

National Weather Service Goes Digital with Internet Mapping

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ABSTRACT

The National Weather Service provides weather warnings for the U.S. Recently, the NWS began issuing short-term warnings in a format that includes polygon information describing more specifically where the major weather threat is located. The NWS also now provides forecast data as part of the new National Digital Forecast Database that consists of a regularly-spaced grid of sensible weather elements covering the entire continental U.S. at a fine resolution. This is a dramatic shift from text products to a dynamic 4-dimensional digital grid. The NWS is looking for new ways to integrate these data in a geospatial format, particularly focusing on Internet Mapping Services. IMS technology will allow a large segment of NWS users to browse weather data and provide them flexibility in determining how the data are rendered. The NWS expects that IMS technology will diversify and modernize weather information dissemination.

1. Introduction

For many years, the National Weather Service (NWS) has produced a substantial suite of products, primarily text, to fulfill the NWS mission to protect life and property in the U.S. These include issuances of hazardous weather watches and warnings as well as routine public forecast products. With recent changes in products and technology, the NWS now has the opportunity to make their products easier to integrate into Geographic Information Systems.

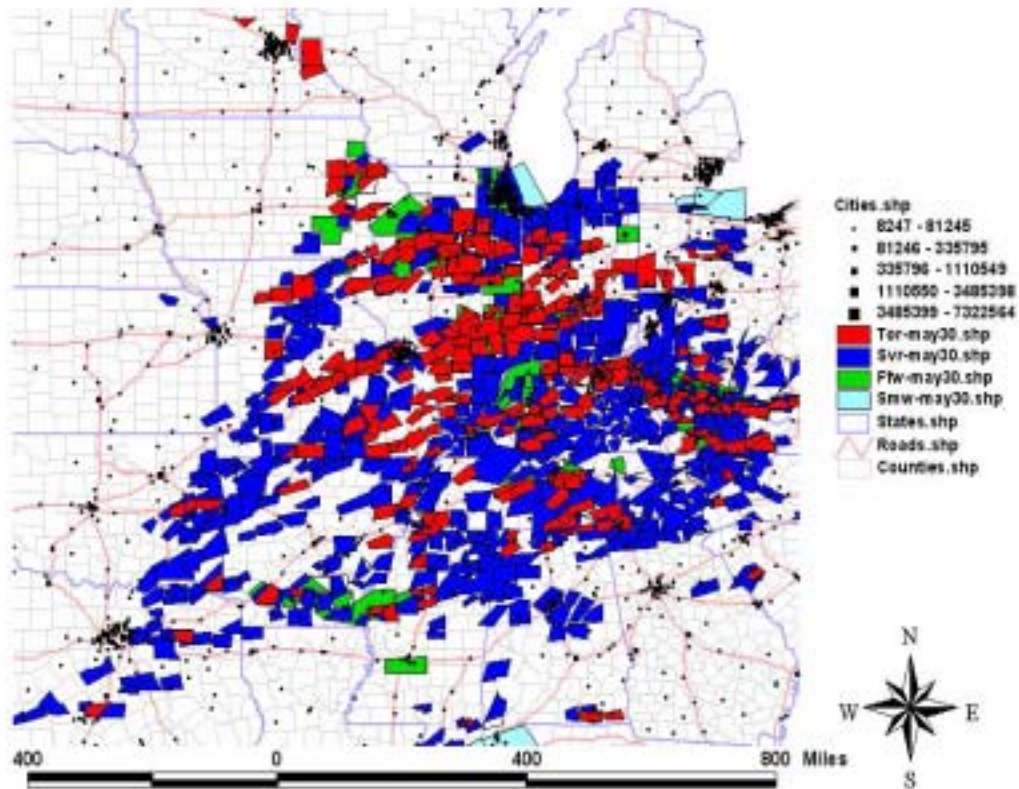
2. Hazardous Weather Warning Polygons

One such change is the addition of latitude-longitude points that define polygons in short-term hazardous weather warnings for tornados, severe thunderstorms, and flash floods. Although these warnings have contained encoded polygons since approximately 1998, the way in which these warnings are often used has limited the sharing of the warning polygon information. Specifically, the NWS and its partners have traditionally used these warnings on a county-by-county basis to match the initial verification and dissemination technologies that were, and in many cases still are, in use across the country. This fit in well with both the existing National Oceanic and Atmospheric Administration (NOAA)

All Hazards Weather Radio system, which is triggered by alerts for entire counties and the structure of many emergency management centers that are defined at the county level.

Recently there has been increased interest within the NWS and amongst its partners to make better use of this valuable information. One such example is the creation of georeferenced shapefiles of the warning polygons for wide use in geographic information systems and for display to our users. A mechanism has been set up to produce real-time polygon depictions of these warnings. A graphical example is shown below.

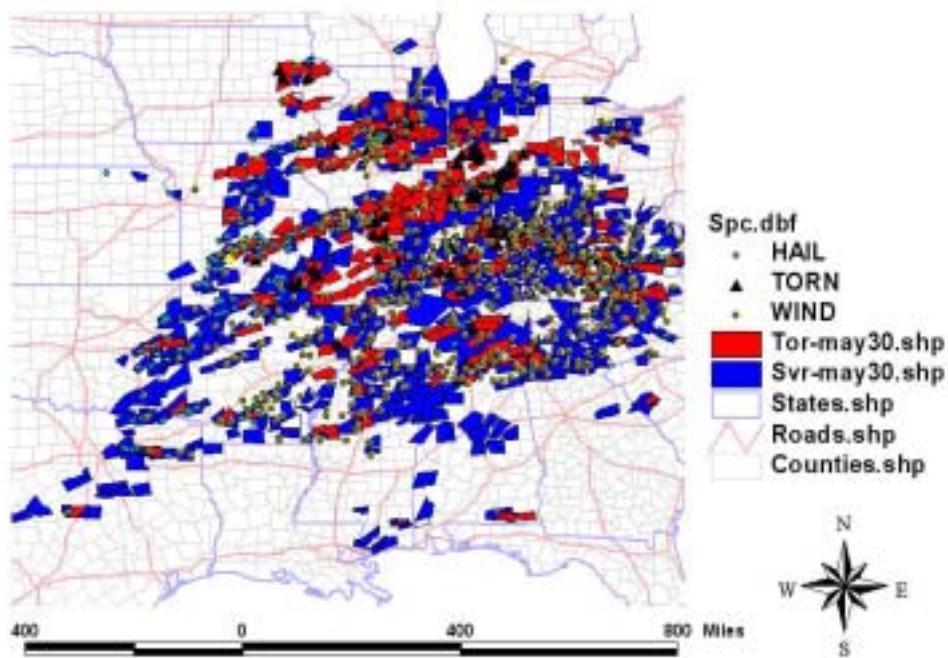
Warnings Issued May 30, 2004



3. Verification

Verification of hazardous weather warnings is one of the primary performance measures the NWS uses to assess its ability to carry out its mission to protect life and property. Verification includes reports of wind damage, large hail, and reported tornado touchdowns—all of which are indicators that hazardous weather has occurred that could threaten life or property. The NWS' Storm Prediction Center has begun to encode these reports using geographic coordinates as well. This allows the reports to easily be brought into a GIS system where analysis can be done. For example, the image below shows reports of hazardous weather for a 24-hour period overlaid on top of NWS issued warnings for the same time period.

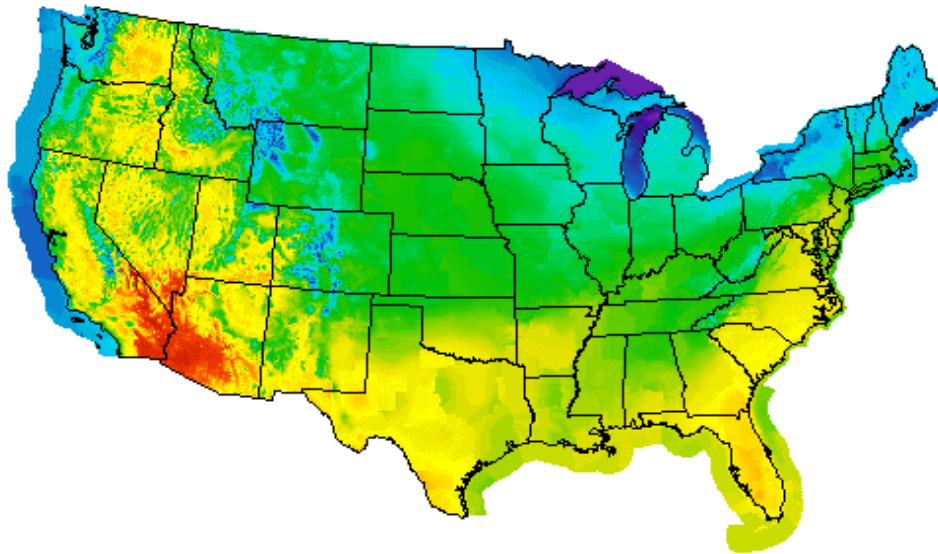
SPC Reports vs. TOR/SVR Warnings 5/30/2004



These kinds of displays enable a quick analysis of performance as well as the opportunity to do more complex analysis for computation of scores that can show historical trends of improvement in issuing warnings.

4. National Digital Forecast Database (NDFD)

Another major undertaking for the NWS is the construction of the National Digital Forecast Database (NDFD). The database consists of forecasts of several sensible weather elements covering the entire country. The spatial resolution of the database is at least 5 km, with upgrades to higher spatial resolution planned. The temporal resolution of the sensible weather elements varies, with the highest resolution available currently being 3-hourly. The sensible weather elements available in the NDFD include fields such as temperature, dew point, probability of precipitation, and wind speed and direction. Further information about the NDFD, including current graphical depictions similar to the sample shown below, can be obtained at: <http://www.nws.noaa.gov/ndfd>.



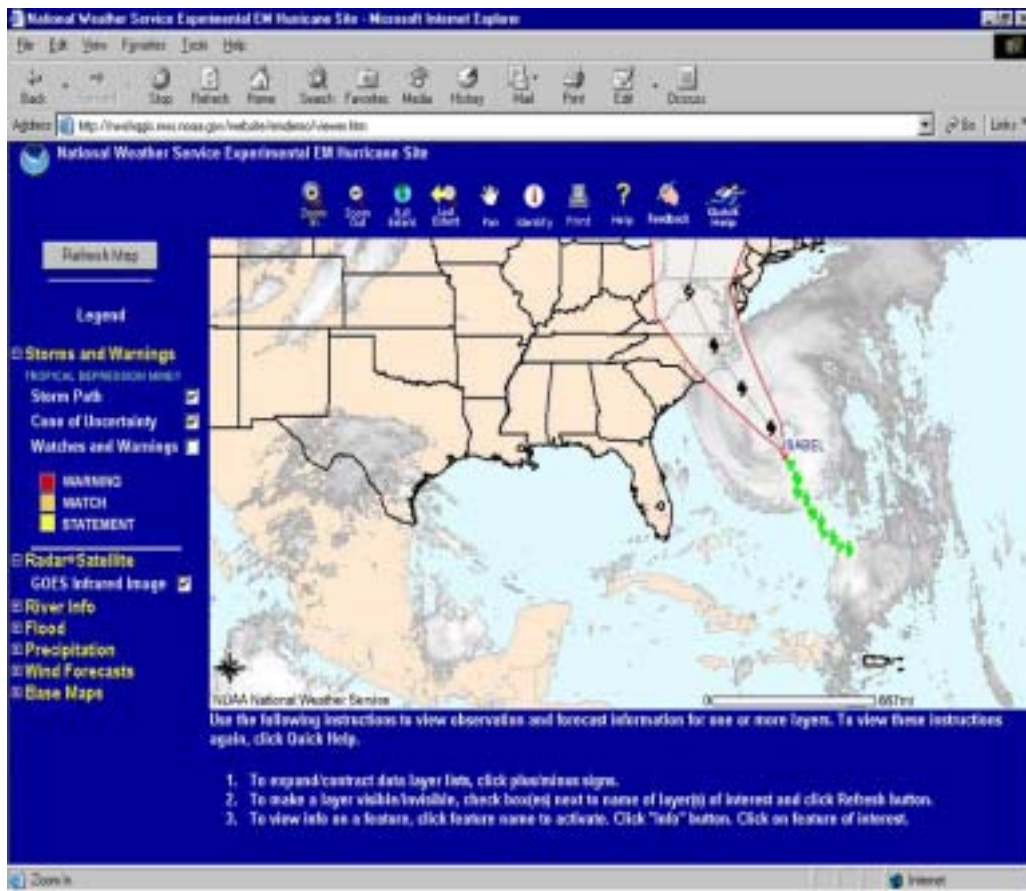
High Temperature(F) Ending Fri Jun 25 2004 8PM EDT
(Sat Jun 26 2004 00Z)



National Digital Forecast Database
Experimental graphic created 06/25/2004 4:38PM EDT



Initial efforts have begun to incorporate portions of the NDFD into prototype NWS Internet Mapping Services. One such prototype was run during the hurricane season of 2003 for the southeast U.S. This prototype (see image below) was coordinated with local and regional emergency managers and included NDFD forecasts of wind speed as well as near-real-time information from NWS weather satellites and river gauges. The prototype was well received. The NWS looks forward to making use of Internet Mapping technology to modernize its dissemination of weather information and to enhance its mission delivery by providing access to our products in formats that better meet the needs of our users, especially with emergency managers—our key partners in protecting life and property.



5. Weather Enterprise and GIS Partnering Efforts

Lastly, the NWS has become a participant in the Atmospheric Special Interest Group (http://www.gis.ucar.edu/sig/sig_homepage.htm) that brings together both users and developers of GIS data to try to develop a data model that could be used for incorporating atmospheric data into GIS platform processing. This group is looking at some of the unique qualities of weather data that differ from other existing GIS data formats such as the importance of the added dimensions of time and vertical space that meteorologists are accustomed to working with.

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