

Ken Waters
National Weather Service, Pacific Region Headquarters
Honolulu, Hawaii

1. INTRODUCTION

For many years, the National Oceanic and Atmospheric Administration’s (NOAA) National Weather Service (NWS) has issued warnings such as tornado and severe thunderstorm for entire counties at one time. Recent software enhancements, however, now allow NWS forecast offices to issue warnings using free-form graphical outlines. These outlines are translated to counties for the use of legacy dissemination systems such as the NOAA Weather Radio. However, the use of these outlines, or polygons, provides much more information to the public about the location and direction of movement of the severe weather. This new use of polygons to define weather location is an important enhancement for the NWS and lends itself well to be used in Geographic Information Systems.

A mechanism has been devised to capture this polygon information off of the text warnings issued by NWS and database the information. These polygons are then converted in near-real-time into shapefiles that can then be read into Geographic Information System (GIS) applications. This paper describes the process that creates these shapefiles and shows sample output from the 2003 storm season.

2. BACKGROUND

Severe weather warnings issued by NWS are typically issued for individual counties. Graphics of these warnings are now being produced by the NWS for Internet dissemination (Figure 1). The counties are encoded using a form of the Universal Geographic Code (UGC) (see <http://iwin.nws.noaa.gov/emwin/WINUGC.HTM>) and the codes are included in the text warning message that is disseminated. This code uniquely identifies the state and county or counties that the warning is valid for. These codes can then be used by automated systems such as the Emergency Managers Weather Information System (EMWIN) and the NOAA Weather Radio system to highlight specific counties being warned for.

This method poses a problem due to the varying sizes and shapes of counties in the United States. In some cases, especially in the southwestern U.S., counties can be quite large.

A warning for some of these large counties might really be focused on just a small portion of the county. However, due to the county-based warning system, all of the county becomes part of the warning. This also causes NOAA Weather Radios that use the Specific Area Message Encoding (SAME) system to activate for all parts of the county.



Figure 1: An example of warnings issued by forecast zones and counties.

3. USE OF POLYGONS

Recently, WARNGEN, a new software tool, has been used by NWS Weather Forecast Offices to issue severe weather warnings such as tornado, severe thunderstorm, and flash floods. WARNGEN, as part of the Advanced Weather Interactive Processing System (AWIPS), allows warnings to be defined as polygons with latitude-longitude pairs used to define vertices of the polygons. This has the great advantage of allowing NWS meteorologists to create warnings that define the precise area of concern, rather than be confined to predefined counties and zones.

To date, however, NWS does not have any dissemination methods that can take advantage of this new and valuable information. Since the late 1990’s this information has been coded at the end of severe weather warnings. However, to get the full value of the polygon warning definitions, users have had to manually plot up the latitude-longitude points on a map to determine the precise warned area.

This is where the use of GIS systems can be quite valuable. GIS technology can allow users to overlay weather information such as warnings over other geographic themes of importance such as roads, county

* Corresponding author’s address: Ken Waters, National Weather Service, 737 Bishop St., Ste. 2200, Honolulu, Hawaii 96813 e-mail: ken.waters@noaa.gov

lines, and cities. To achieve this, though, these warning polygons must first be converted into a GIS-friendly format such as shapefiles.

4. DATA CONVERSION

A system was set up at NWS Pacific Region to capture NWS severe weather warnings and database the polygon information. Data extracted from the text warnings as received over AWIPS include the start and stop times for the warning, the UGC's for the affected counties, and the polygon information. Another program, written in the Perl scripting language, updated the database each minute, removing expired warnings and adding newly-issued warnings. At the same time, the polygon information for all issued warnings is written to a text file that is used for input for the creation of shapefiles.

After much searching on the Internet, a software tool was found that can convert text files of a specific format into shapefiles. This application, 'gen2shp', greatly simplifies the process and eliminates the need to write format-specific software that can write files in the needed format.

All NWS warnings have been databased since February 2003 and real-time shapefiles are being produced and uploaded to the Internet at regular intervals. An example of a graphic showing the NWS warnings issued in February and March 2003 is shown in Figure 2.

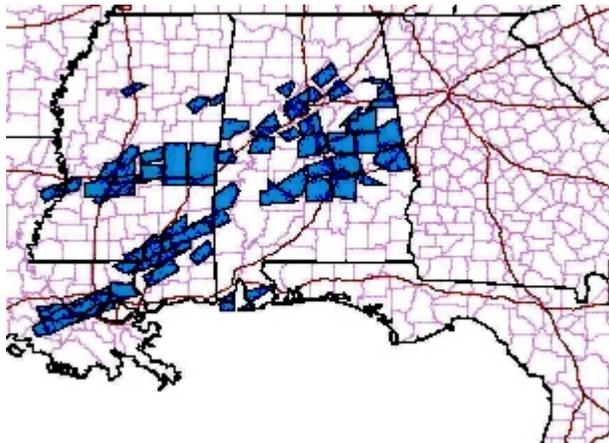


Figure 2 - Polygons depicting NWS warnings issued Feb-March 2003.

5. FUTURE PLANS

The depiction of NWS watches and warnings in a GIS format is an important step in the agency's plans to take advantage of new technologies to disseminate information. It is hoped that shapefiles of these data can be used along with other NOAA observational data such as radar imagery, satellite imagery, and forecast data from the National Digital Forecast Database, in GIS-ready applications such as an Internet Mapping System, to better serve NWS customers.

6. REFERENCES

National Academy of Sciences, "Fair Weather: Effective Partnerships in Weather and Climate Services", 2003

