Fall 2013

NATIONAL WEATHER SERVICE AMARILLO, TEXAS

The Dryline

GIS: What's Here Now & What's Coming Soon

By Christopher Morris, Meteorologist

With the rapid increase in Geographic Information Systems (GIS) usage, the National Weather Service (NWS) has taken steps to provide a number of its products in a GIS format accessible through the NWS GIS Portal webpage (www.weather.gov/gis). The site contains over 40 different products from the NWS, the Storm Prediction Center (SPC), the National Hurricane Center (NHC), the National Climatic Data Center (NCDC), and other sources in both KML and shapefile formats. If you don't have any GIS software but want to view the images, the NWS GIS Portal provides links to free downloads of some common GIS software such as Google Earth, ArcExplorer, and the NASA World Wind Viewer.

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Winter Weather Safety

By Christine Krause, Meteorologist

After such a hot and dry summer, the return to colder weather can seem jarring to Texas and Oklahoma Panhandle residents. However, the onset of winter is right around the corner. In fact in the past, there have been numerous winter weather events that occurred in the months of October and November, even as recently as October 27th. Since winter is rapidly approaching, now is as good a time as any to review winter weather safety tips before freezing rain, sleet, and snow impact the Panhandles.

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Each product on the GIS site is divided into 5 categories: Current Weather, Forecasts, Past Weather, Fire Weather, and Additional Info. The "Current Weather" section contains real-time severe weather watches and warnings, radar imagery, surface observations, satellite imagery, and river gages. Each product has an enabled pop-up window that contains detailed information about what is displayed as well as a hyperlink to the source webpage (see figure 1). In the "Forecasts" section, users can find local forecasts, model forecast soundings, river gage forecasts, and severe weather outlooks (Figure 2). "Past Weather" provides archived radar data, NCDC Climate Atlas, storm reports, tornado tracks, and past hurricane tracks. The "Fire Weather" page illustrates where the NWS is currently supporting firefighting efforts by providing spot forecasts. Under "Additional Info", links are provided to websites which have an array of supplemental information, such as the NOAA nowCOAST. The NOAA nowCOAST offers users the latest displays of surface weather and ocean observations, satellite imagery, radar mosaics, sea surface temperature analyses and gridded forecasts. Additionally, the Hydrometeorological Prediction Center's (HPC) Quantitative Precipitation Forecasts, which show the expected rainfall accumulation, are available in KML but not shapefile. The HPC also produces Winter Weather Outlooks (Figure 3), but currently are only available on their webpage (http://www.hpc.ncep.noaa.gov/kml/kmlproducts.php#winwx).

Figure 1: Surface Observations available from the NWS GIS Portal displayed in Google Earth. Available at www.weather.gov/gis

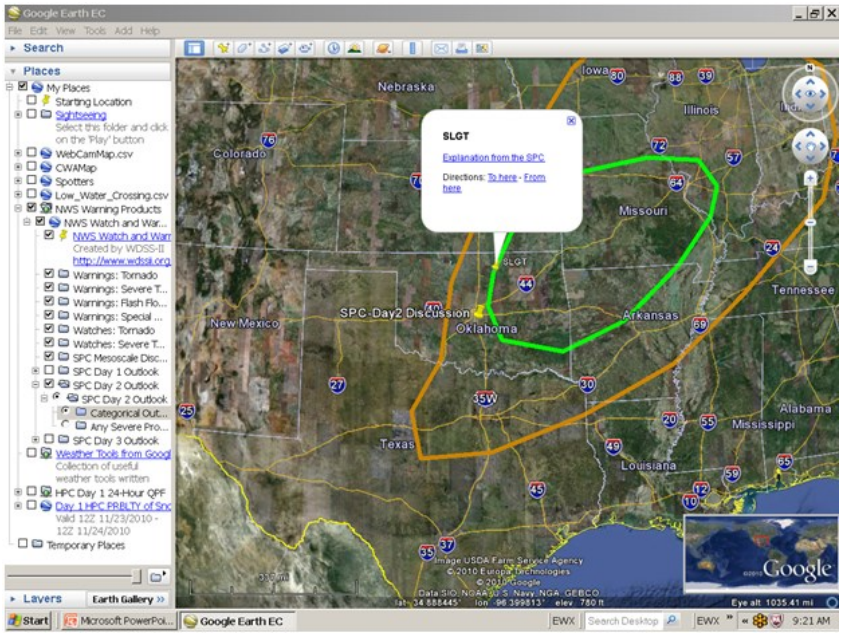

Figure 2: SPC Day 2 Convective Outlook from the NWS GIS Portal displayed in Google Earth.

GIS: What's Here Now & What's Coming Soon *continued*

Figure 3: HPC Day 1 Winter Weather Probability displayed in Google Earth. p.noaa.gov/kml/kmlproducts.php#winwx

As more products become available in a GIS format on a national scale, regional teams and local forecast offices are working on providing smaller-scale projects in a GIS format. These projects are still in the developmental and experimental phases, however, some are currently available. For example, the San Diego, CA office has developed a display of local storm reports from across the nation viewable in Google Maps (www.wrh.noaa.gov/sgx/kml/lsr.php?cwa=nws&lsr=All). The Birmingham, AL and Amarillo, TX, offices have developed a graphical interpolation of CoCoRaHS rainfall reports which are updated daily

Birmingham: www.srh.noaa.gov/bmx/rainfallPlots/index.php

Amarillo: www.srh.noaa.gov/ama/?n=precipmap

The Little Rock, AR office has created a website (www.srh.noaa.gov/lzk/?n=gisdata.htm) containing downloadable GIS files for significant storm events for their area. Finally, the Austin/San Antonio office has utilized GIS software in a similar fashion as these offices, but currently mainly to accompany an overall event review. These can be found on our event review website (www.srh.noaa.gov/ewx/?n=postwx.htm).

Even though there are more than 40 different products currently available in both KML and shapefile format, the NWS is striving to provide more of its products through the NWS GIS Portal webpage. Meanwhile, both regional teams and local offices are integrating GIS software to provide smaller scale projects and information. To learn more about these projects, please visit your local NWS office's webpage.

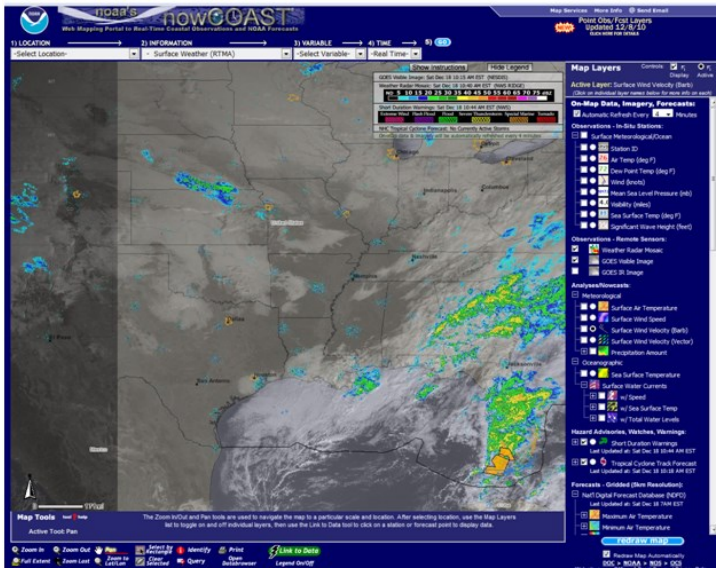

Figure 4: NOAA nowCOAST displaying visible satellite and a radar mosaic.

Winter Weather Safety *continued*

It is highly recommended to stay home and avoid traveling during a winter storm. However, if you must travel, ensure that your vehicle is prepared for inclement winter weather. A few items that should be checked to winterize your vehicle include the battery, brakes, heater, defroster, and tires. Also, check to make sure fluids such as antifreeze and windshield wiper fluid are not low and fill up/replace, if necessary. When traveling, keep your gas tank near full and avoid traveling alone. Prior to departing, check the latest road conditions and plan an alternate route. Inform a friend or family member of your travel plans and when you expect to arrive at your destination. An emergency supply kit is recommended in the event you become stuck or stranded. Items that should be included are a mobile phone, blankets, dry clothing, non-perishable food, water, a first aid kit, flashlights, extra batteries, and a snow shovel.

Winter Weather Products Issued by the NWS Amarillo

Winter Storm Watch: A winter storm watch is issued when conditions are favorable for hazardous winter weather to develop across all or parts of the Texas and Oklahoma Panhandles. Winter storm watches are generally issued 12 to 48 hours in advance to provide the public and decision makers time to prepare for the impending winter weather.

Winter Storm Warning: When hazardous and life-threatening winter weather is occurring, likely, or has a high probability of occurrence, a winter storm warning will be issued. The following criteria or combination of will warrant a winter storm warning:

Snow accumulations of 6 inches or more in a 24 hour period

Sleet accumulations greater than one half of an inch

High impact/life-threatening events that do not meet defined warning criteria (e.g. near blizzard conditions)

Winter Weather Safety *continued*

Blizzard Warning: A blizzard warning will be issued when both of the following conditions are forecast to occur for three or more hours:

Wind speeds of 35 mph or greater

Considerable falling or drifting snow with visibilities at or below one quarter of a mile

Ice Storm Warning: When significant ice accumulations of one quarter of an inch or greater are expected, an ice storm warning will be issued.

Winter Weather Advisory: A winter weather advisory will be issued for hazardous winter weather that causes significant inconveniences. The following criteria or combination of will warrant a winter weather advisory:

Snow accumulations of 1 to 5 inches in a 24 hour period.

Sleet accumulations less than one half of an inch

Freezing Rain Advisory: A freezing rain advisory will be issued for a light accumulation of ice from light rain and/or drizzle.

For the latest road conditions, please use the following numbers:

Texas Panhandle:	1-806-468-1488	Oklahoma:	1-405-425-2385
Texas:	1-800-452-9292	New Mexico:	1-800-432-4269

A History of Observing the Weather

Sun, rain, snow, wind...we can't escape the weather, but we can prepare for it if we know what is coming. Checking the daily weather forecast is part of a regular routine for many of us. But have you ever thought about how your local meteorologist actually develops those weather forecasts?

The process of forecasting weather has four elements: observations, analysis, prediction, and dissemination/communications. While we see the end of this process, it is the first element—observations—that serve as the fundamental building block in the weather forecasting process.

Weather observations are collected, quality-controlled, and used in numerical weather prediction models to create forecasts on local to global scales. Without accurate, frequent, current, and comprehensive weather observations, analyses are weak, models/predictions are inaccurate, and the value of weather information to the public and industry is reduced.

Here, a pilot balloon is launched from a U.S. Coast

The key parameters of weather observations include temperature, moisture, pressure, and wind speed and direction at the Earth's surface and vertically thru the atmosphere. These elements have not changed dramatically since the first weather observations were recorded. However, The platforms for weather instruments and the methods to disseminate weather information have changed dramatically over the years, both in terms of volume and reliability.

The National Weather Service and its predecessor organizations have been in the business of observing weather since the 1800s. This article looks at the history of weather observations and how increased observational accuracy has led to enhanced forecasting capabilities and ultimately enhanced our ability to protect lives and property.

Weather Observations in Early American History

The early American colonial years are peppered with events and stories referencing weather observations. The first systematic weather observations in North America were made in 1644 in Wilmington, Delaware, by Reverend John Campanius Holms. Observations of storm movement and weather patterns were first noticed by Benjamin Franklin when he documented the movement of a hurricane from Philadelphia to Boston in 1743. During the signing of the Declaration of Independence, Thomas Jefferson noted that the high temperature for Philadelphia on July 4, 1776, was 76 degrees Fahrenheit (24 degrees Celsius). Presidents such as George Washington and Jefferson were some of the first weather observers in the county. And, during their trip to explore the western U.S. in 1804-1806, the Lewis and Clark expedition made regular weather observations.

Building a Weather Observing Network

The importance of weather observations quickly gained a strong foothold in our young nation. In 1776, Thomas Jefferson began to recruit volunteer weather observers throughout Virginia. By 1800, there were volunteers in five other states, including Massachusetts, Pennsylvania, Connecticut, New York, and North Carolina.

On February 9, 1870, President Ulysses S. Grant signed a joint resolution of Congress authorizing the Secretary of War to establish a national weather service. Within the Department of War, this weather operation was assigned to the Signal Service Corps under Brigadier General Albert J. Myer. The weather operation was officially called "The Division of Telegrams and Reports for the Benefit of Commerce." Under the direction of General Myer, the first synchronous weather observations were taken on November 1, 1870, at 7:35 a.m., when weather observations at 24 stations were recorded and transmitted to a central site in Washington, DC.

Observations and Aviation

The advent of aviation changed the Weather Bureau substantially. In 1926, the Air Commerce Act directed the Weather Bureau to provide weather services to civilian aviation. Around this time, weather observations were also being taken by the U.S. Navy and the Weather Bureau from airplanes. Thus, the connection between weather operations and aviation was established.

During the mid-1900s, weather observing technologies started growing at a rapid pace. In 1934, 20 daily aircraft observations were flown by the Weather Bureau and it partners. This program proved to be risky and expensive and was replaced by the pilot-balloon (pibal) program.

The pibal was replaced by the radiosonde in 1938, a change that allowed weather observations up to 100,000 feet (30 kilometers) to be collected. Radiosondes are units for use in weather balloons that measure various atmospheric parameters, such as air temperature, humidity, and pressure, and transmit information to a fixed receiver on the ground. Additionally, unlike the pibal, the radiosonde could be launched in most types of weather conditions.

This image shows early testing of hydrogen-filled balloons for radiosonde measurements. The theodolite in the image was used to track the balloon to the limit of visibility.

Radar and Satellites

Two new weather observing technologies—weather radar and weather satellites—were developed almost simultaneously during the 1950s. Both technologies were developed to directly support needed weather observations during military campaigns. Today, we refer to weather observations from radar and satellites as "remote sensing." Remote sensing means we can obtain weather observations far from the weather observing technology and greatly expand our weather observing network.

The radar technology originally designed to detect and locate hostile aircraft in World War II served as the basis for the advanced weather radar systems that are saving lives today. Weather radars were first operated by the Army in 1954. The first weather radar was operated by the Weather Bureau in Miami in 1959. Today, NOAA's National Weather Service relies daily on radar to detect, locate, and measure precipitation inside clouds.

The first weather satellite was successfully launched on April 1, 1960. Weather satellites allow us to observe the entire Atlantic and Pacific Oceans in minutes. These new technologies dramatically reduced "weather surprises" by observing the atmosphere more frequently. Today, cloud images collected from these satellites are seen daily on television weather forecasts.

Today's Volunteer Observers

Today, NOAA's National Weather Service depends on volunteer support from the general public to gather weather observations through two key programs: Storm Spotters and the Cooperative Observer Program. In both these programs, volunteers provide vital, real-time observational data to the National Weather Service.

Storm Spotters

The impacts of severe weather are felt almost every day by tens of thousands of Americans. To obtain critical weather information from a variety of locations, the National Weather Service and partner groups set up Storm Spotters, a volunteer program with more than 230,000 trained severe weather spotters. These volunteers help keep their local communities safe by sending the National Weather Service timely and accurate reports of severe weather.

Storm Spotters volunteers provide essential information for all types of environmental hazards; however, the main responsibility of a spotter is to report severe local storms. In an average year, the U.S. is affected by 10,000 severe thunderstorms, 5,000 floods, and more than 1,000 tornadoes. Where appropriate, spotters also are trained to recognize warning signs for earthquakes; landslides; avalanches; volcanic ashfall; and coastal hazards such as tsunamis, water spouts, and rip currents.

Weather observations play a central role in protecting us from severe weather, such as this supercell thunderstorm, which was spotted in Miami, Texas.

Since the program started in the 1970s, Storm Spotters information, coupled with Doppler radar technology, improved satellite data, and other resources, has enabled the National Weather Service to issue more timely and accurate warnings for tornadoes, severe thunderstorms, hurricanes, and flash floods. Storm Spotters volunteers form the nation's first line of defense against severe weather. The efforts of these volunteers have given communities the precious gift of time—seconds and minutes that can help save lives.

The science and technology of weather observations have made great strides and progress during the short history of this country. The progress of weather observations is related directly to the rapid development of technology and a greater scientific understanding of the Earth's atmosphere. Today, weather observations are linked to environmental Earth observations, including measurements of the atmosphere, the oceans, and land surfaces. The observing program is diverse, ranging from very complex technologies such as weather satellites to basic instruments such as the thermometer used by volunteers in their backyards. Improvements in the accuracy and reliability of daily weather forecasts to the public and American industries are directly tied to better and more frequent weather observations. All of this leads to a safer general public and a stronger national economy.

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