLOUDY SKIES.

FOR THE REMAINDER OF THE AFTERNOON HOURS...I EXPECT ADDITIONAL SHOWERS TO DEVELOP AS THE CENTER OF THE UPPER LOW MOVES OVERHEAD AND



Another view of the forecast information that gives the user more detail of the expected conditions is the **hourly weather graph**. The link to this is also located in the lower right corner of the point-and-click page, noted with the number 5 on the [earlier image](#).

This graph gives detailed hour-by-hour information of each parameter in the forecast. The user can customize the view by turning certain parameters on and off, and can change the time period of the forecast view.

The **climate section** of the NWS website provides a vast amount of information on historical weather conditions. This page is accessed from the forecast office home page, selecting the “Local” title under the Climate header. The observed weather section on the climate page provides detailed weather information for specific cities in the area. The Daily Climate Report is a breakdown of all weather conditions on a particular day, including temperatures, precipitation, wind information, heating/cooling degree days, as well as normal values and records. The Preliminary Monthly Climate Data product provides an overview for the entire month of the main weather parameters. This product also provides information on monthly departure from normal for temperature and precipitation. Additionally, from the climate page, the user can select the NOWData tab to access information from sites in the CWA that are not necessarily official climate reporting stations. These sites are most often information from cooperative observers. These observers are trained by the local office, and generally report data once per day. A variety of information is available for these locations.

Other information from this page includes: links to climate prediction information, mostly from the Climate Prediction Center, astronomical data and a customized page of local information specific for each office.

The figure shows the 'Observed Weather Reports' interface. At the top, there are seven tabs: Observed Weather, Climate Locations, Climate Prediction, Climate Resources, Local Data/Records, Astronomical, and NOWData. The main content area is divided into four sections: 1. Product, 2. Location, 3. Timeframe, and 4. View. Under 'Product', there are radio buttons for Daily Climate Report (CLI), Preliminary Monthly Climate Data (CF6), Record Event Report (RER), Monthly Weather Summary (CLM), and Regional Summary (RTP). Under 'Location', there is a dropdown menu with options: Albany NY, Glens Falls NY, and Poughkeepsie NY. Under 'Timeframe', there are radio buttons for Most Recent and Archived Data, with a list of dates from August 1st, 2010, to July 27th, 2010. Under 'View', there is a yellow 'Go' button. Below these sections are links for Storm Event Database (SPC) and Storm Data (NCDC). At the bottom, there is a 'Product Description' section for the Daily Climate Report (CLI), which states: 'Detailed daily weather statistics (usually for yesterday), including temperature, precipitation, degree days, wind, humidity, sunrise/sunset, and record temperature data for the following day. Precipitation data includes both calendar year and water year totals, percent of normal values, and comparisons to normal. This product is available for up to 2 months.'

National Weather Service
Advanced Hydrologic Prediction Service

Home News Organization Search for: _____

A number of issues with Internet Explorer 6 (IE6) have been reported since the switch to a new domain name on April 19, 2010. If you are using IE6 please consider upgrading to a more recent browser version.

ALERT! A Flood Warning is in effect for portions of the area. [View all valid statements/warnings](#) or choose a specific point or river to get the details for that location.

Weather Forecast Office St. Louis, MO

River Observations River Forecasts Within 48 Hours Precipitation Download

06/15/2010 09:15 PM CDT

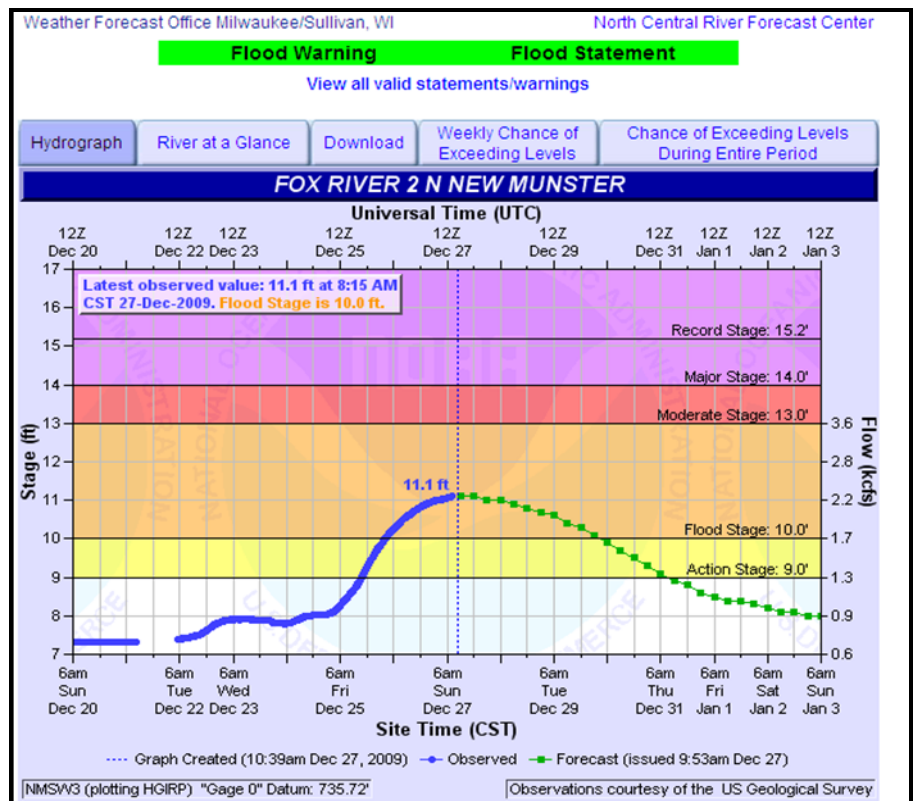
Map Legend

- Hydrograph Available
- Probability and Hydrograph Available
- Major Flooding
- Moderate Flooding
- Minor Flooding
- Near Flood Stage
- No Flooding
- Observation More Than 24 Hours Old
- Out of Service

Print / Save Map

Hydrologic information is also available from our website. On the left hand blue menu of the main website, under the Hydrology header, select "Rivers and Lakes". The locations on this map are sites where a gauge is available to record data on the height of the water in the river or lake. These locations are color coded based on the current level of the river. Green points have no flooding; yellow locations are in the bank full or action stage. Orange, red or purple icons mean that this location is currently above flood stage and is experiencing minor, moderate or major flooding, respectively.

Clicking on one of the locations will bring up a graph of the past several days of river stage data. Also, if a forecast is currently being produced, green points will indicate the expected river levels for the coming days. The blue vertical line down the middle of this graph shows the current time. This webpage will also show the exact location of the gage, as well as historic records of high and low water levels.



The information provided in these pages is only a sample of all the information that can be found on any National Weather Service website. Additional information is available on all websites. Local offices also customize sections of the websites and have more information specific to the office.

Weather.gov Map Display Organization

The NWS issues a variety of non-routine weather messages to alert the general public of current or impending weather hazards. The NWS also relays, through its communication systems several non-weather-related emergency messages, such as one for 911 telephone outages. All of these messages are broken down into four main categories: warnings for life/property-threatening hazards, advisories for not life-threatening hazards, watches for favorable conditions which could lead to hazards and statements for follow-ups.

When a non-routine message has been generated for a location, the appropriate county or counties will be color-coded on the U.S. map on the main NWS page or on the county maps on WFO homepages. The names or types of non-routine messages currently in effect are listed below or to the right of the base-map. While there may be multiple products currently in effect for a single county, only one color can be displayed. For this reason, the products have been prioritized into the four categories listed above. It must be stressed that the layering priority does not reflect the NWS opinion of the exact local threat priority of each weather hazard. Any weather hazard, or non-weather hazard, can be just as deadly as any other depending on the circumstances. Below is the layering priority for display purposes only.

1	Tsunami Warning	41	Flood Statement	76	Air Stagnation Advisory
2	Tornado Warning	42	Tsunami Advisory	77	Low Water Advisory
3	Extreme Wind Warning	43	Wind Chill Warning	78	Local Area Emergency
4	Severe Thunderstorm Warning	44	Extreme Cold Warning	79	Avalanche Watch
5	Flash Flood Warning	45	Hard Freeze Warning	80	Blizzard Watch
6	Shelter In Place Warning	46	Freeze Warning	81	Inland Tropical Storm Watch
6	Evacuation - Immediate	47	Red Flag Warning	82	Tropical Storm Watch
7	Civil Danger Warning	48	Hurricane Watch	82	Tropical Storm Watch
7	Nuclear Power Plant Warning	48	Hurricane Watch	82	Inland Hurricane Watch
7	Radiological Hazard Warning	48	Typhoon Watch	83	Winter Storm Watch
7	Hazardous Materials Warning	48	Typhoon Watch	87	Coastal Flood Watch
7	Fire Warning	49	Hurricane Local Statement	84	Lakeshore Flood Watch
7	Civil Emergency Message	49	Typhoon Local Statement	85	Flood Watch (for forecast points)
8	Law Enforcement Warning	50	Snow and Blowing Snow Advisory	85	Flood Watch (areal)
9	Hurricane Force Wind Warning	51	Freezing Rain Advisory	86	High Wind Watch
9	Inland Hurricane Warning	51	Freezing Drizzle Advisory	87	Excessive Heat Watch
10	Hurricane Warning	52	Sleet Advisory	88	Extreme Cold Watch
10	Typhoon Warning	53	Winter Weather Advisory	89	Wind Chill Watch
11	Special Marine Warning	54	Lake Effect Snow and Blowing Snow Advisory	90	Lake Effect Snow Watch
11	Marine Weather Statement	54	Lake Effect Snow Advisory	91	Freeze Watch
12	Blizzard Warning	55	Wind Chill Advisory	92	Fire Weather Watch
13	Ice Storm Warning	56	Heat Advisory	93	Extreme Fire Danger
14	Inland Tropical Storm Warning	57	Urban and Small Stream Flood Advisory	94	Child Abduction Emergency
15	Heavy Snow Warning	57	Small Stream Flood Advisory	95	911 Telephone Outage
16	Winter Storm Warning	57	Arroyo and Small Stream Flood Advisory	96	Coastal Flood Statement
17	High Wind Warning	57	Flood Advisory	97	Lakeshore Flood Statement
18	Tropical Storm Warning	57	Hydrologic Advisory	98	Special Weather Statement
19	Storm Warning	58	Lakeshore Flood Advisory	99	Marine Weather Statement
20	Tsunami Watch	58	Coastal Flood Advisory	100	Hazardous Weather Outlook
21	Avalanche Warning	59	Flood Advisory (for forecast points)	101	Short Term Forecast
22	Earthquake Warning	60	High Surf Advisory	102	Administrative Message
23	Volcano Warning	61	Blowing Snow Advisory	103	Test
24	Coastal Flood Warning	62	Snow Advisory		
25	Lakeshore Flood Warning	63	Heavy Freezing Spray Warning		
26	Flood Warning (areal)	64	Dense Smoke Advisory		
27	Flood Warning (for forecast points)	65	Small Craft Advisory For Hazardous Seas		
28	High Surf Warning	65	Small Craft Advisory for Rough Bar		
29	Sleet Warning	65	Small Craft Advisory for Winds		
30	Lake Effect Snow Warning	65	Small Craft Advisory		
31	Excessive Heat Warning	66	Brisk Wind Advisory		
32	Dust Storm Warning	67	Hazardous Seas Warning		
33	PDS - Tornado Watch	68	Dense Fog Advisory		
34	Tornado Watch	69	Lake Wind Advisory		
35	PDS - Severe Thunderstorm Watch	70	Wind Advisory		
36	Severe Thunderstorm Watch	71	Blowing Dust Advisory		
37	Flash Flood Watch	72	Frost Advisory		
38	Severe Weather Statement	73	Ashfall Advisory		
39	Flash Flood Statement	74	Freezing Fog Advisory		
40	Gale Warning	75	Freezing Spray Advisory		

For more information on the colors for each of these products, see:

<http://www.nws.noaa.gov/wwamap-prd/wwacolorab.php?x=1>

7. Outreach and Education

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

Outreach Activities

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

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

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

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

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

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



NWS Safety Campaigns

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

Calendar of awareness weeks:

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

Air Quality Awareness Week

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

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

Flood Safety Awareness Week

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

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

Heat Awareness Day

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

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

Hurricane Preparedness

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

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

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

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

National Lightning Safety Awareness Week

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

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

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



National Rip Current Awareness Week

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

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

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

Tornado and Severe Weather Awareness

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

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

Tsunami Awareness Week

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

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

Turn Around, Don't Drown

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

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

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

Winter Weather Awareness

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

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

NOAA Weather Radio All Hazards (NWR) Awareness Day

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

Weather Safety Rules

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

Boating Weather Safety Rules

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

Dust Storm Driving Safety Rules

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

Flood/Flash Flood Rules

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

Fog Driving Safety Rules

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

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

Heat Wave Safety Rules

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

Lightning Safety Rules

- Get inside a home, large building or an all-metal (not convertible) automobile.
- Do not use corded telephones except for emergencies.
- Do not stand underneath a natural lightning rod such as a tall, isolated tree or a telephone pole.
- Avoid projecting above the surrounding landscape, such as standing on a hilltop.
- In a forest, seek shelter in a low area under a thick growth of small trees. In open areas, go to a low place such as a ravine or valley.
- Get away from open water, tractors and other metal farm equipment, and small metal vehicles such as motorcycles, bicycles or golf carts.
- Avoid wire fences, clotheslines, metal pipes and rails. Put down golf clubs.
- If you are caught in a level field or in the open away from shelter and you feel your hair stand on end, lightning may be about to strike you. Do not lie flat on the ground. Instead drop to your knees and bend forward, putting your hands on your knees.

Tornado Safety Rules

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

If no sturdy shelter is available:

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

Tsunami Safety Rules

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

Winter Storm Safety Rules

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

If a Blizzard Traps You in Your Automobile

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

Winter Travel Safety Rules

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

Winter Travel Kit

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

StormReady®/ TsunamiReady™

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

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

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

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



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

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

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

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

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

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

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

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

What happens when a community becomes StormReady®/TsunamiReady®?

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



Severe Weather Spotter Training

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



Importance of Spotters

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

Setting Up a Spotter Class

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

Who Can Attend Spotter Classes?

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

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

When Spotter Classes Are Held?

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

officials. The county's EM director will have a feel for what is best for their county.

Length of Spotter Classes

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



How many people attend spotter classes?

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

Schedule of classes

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

Type/format of spotter class

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

Certification and ID Numbers

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

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

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



Training materials

Some WFOs post their spotter class slide sets on their websites on the SkyWarn page or on another page that has some variation of “Storm Spotter” as its title. Refer to <http://www.weather.gov> in order to access the web sites of individual offices (point and click on the U.S. map.) The SkyWarn page will have other material to review. Here are other good starting points – <http://www.weather.gov/organization.php> and <http://www.spc.noaa.gov>

Otherwise, there is a wealth of spotter training material on the internet; use your favorite search engine on these words – spotter training, severe weather, SkyWarn, tornadoes, downburst winds, etc.

Experience has shown that the greater the amount of basic meteorology knowledge a spotter has, the more effective they will be (fewer mistakes). Again, there is a wealth of basic weather information available on the internet, as well as in books that can be bought in book stores or online. There are also weather-related magazines on the market.

There are many organized spotter groups or clubs in the U.S. that offer training material online.

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

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

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

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

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

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

Refer to the *Storm Data* section on [Page 44](#) in this Informational Guidebook for more details about *Storm Data*.

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

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

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

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

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

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

Definitions of Severe Weather Events and Clouds Used in Spotter Classes

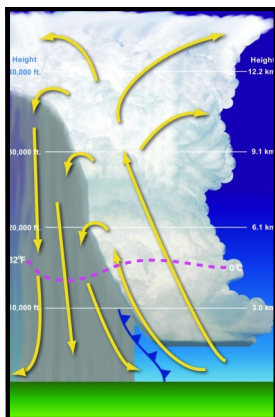
Information provided on this page and the next page do not replace or substitute for material presented in NWS-provided severe weather spotter classes. The information provided below is only for quick reference purposes. A complete NWS glossary can be found at this link: <http://forecast.weather.gov/glossary.php>?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

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



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

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



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

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



Education & Training Courses

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

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

For detailed information about EMI educational opportunities, go to this web site:

<http://training.fema.gov/> or <http://training.fema.gov/IS/>.

A description of a typical course follows.

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

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

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

Prototype Curriculum for Associate Degrees in Emergency Management

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

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

Locally-taught EMI weather- related courses

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

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

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

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

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

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

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

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

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

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

Universities and Colleges Offering Degrees in Emergency Management

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

Online Resources

- **NOAA Education Resources**

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

NOAA Resources for Teachers and Students

<http://www.education.noaa.gov/>

NOAA Resources for Children

<http://www.education.noaa.gov/sweather.html>

NOAA Central Library- Journal Articles, Books, and Photos

<http://www.lib.noaa.gov/>

- **NWS Education Resources**

NWS Education/Outreach

The following contain links to NOAA's web sites that contain information about weather education and outreach.

<http://www.weather.gov/education.php>

<http://www.weather.gov/om/edures.shtml>

<http://www.magazine.noaa.gov/stories/mag201.htm>

NWS Publications

The Office of Climate, Water, and Weather Services produces outreach materials to increase the public's awareness of weather safety and emergency preparedness. Many publications are ONLY available online.

<http://www.weather.gov/os/brochures.shtml>

NWS Glossary

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

<http://www.weather.gov/glossary>

JETSTREAM – Online School for Weather

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

<http://www.srh.noaa.gov/srh/jetstream/>

Local NWS web sites – Educational and Preparedness Information

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

- **American Meteorological Society**

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

<http://www.ametsoc.org/amsedu>

- **National Weather Association**

The National Weather Association (NWA) is a nonprofit association that promotes excellence in operational meteorology and related activities since its inception in 1975.

<http://www.nwas.org>

- **Department of Homeland Security**

<http://www.dhs.gov/index.shtml>

Career and Job Resources

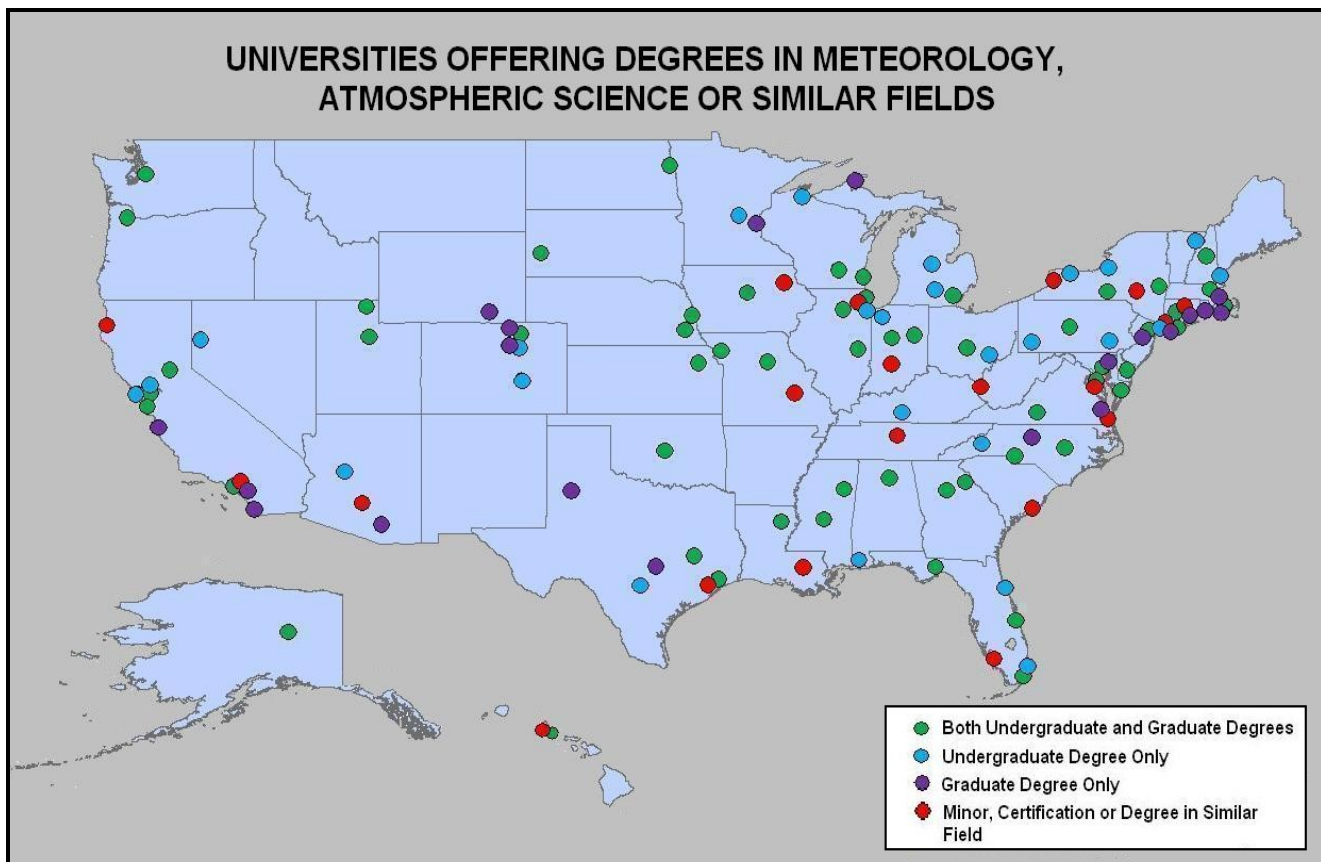
Careers

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

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

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

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



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

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

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

Student Career Experience Program (SCEP)

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

Student Temporary Employment Program (STEP)

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

Student Volunteer

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

Career Resources

National Weather Service Career Information

<http://www.weather.gov/careers.php>

National Severe Storm Laboratory FAQ on Meteorology Careers

http://www.nssl.noaa.gov/faq/faq_careers.php

NOAA Education for Students

<http://www.education.noaa.gov/students.html>

National Weather Service School and Student Information

<http://www.srh.noaa.gov/jetstream/nws/careers.htm>

NOAA Careers

<http://www.careers.noaa.gov/>

Weather Careers

<http://www.srh.noaa.gov/jetstream/nws/careers.htm>

United Corporation for Atmospheric Research Career Opportunities

<http://www.fin.ucar.edu/hr/careers/>

State Climatology Offices in the United States

<http://www.stateclimate.org/>

NOAA Regional Climate Centers

<http://www.ncdc.noaa.gov/oa/climate/regionalclimatecenters.html>

NOAA Weather Education Resources

<http://www.weather.gov/om/edures.shtml>

National Severe Storm Laboratory's Listing of Meteorology Degree Programs

<http://www.nssl.noaa.gov/faq/schools.html>

NOAA's Education Opportunities for Students

<http://www.magazine.noaa.gov/stories/mag201.htm>

All Federal Employment

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

<http://usajobs.gov/>

Department of Labor Job Outlook for Atmospheric Scientists

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

<http://www.bls.gov/oco/ocos051.htm>

8. Equipment

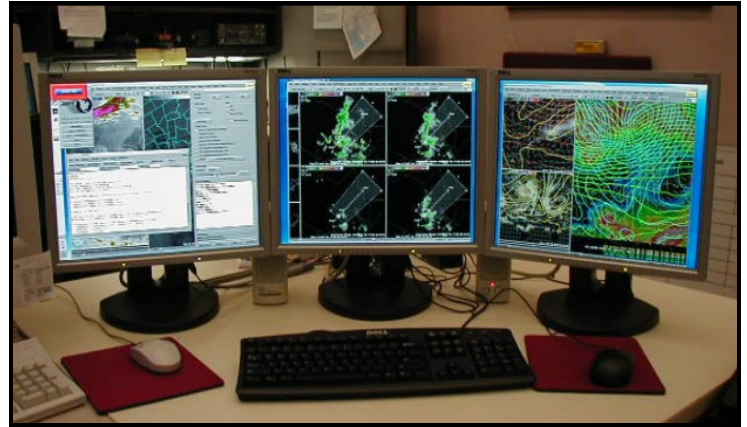
In order to provide the wide variety of services that the NWS provides, a number of important pieces of equipment are utilized. Some of the basic equipment can be found in any business office in the country. Other instruments are very specific to the NWS or other weather agencies. These instruments will be described here.

The table below is a list of equipment used within NWS offices to aide in daily activities. The list encompasses the major programs used in most or all offices. Local offices may have additional equipment not listed here. Additional equipment and observations from outside of NOAA are utilized, including ship observations and mesonet systems, but will not be discussed here.

EQUIPMENT	USES
Advanced Weather Interactive Processing System (AWIPS)	Display system for hydro-meteorological operations.
Automated Surface Observation System (ASOS)	Sensors measure wind, temperature, moisture, cloud bases, pressure, weather and obscurations.
Cooperative Observation Equipment	Measure temperature, precipitation.
Doppler Weather Radar	Detects precipitation allowing for the display of precipitation.
Hydrologic Observing Systems	Gauges measure river stage/flow.
Marine and Tsunami Buoys	Measure wave heights, wind and pressure or water depth.
NOAA Weather Radio	Official warning and forecast voice of the NWS.
Satellite	Detect cloud tops, temperatures, moisture content, large scale winds, sea surface temperatures.
Radiosonde and tracking system	Measure wind, temperature and moisture of the upper atmosphere.
Wind Profilers	Samples wind speed and direction vertically from one location.

AWIPS

The Advanced Weather Interactive Processing System (AWIPS) is a technologically advanced information processing, display and telecommunications system that is the cornerstone to the forecast process in an NWS office. AWIPS workstations typically have a tri-monitor setup for displaying data and preparing the forecast. Additionally, an AWIPS text workstation is located at each workstation for producing and displaying text products and observations. Data dissemination and acquisition through AWIPS is handled through satellite systems. This allows the network to be independent of land based communication that may be affected by weather or other events.



ASOS

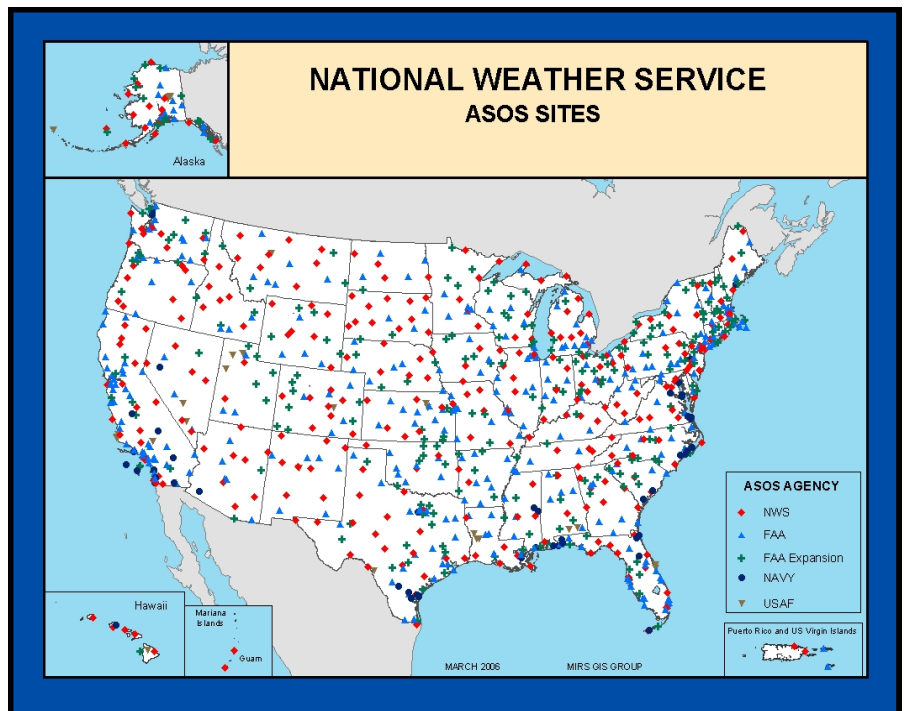
The Automated Surface Observing Systems (ASOS) program is a joint effort of the NWS, the Federal Aviation Administration (FAA), and the Department of Defense (DOD). The ASOS serves as the nation's primary surface weather observing network. ASOS is designed to support weather forecast activities and aviation operations, and at the same time, support the needs of the meteorological, hydrological and climatological research communities.

With the largest and most modern compilation of weather sensors, ASOS has significantly expanded the information available to weather forecasters and the aviation community. The ASOS network has more than doubled the number of full-time surface weather observing locations. ASOS works non-stop, updating observations every minute, 24 hours a day, every day of the year.

Getting more information on the atmosphere more frequently and from more locations is the key to improving forecasts and warnings. Thus, ASOS information helps the NWS to increase the accuracy and timeliness of its forecasts and warnings.

The primary concern of the aviation community is safety, and weather conditions often threaten that safety. A basic strength of ASOS is that critical aviation weather parameters are measured where they are needed most: airport runway touchdown zone(s). ASOS detects significant changes, disseminating hourly and special observations via the networks. Additionally, ASOS routinely and automatically provides computer-generated voice observations directly to aircraft in the vicinity of airports, using FAA ground-to-air radio. These messages are also available via a telephone dial-in port. ASOS observes, formats, archives and transmits observations automatically. ASOS transmits a special report when conditions exceed preselected weather element thresholds, e.g., the visibility decreases to less than 3 miles.

Additional similar observing stations known as Automated Weather Observing Systems (AWOS) are owned by the state or a private company and maintained by private vendors.



Basic weather elements from ASOS:

- Sky condition: cloud height and amount (clear, scattered, broken, overcast) up to 12,000 feet
- Visibility (to at least 10 statute miles)
- Basic present weather information: type and intensity for rain, snow, and freezing rain
- Obstruction to vision: fog, haze
- Pressure: sea-level pressure, altimeter setting
- Ambient temperature, dewpoint temperature
- Wind: direction, speed and character (gusts, squalls)
- Precipitation accumulation
- Selected significant remarks including - variable cloud height, variable visibility, precipitation beginning/end times, rapid pressure change, pressure change tendency, wind shift, peak wind

Sensor Description

SKY CONDITION: ASOS sky condition is determined by a laser ceilometer referred to as the Cloud Height Indicator (CHI). The CHI is used to detect the presence of clouds directly overhead up to 12,000 feet above ground level.

VISIBILITY: ASOS visibility is based on light scattering. The visibility sensor projects a beam of light over a very short distance, and the light that is scattered is detected by a receiver. The amount of light scattered and then received by the sensor is converted into a visibility value.

PRESENT WEATHER AND OBSTRUCTIONS TO VISION: There are two ASOS present weather sensors. The Precipitation Identifier (PI) sensor discriminates between rain (RA) and snow (SN). The Freezing Rain (FZRA) sensor detects freezing rain. ASOS evaluates multiple sensor data and infers the presence of obstructions to vision.

The PI sensor has the capability to detect and report -RA, RA, +RA, -SN, SN, +SN. When rain and snow are mixed and the pre-

vailing precipitation type cannot be determined, ASOS will report UP. The Freezing Rain sensor measures accumulation rates as low as 0.01 inches per hour. If freezing rain is detected and the PI sensor indicates no precipitation or rain, then freezing rain is reported. If freezing rain is detected when the PI indicates snow, then snow is reported.

Obstructions to vision are not directly measured by ASOS, but inferred from measurements of visibility, temperature, and dew point. There are only two reported by ASOS: Fog (FG) and Haze (HZ), and only when the visibility is below 7 statute miles.

TEMPERATURE AND DEW POINT: The ASOS temperature and dew-point sensors directly measure the air and dew-point temperatures.

WIND: ASOS senses wind speed and direction with a sonic wind sensor. This sensor uses sound waves to measure the wind characteristics. Wind character and peak wind are obtained by comparing average and maximum wind speeds.

PRESSURE: Because pressure measurement is critical, three separate and independent pressure sensors are used at larger airports. Two pressure sensors are used at other locations.

PRECIPITATION ACCUMULATION: ASOS uses a heated tipping bucket precipitation gauge.



COOP Observing Equipment

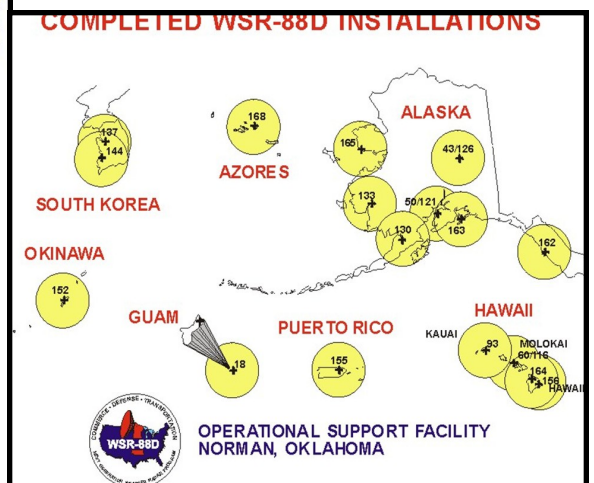
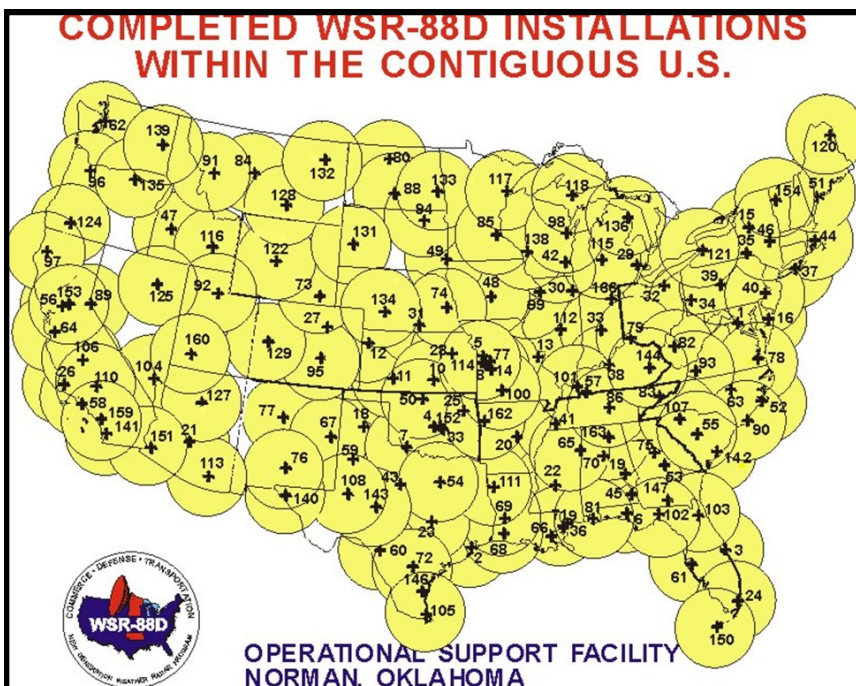
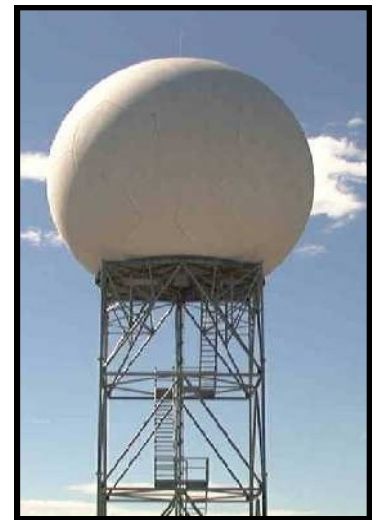
Cooperative observers across the country are provided equipment by their local NWS office for providing accurate observations on a daily basis. Each coop observing station is equipped with a digital thermometer that keeps track of current temperature as well as the minimum and maximum temperature. These stations also have a rain gauge. Several types of gauges are used: 8 inch gauges, 4 inch gauges, tipping bucket rain gauges and weighing gauges.

Doppler Weather Radar

The NEXRAD, also known as the Weather Surveillance Radar, 1988 Doppler (WSR-88D) is the most advanced operational weather radar network in the world; it gives meteorologists the ability to see "inside" a storm. Using the NEXRAD, forecasters can predict the weather with the aid of data such as reflectivity, velocity and spectrum width of an atmospheric disturbance. There are 159 operational NEXRAD radar systems deployed throughout the United States and at selected overseas locations. The maximum range of the NEXRAD radar is 250 nautical miles.

The WSR-88D system is comprised of Doppler radars, telecommunications, computer data communications, data processing hardware and software, display and data entry equipment, documentation and certain facilities and support capabilities required to detect, process, distribute, and display weather information in a manner which allows the DOC, the DOD and the DOT to fulfill their mission needs.

<http://www.roc.noaa.gov/WSR88D/Default.aspx>





Radar (cont.)

In addition to the WSR-88D radars that the NWS has in place across the country, a number of airports are also installing their own radar units. Terminal Doppler Weather Radars (TDWR) provide weather data in and around airports for FAA Air Traffic Controllers. The NWS developed the Supplemental Products Generator (SPG) to provide weather data from the FAA's TDWRs to NWS forecasters. The data can then be used to complement the data from WSR-88D systems to provide a backup during outages, fill in coverage gaps and provide a second data set to confirm the data from nearby WSR-88D radars.

Stream Gauges

Numerous observation sites are set up along rivers across the country to record water levels. Stream flow readings are also taken at these points at times to develop a stream flow curve for each location. These observations are used in issuing flood warnings, statements and forecasts. Several different types of river gauges are utilized: stilling well, bubbler, radar, acoustic and staff gauges. Most of these gauges record water levels multiple times an hour. Staff gauges are read as little as once per day. Frequently, river gauges are accompanied by rain gauges and temperature sensors. The NWS does not maintain all river gauges. Some are owned by cities or counties. Many are owned and maintained by the United States Geological Survey (USGS).



Marine and Tsunami Buoys



Marine buoys are utilized in oceans surrounding the United States as well as in the Great Lakes. These buoys provide observations of wind speed and direction as well as wave height that are essential in producing forecasts for offshore regions. Many of the buoys are also equipped with sensors to measure atmospheric pressure, temperature and dewpoint. The NWS and National Data Buoy Center own and operate many of the buoys and other offshore sensors, however some are owned by universities or other entities.

Tsunamis are detected by NOAA's DART® (Deep-ocean Assessment and Reporting of Tsunamis) buoy network. When a tsunami event occurs, the first information available about the source of the tsunami is based only on the available seismic information for the earthquake event. As the tsunami wave propagates across the ocean and successively reaches the DART systems, these systems report sea level information measurements back to the Tsunami Warning Centers, where the information is processed to produce a new and more refined estimate of the tsunami source. The result is an increasingly accurate forecast of the tsunami that can be used to issue watches, warnings or evacuations.

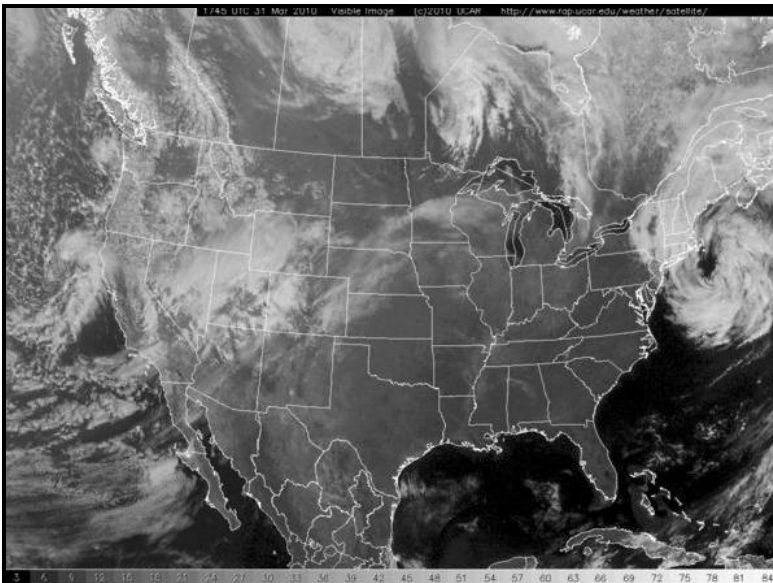
NOAA Weather Radio All Hazards

NOAA Weather Radio is a means of broadcasting weather information to homes across each office's county warning area. The system used within the NWS office is called Console Replacement System. CRS is used in the NWS office to maintain and organize products transmitted to the radio. Every state has numerous NWR transmitters outside of the NWS office to feed the signal to weather radios. For more information, see the [Communication section](#).

Satellites

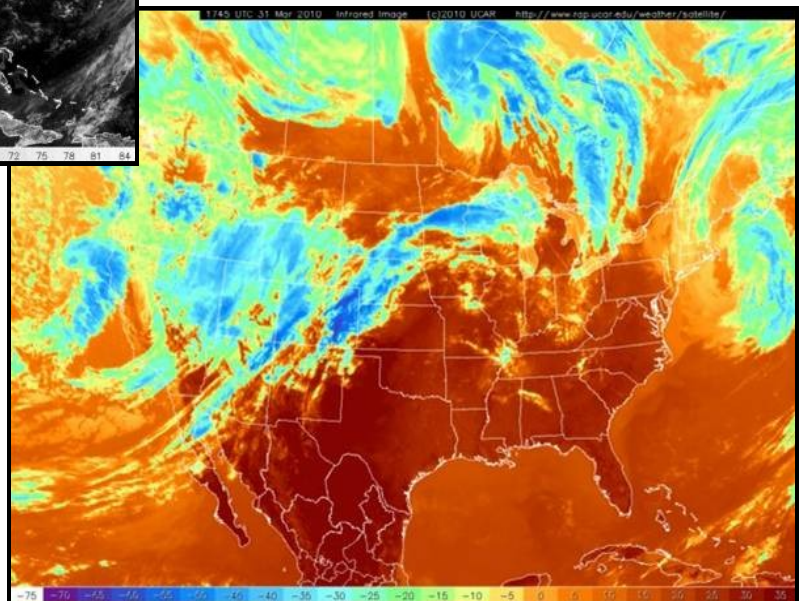
Satellite imagery is essential in accurately forecasting and nowcasting weather conditions. NOAA owns and operates a series of geostationary satellites known as GOES. These satellites maintain a stationary position above the earth. GOES-11 is currently operational over the western United States, and GOES-13 operates over the eastern U.S. Backup satellites are also in place in the event the current satellites fail. Satellite technology is continuously improving, and future satellites are expected to provide more frequent and higher resolution data.

Satellites provide multiple imaging products by reading several different wavelengths of electromagnetic energy. The two most commonly viewed products are the visible and infrared channel (shown below). Water vapor is also a commonly used product. Several others are also available.



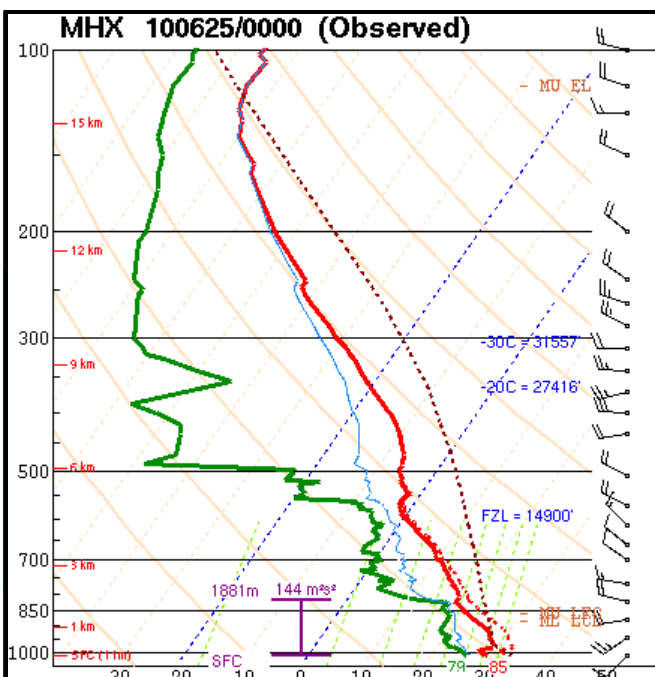
Visible Satellite Image

Infrared Satellite Image



Radiosondes and Upper Air Soundings

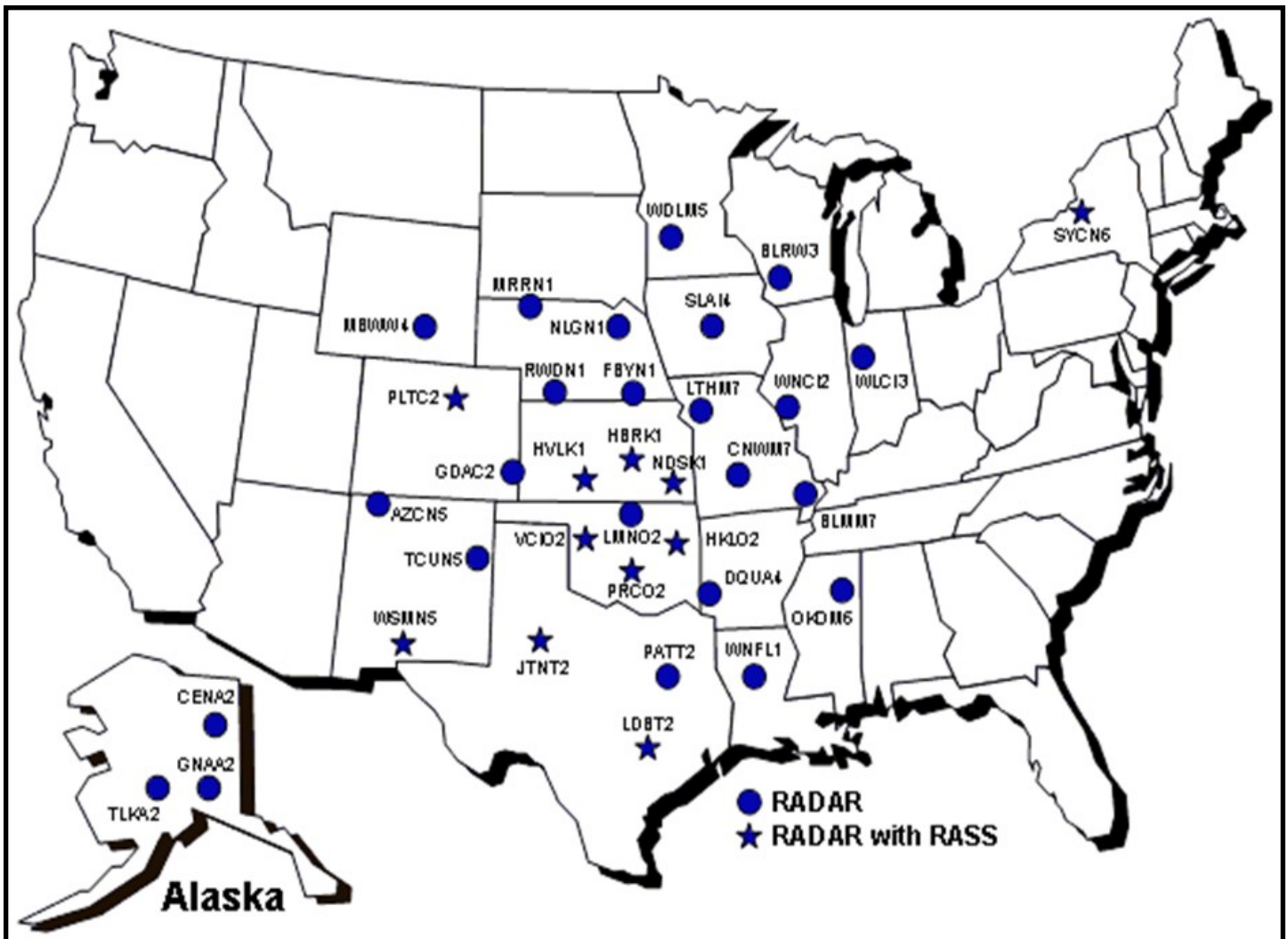
Conditions throughout the atmosphere are vital in the forecast process. In order to sample this data, the NWS uses radiosondes attached to weather balloons. At least twice a day, weather balloons are launched from 92 stations in North America and 10 locations in the Caribbean to gather important weather information vertically through the atmosphere. The weather balloon has a radiosonde package attached to it with instruments to measure temperature, pressure, winds and other atmospheric information.



Radiosonde output

Wind Profilers

The NWS also operates a network of 35 wind profilers throughout the central part of the U.S. and in Alaska. These units transmit waves into the air that work similarly to a Doppler radar. The radars detect fluctuations in the atmospheric density caused by turbulent mixing of volumes of air with slightly different temperature and moisture content. The resulting fluctuations of the index of refraction are used as a tracer of the mean wind in the clear air. The result is a measurement of the vertical wind at numerous levels above the ground.



9. Tables and Abbreviations

Sky condition

The “sky condition” describes the average percentage of the sky that is covered by opaque clouds (not transparent to light) at a given time.

Sky Condition (Day)	Sky Condition (Night)	Opaque Cloud Cover
Sunny	Clear	1/8 or less; (0 to 12.5%)
Mostly Sunny	Mostly Clear	1/8 to 3/8; (12.5 to 37.5%)
Partly Sunny	Partly Cloudy	3/8 to 5/8; (37.5 to 62.5%)
Mostly Cloudy	Mostly Cloudy	5/8 to 7/8; (62.5 to 87.5%)
Cloudy	Cloudy	7/8 or more; (87.5 to 100%)

Time periods

The terms listed below are used in National Weather Service forecasts to delineate time periods.

Time Period	Description (local time)
Today	6:00 a.m. to 6:00 p.m.
Tonight	6:00 p.m. to 6:00 a.m.
This Morning	6:00 a.m. to noon
This Afternoon	Noon to 6:00 p.m.
This Evening	6:00 p.m. to midnight

UTC to Local Time Conversion Table

UTC is Coordinated Universal Time. By international agreement, the local time at the prime meridian, which passes through Greenwich, England. It is also known as "Z time" or "Zulu Time."

Example: To convert 12 UTC to Mountain Standard time, in the table below, the conversion factor is -7 .
So: $12 - 7 = 5$. 12 UTC is the same as 5am MST.

Time Zone	Standard Time	Daylight Time
Eastern	-5	-4
Central	-6	-5
Mountain	-7	-6
Pacific	-8	-7
Alaska	-9	-8
Hawaii	-10	-9

Probability of Precipitation

The Probability of Precipitation describes the chance that measurable precipitation (0.01 inch) will occur during a specific period at any given point in a forecasted area.

Probability	Expression of Uncertainty	Areal Coverage
0%	None used	None used
10%	None used	Isolated or Few
20%	Slight chance	Isolated
30%	Chance	Scattered
40%	Chance	Scattered
50%	Chance	Scattered
60%	Likely	Numerous
70%	Likely	Numerous
80%	None used	Occasional/Definite/ "Periods of"
90%	None used	Occasional/Definite/ "Periods of"
100%	None used	Occasional/Definite/ "Periods of"

Hail Size

Typically refers to the diameter of the hailstones. Warnings and reports may report hail size through comparisons with real-world objects that correspond to certain diameters:

Description Diameter (inches)			
Pea	0.25-0.375	Lime	2.00
Small Marble / M&M candy	0.50	Tennis Ball	2.50
Penny	0.75	Baseball	2.75
Nickel	0.88	Large Apple	3.00
Quarter	1.00	Softball	4.00
Half Dollar	1.25	Grapefruit	4.50
Walnut/Ping Pong Ball	1.50	Computer CD	4.75
Golf Ball	1.75		

Source: <http://www.spc.noaa.gov/misc/tables/hailsize.htm>

Heat Index

An index that combines air temperature and relative humidity in an attempt to determine the human-perceived equivalent temperature—roughly “how hot it feels.”

Using RH

Relative Humidity (%)	Temperature (°F)																	
	80	82	84	86	88	90	92	94	96	98	100	102	104	106	108	110	112	114
40	80	81	83	85	88	91	94	97	101	105	109	114	119	124	130	136	142	148
45	80	82	84	87	89	92	96	100	104	109	114	119	124	130	137	143		
50	81	83	85	88	91	95	99	103	108	113	118	124	131	137				
55	81	84	86	89	93	97	101	106	112	117	124	130	137					
60	82	84	88	91	95	100	105	110	116	123	129							
65	82	85	89	93	98	103	108	114	121	128	136							
70	83	86	90	95	100	106	112	119	126									
75	84	88	92	97	103	109	116	124										
80	84	89	94	100	106	113	121											
85	85	90	96	102	110	117												
90	86	91	98	105	113													
95	86	93	100	108														
100	87	95	103															

Blank = Dewpoint > 85 °F

Heat Disorder Risk:

Caution
Extreme Caution
Danger
Extreme Danger

Using Dewpoint

Dew Point (°F)	Temperature (°F)															
	80	82	84	86	88	90	92	94	96	98	100	102	104	106	108	110
60	81	82	84	86	88	90	92	94	96	98	101	103	105	107	110	112
62	81	83	85	87	88	90	93	95	97	99	102	104	106	109	110	114
64	82	84	85	87	89	91	94	96	98	101	103	105	107	110	112	115
66	82	84	86	88	90	92	95	97	99	102	104	107	109	111	114	117
68	83	85	87	89	92	94	96	99	101	104	106	108	110	113	116	118
70	83	86	88	91	93	96	98	100	103	105	108	110	113	116	118	120
72	84	87	90	91	95	97	100	102	105	107	110	112	115	118	120	122
74	85	88	91	94	97	99	102	104	107	109	112	115	117	119	122	125
76	85	89	93	96	99	101	105	107	110	112	114	118	120	123	125	127
78	86	91	94	98	101	105	108	110	113	116	118	121	123	125	128	131
80	87	93	97	101	104	107	111	114	116	118	121	124	127	129	132	134
82		95	100	104	108	111	115	119	120	123	126	128	131	133	135	139

Heat Disorder Risk:

Caution
Extreme Caution
Danger
Extreme Danger

Wind Chill

Increased wind speeds accelerate heat loss from exposed skin, and the wind chill is a measure of this effect. No specific rules exist for determining when wind chill becomes dangerous. As a general rule, the threshold for potentially dangerous wind chill conditions is about -20°F. Wind chill is calculated by wind speed at an average height of five feet, the typical height of an adult human face, based on readings from the national standard height of 33 feet, the typical height of an anemometer. Wind chill incorporates heat transfer theory, heat loss from the body to its surroundings, during cold and breezy/windy days. The calculation assumes no impact from the sun as well as lowering the calm wind threshold to 3 mph.

Wind (mph)	Temperature (°F)																
	35	30	25	20	15	10	5	0	-5	-10	-15	-20	-25	-30	-35	-40	-45
5	31	25	19	13	7	1	-5	-11	-16	-22	-28	-34	-40	-46	-52	-57	-63
10	27	21	15	9	3	-4	-10	-16	-22	-28	-35	-41	-47	-53	-59	-66	-72
15	25	19	13	6	0	-7	-13	-19	-26	-32	-39	-45	-51	-58	-64	-71	-77
20	24	17	11	4	-2	-9	-15	-22	-29	-35	-42	-48	-55	-61	-68	-74	-81
25	23	16	9	3	-4	-11	-17	-24	-31	-37	-44	-51	-58	-64	-71	-78	-84
30	22	15	8	1	-5	-12	-19	-26	-33	-39	-46	-53	-60	-67	-73	-80	-87
35	21	14	7	0	-7	-14	-21	-27	-34	-41	-48	-55	-62	-69	-76	-82	-89
40	20	13	6	-1	-8	-15	-22	-29	-36	-43	-50	-57	-64	-71	-78	-84	-91
45	19	12	5	-2	-9	-16	-23	-30	-37	-44	-51	-58	-65	-72	-79	-86	-93
50	19	12	4	-3	-10	-17	-24	-31	-38	-45	-52	-60	-67	-74	-81	-88	-95
55	18	11	4	-3	-11	-18	-25	-32	-39	-46	-54	-61	-68	-75	-82	-89	-97

Frostbite Times:

30 Minutes

10 Minutes

5 Minutes

Wind

Descriptions used to describe sustained wind speeds throughout NWS products.

Wind Speed	Description
0 to 5 mph	Light, Calm
5 to 20 mph	None used
15 to 25 mph	Breezy, Brisk, Blustery
20 to 30 mph	Windy
30 to 40 mph	Very Windy
40 to 73 mph	High, Strong, Damaging
74 mph or Greater	Hurricane Force

Enhanced Fujita (EF) Tornado Scale

A scale of tornado intensity in which wind speeds are inferred from an analysis of wind damage.

Category	Winds
EF 0	65-85 mph
EF 1	86-110 mph
EF 2	111-135 mph
EF 3	135-165 mph
EF 4	166-200 mph
EF 5	> 200 mph

Saffir-Simpson Hurricane Wind Scale

This scale was developed in an effort to provide examples of the type of damage and impacts associated with the winds of the indicated intensity. The scale of numbers is based on the maximum sustained winds associated with the cyclone. As the hurricane intensifies or weakens, the scale number changes accordingly. The following table shows the scale broken down by maximum sustained wind speed. For more information on the scale see: <http://www.nhc.noaa.gov/>

Category	Winds	Summary
1	74-95 mph	Very dangerous winds will produce some damage
2	96-110 mph	Extremely dangerous winds will cause extensive damage
3	111-130	Devastating damage will occur
4	131-155	Catastrophic damage will occur
5	>155 mph	Catastrophic damage will occur

Beaufort Wind Scale

A system used to estimate and report wind speeds when no measuring apparatus is available.

Force	Wind (Knots)	Wind (MPH)	WMO Classification	Appearance of Wind Effects	
				On the Water	On Land
0	Less than 1	Less than 1	Calm	Sea surface smooth and mirror-like	Calm, smoke rises vertically
1	1-3	1-4	Light Air	Scaly ripples, no foam crests	Smoke drift indicates wind direction, still wind vanes
2	4-6	4-7	Light Breeze	Small wavelets, crests glassy, no breaking	Wind felt on face, leaves rustle, vanes begin to move
3	7-10	8-12	Gentle Breeze	Large wavelets, crests begin to break, scattered whitecaps	Leaves and small twigs constantly moving, light flags extended
4	11-16	13-18	Moderate Breeze	Small waves 1-4 ft. becoming longer, numerous whitecaps	Dust, leaves, and loose paper lifted, small tree branches move
5	17-21	19-24	Fresh Breeze	Moderate waves 4-8 ft taking longer form, many whitecaps, some spray	Small trees in leaf begin to sway
6	22-27	25-31	Strong Breeze	Larger waves 8-13 ft, whitecaps common, more spray	Larger tree branches moving, whistling in wires
7	28-33	32-38	Near Gale	Sea heaps up, waves 13-20 ft, white foam streaks off breakers	Whole trees moving, resistance felt walking against wind
8	34-40	39-46	Gale	Moderately high (13-20 ft) waves of greater length, edges of crests begin to break into spindrift, foam blown in streaks	Whole trees in motion, resistance felt walking against wind
9	41-47	47-54	Strong Gale	High waves (20 ft), sea begins to roll, dense streaks of foam, spray may reduce visibility	Slight structural damage occurs, slate blows off roofs
10	48-55	55-63	Storm	Very high waves (20-30 ft) with overhanging crests, sea white with densely blown foam, heavy rolling, lowered visibility	Seldom experienced on land, trees broken or uprooted, "considerable structural damage"
11	56-63	64-72	Violent Storm	Exceptionally high (30-45 ft) waves, foam patches cover sea, visibility more reduced	
12	64+	73+	Hurricane	Air filled with foam, waves over 45 ft, sea completely white with driving spray, visibility greatly reduced	

Common Abbreviations in Forecast Discussions and Products

Below is a list of just a few of the common abbreviations used in forecast discussions and other NWS products. A more extensive list, along with a glossary can be found here: <http://www.weather.gov/glossary/>

ADVCTN— Advection

ADVY - Advisory

AFD – Area Forecast Discussion

AFTN – Afternoon

AGL – Above Ground Level

ASOS – Automated Surface Observing System

AWIPS – Advanced Weather Interactive Processing System

AWOS – Automated Weather Observation System

BKN – Broken

CAA – Cold Air Advection

CAPE - Convective Available Potential Energy

CONT - Continue

CWA – County Warning Area

DGEX - Downscaled GFS with ETA Extension model

ECMWF - European Center for Medium-Range Weather Forecasts

ELY - Easterly

EWD - Eastward

GFS - Global Forecast System

FCST – Forecast

FROPA – Frontal Passage

IFR – Instrument Flight Rules

KTS - Knots

LGT - Light

LIFR – Low Instrument Flight Rules

MAV – Aviation MOS Guidance

MB – Millibar

MSL - [above] Mean Sea Level

MOS - Model Output Statistics

MVFR – Marginal Visual Flight Rules

NAM - North American Mesoscale Model

NLY – Northerly

NELY - Northeasterly

NWD - Northward

NWLY – Northwesterly

OVC - Overcast

PVA - Positive Vorticity Advection

RFC – River Forecast Center

RH – Relative Humidity

RUC - Rapid Update Cycle model

SAT - Satellite

SCT – Scattered

SFC – Surface

SELY – Southeasterly

SLY – Southerly

SPC – Storm Prediction Center

SREF - Short Range Ensemble Forecast model

SRN – Southern

SWLY - Southwesterly

UTC - Universal Time Coordinated. It is also known as "Zulu Time."

VFR – Visual Flight Rules

VSBY – Visibility

WLY – Westerly

WAA — Warm Air Advection

WND – Wind

WRN – Western

WX - Weather

Administrative and Acknowledgement Information

This is a living document that will be periodically updated by the current National Warning Coordination Meteorologist (WCM) Program Leader in the Office of Climate, Water, and Weather Services (OCWWS 1/OS51) at the NWS Headquarters, or their designee.

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The need for a national-based NWS Information Guide was identified by Emergency Managers in an open-forum session at the 2009 International Association of Emergency Managers (IAEM) Conference in Orlando. NWS management at the open-forum session made completion of the guide a national requirement and indicated that it would be ready for the 2010 IAEM Conference in San Antonio, Oct 30-Nov 4, 2010.

This document is considered Part 1. Part 2 is to be developed and maintained by local offices. It is intended that Part 2 will contain additional detailed information pertaining to local WFO County Warning Areas as well as any state-only services and procedures.

WFO Milwaukee/Sullivan, WI (MKX) volunteered to develop the national guide. A team of 13 individuals worked on the initial guide development:

Rusty Kapela – MKX Warning Coordination Meteorologist (Team Leader)
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Chris Franks – Minneapolis, MN General Forecaster (former MKX Met Intern) (Editor)
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Chris Kornkven – MKX Electronic Technician
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Many of the images and descriptions in this book came from other documents, publications and websites already prepared by local WFOs and other centers/offices.

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