EMERGENCY PREPAREDNESS AND TOURISM: BOTH WIN WITH HELP OF THE AMATEUR METEOROLOGIST

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Abstract

Weather is an important aspect of tourism. Ample snow and cold are needed for cross country skiing while beach-goers prefer the other extreme. In both cases individuals seek information about the weather in order to prepare for a recreation experience. The amateur weather hobbyist can serve that need. These individuals establish a home weather station in the backyard. The opportunity then arises, how can this weather data get to the end user – the tourist? This paper examines the potential of using the Internet to link all of these amateur weather stations in order to provide a more complete picture of our atmosphere. In addition to the interest by tourists, emergency preparedness agencies gain valuable information from this data.

Keywords: Hobbyist, partnerships, emergency preparedness.

1.0 Introduction

The fall 2004 Atlantic hurricane season was one the most severe in recent times. Several named storms caused considerable damage and loss of life in the Caribbean and Gulf States. What became apparent was the role of amateur meteorologists in alerting the public about the advancing rain and wind. Just like the Amateur Radio operator has helped emergency preparedness, this new network of weather stations staffed by hobbyists can do the same (Gagnon 2000). Weather volunteers serve that need by filling in the gaps of weather coverage across the nation (Gnatek 2004).

Serving the needs of a hungry population starved for current weather data, these hobbyists do their duty by maintaining a weather station in their backyard or rooftop and broadcast that data to the world via the Internet. Even the popular press has recognized the importance of this hobby and offers instruction for the amateur meteorologist in the process (Williams 2004). Weather is so ingrained in our daily lives that it links individuals by some common interest. Weather is something someone will talk about while waiting in line at the grocery store or in a casual conversation with an acquaintance. We may comment on the temperature (e.g., too hot or too cold), precipitation (too much or not enough) or other atmospheric variables (wind, clouds). It is this casual component of weather that links us all and has fueled interest in collecting weather data and then broadcast this information to a demanding citizenry.

Taken to the extreme, weather enthusiasts may risk life and limb to experience first hand a hurricane or tornado. In fact a brand new form of tourism was born from the interest in chasing tornadoes. See Bristow and Cantillon's (2000) study of tornado chasing tours in the American Midwest. Weather attracts people beyond a casual interest. Yet in even more tranquil environments, the tourist wants to know if it might rain or not during a vacation.

1.1 History

Organized efforts in linking the hobbyist and the nation's demand for weather data is not new. The National Weather Service created the Cooperative Observing Program (COOP) to meet such a demand. The COOP is a nationwide weather and climate monitoring network for nearly 12,000 volunteers maintaining a 24/7 vigilance. Temperature and precipitation (including snowfall) are the basic data collected. Its roots can be traced to Thomas Jefferson who had envisioned the nation would be covered by weather observations with at least one person per county (COOP 2000).

So what is the Cooperative Observing Program? The Cooperative Observing Program has long history of service in the United States. The COOP serves two goals: (1) provide daily data usually maximum and minimum temperature and 24-hour precipitation totals) required to define the United States climate; and (2) provide real time data support the National Weather Service (NWS) in areas of forecasts and warning.

Specifically a cooperative station is a site at which observations are taken by volunteers. Actually there may be some automatic stations providing this service as well. While Cooperative observers may serve on either a paid or unpaid basis, the services frequently consist of taking and recording temperature and precipitation daily and reporting to the National Climatic Data Center or an NWS office at the end of each month (Citizen Weather Observer Program 2004). The United States is not alone in the volunteer weather data collection. In the United Kingdom, amateur meteorologists can visit the Met Office at http://www.meto.gov.uk/bookshelf/observations/index.html to learn how they may join the effort in that country.

1.2 Current Situation

Weather forecasting and hobbyists have grown hand in hand in the last decade. Notess (1994) summarized the advancing linkages that the World Wide Web provided in connecting the weather data resources at universities of the world together. This early information was crude by today's standards, although the tabular data and raw satellite imagery was essential for the professional meteorologists and early weather enthusiasts alike. This early taste of world wide weather data is akin to the anticipation phase of the recreation experience (Clawson and Knetsch 1996). That is, any advance information about the weather could inspire a traveler to take a sweater or umbrella on the next trip. It might even deter a tourist from the trip, should the current or predicted weather conditions be viewed as not so conducive for the planned experience. A contemporary example of this is best illustrated by travel cancellation insurance. Imagine planning a trip to southeast U.S. or the Caribbean during hurricane season; it is best to plan that trip a few days in advance due to the likelihood of tropical storms. And this information is all made possible for the tourist via the Internet. Bristow (1999) noted that the information found on the web might actually increase or decrease tourism based on the type of information found about the destination.

The downhill skier will be interested in current weather conditions as much as the number of operating lifts. It is for this reason that we find weather information on ski resort websites, often linked with live cams of the slopes. This paper illustrates the usefulness in providing a more complete coverage of weather observatories managed volunteers. The weather hobbyists have the potential to help citizens during times of extreme weather. During periods of relative calm, this information could serve the need of tourism by providing that same expanded coverage.

2.0 Methods

The National Weather Service's Cooperative Observer Program is a partnership between the nation's weather observing network and more than 11,000 volunteers who take observations on at farms, in urban and suburban areas, National Parks, seashores, and mountaintops. If we add the Internet and low cost electronic weather stations, the potential for expanding weather reports with a relative ease of access, blanket the nation. In order to understand the usefulness, an inventory of personal weather stations is mapped along with the official stations administered by the National Weather Service. Information about the personal volunteer stations includes location and types of weather data collected, including temperature, wind direction and speed, atmospheric pressure and rainfall. Additionally, the stations archive this data for future retrieval. The Weather Underground is encouraging more hobbyists to join the effort (Weather Underground 2004).

For the purpose of this analysis, Connecticut was selected. While Connecticut is a fairly uniform shaped area (rectangular), it was still necessary to collect weather data from the neighboring states of New York, Massachusetts and Rhode Island. With this additional coverage, our analysis includes atmospheric factors outside the political boundary since weather is not

dependent on administrative boundaries. The data were collected on 2 February 2005 and include temperatures for midnight, 0600 and 1200 (noon) local time (EST). See Figure 1 for the coverage in all of New England.

The location of the weather sites were geocoded on base maps of New England, referenced by the latitude and longitude. Using ESRI's ArcGIS software (ArcView 8.3) and geography data, the maps created show the distribution of the weather data sites in the region. Both official National Weather Sites and Personal Weather Sites are mapped. The Personal Weather sites were collected from the Weather Underground web site available at http://www.wunderground.com/. To create the isothermal maps (maps connecting areas of equal atmospheric temperature), the spatial analyst extension of the software employed interpolating to a raster image, then a kriging technique to create a surface map of weather temperatures for Connecticut. Kriging is a geostatistical technique for interpolation that uses information about the spatial autocorrelation in the vicinity of each point to provide 'optimal' interpolation (http://en.mimi.hu/gis/kriging.html).

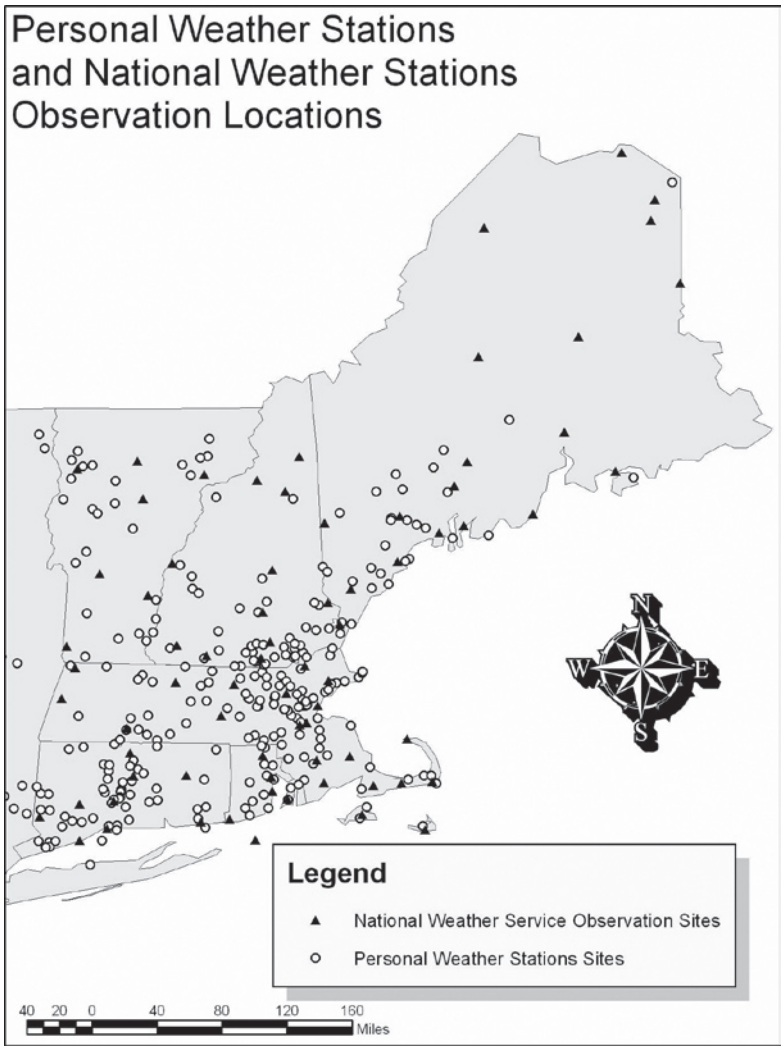

Figure 1.—Sampling Sites for data collected 2 February 2005.

3.0 Results

Compare Figure 2 and Figure 3. These maps represent the temperature data collected at 6 a.m. on 2 February 2005 at the National Weather Service's official sites and the Personal Weather Sites. For Figure 2, an isothermal map is shown using only the data from the National Weather Service sites. For Figure 3, our temperature map is generated from the Personal Weather Sites. Even the casual observer will note the additional data provided by the amateur sites. Based on our sample, the additional information provided by these volunteer meteorologists provide a more complete and accurate picture of the atmosphere. These data are useful for a better understanding of the microclimate of the area and may provide useful information for the tourist.

Figures 4 and 5 illustrate the variation at noon. Still the reader will observe the additional data provided by the more complete coverage of the personal weather sites. We note that local conditions may influence the ambient air temperature. This "Urban Heat Island" effect recognizes that the built up environment of our cities will contribute to higher temperatures than the surrounding countryside. Further we must recognize that elevation will mean that the hilly regions may experience lower temperatures than sea level stations. But what remains clear in our analysis is the increase level of detail offered by the increased coverage provided by the amateur enthusiasts.

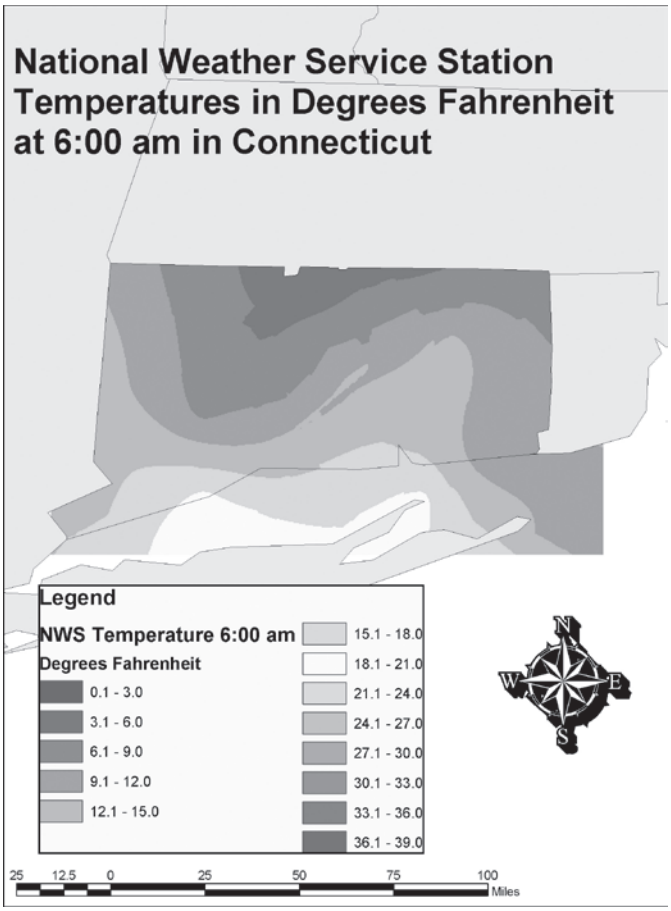

Figure 2.—National Weather Sites 0600 hours.

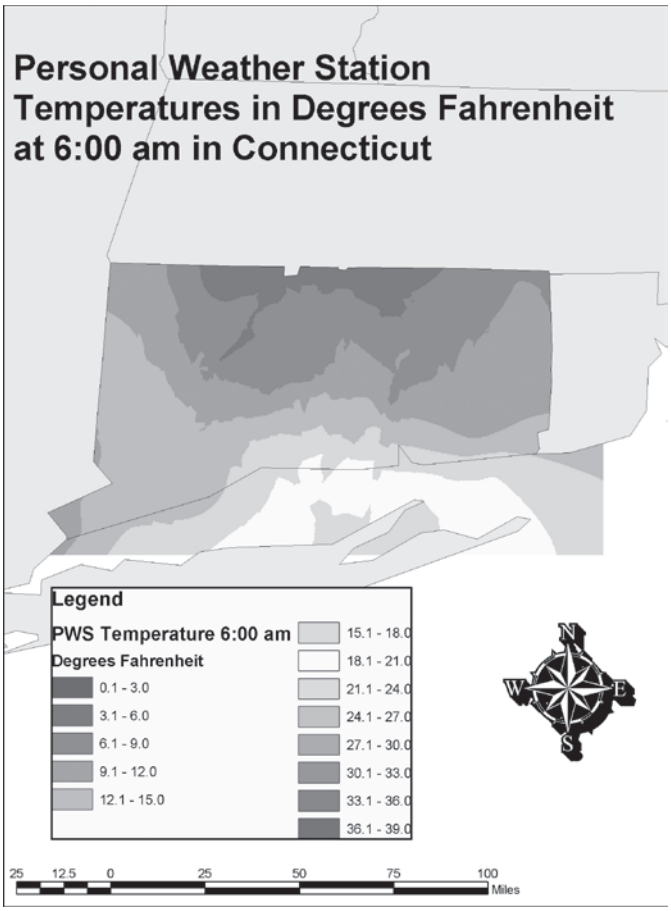

Figure 3.—Personal Weather Sites 0600 hours.

4.0 Discussion

The importance of linking these amateur weather stations can certainly be justified by any plan to address emergency preparedness. The private public partnership is not new in this arena. The American Red Cross has an active list of volunteers on-call and ready to serve. Ham radio operators will provide emergency communications. And the amateur meteorologist can provide through these internet links, the comprehensive coverage needed to supply the public with much needed atmospheric data.

Geographic Information Systems technology is certainly relevant for this kind of service. Johnson (2000) provides a useful background for emergency preparedness applications with a GIS. Linking weather monitoring stations, with the analytical techniques employed in GIS and broadcasting this information to the world on the web can serve multiple users, including the tourist.

A citizenry now demands 24/7 information and that includes the weather. Can you imagine telling the television viewers thirty years ago that a television network would be devoted to weather? Our insatiable hunger for weather, especially severe weather, will encourage future meteorologists to reach out even further. So for the tourist, during the calm between storms, if advance information can be help better plan a leisure experience, time and money can be saved.

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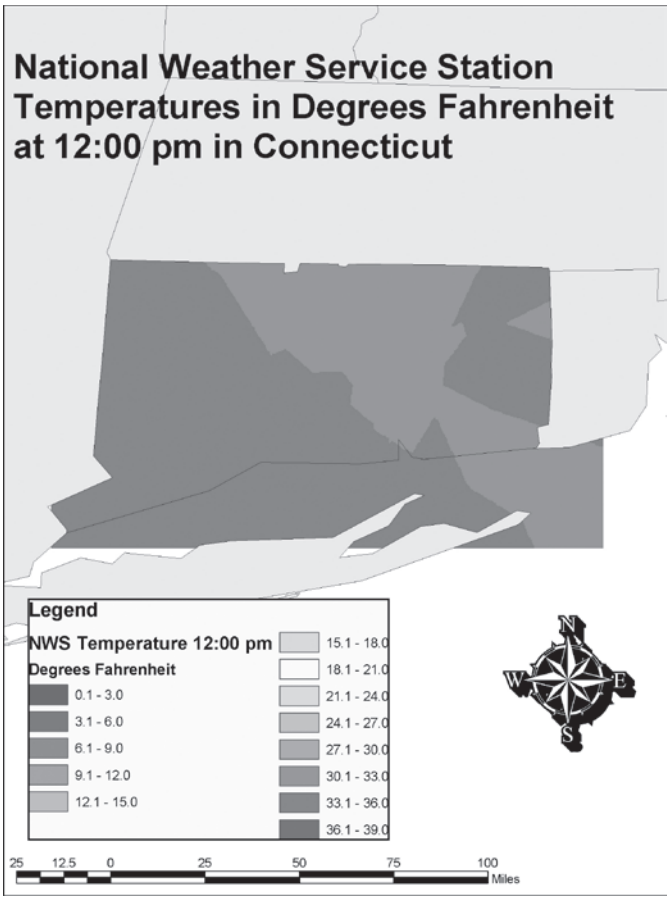

Figure 4.—National Weather Sites 1200 hours.

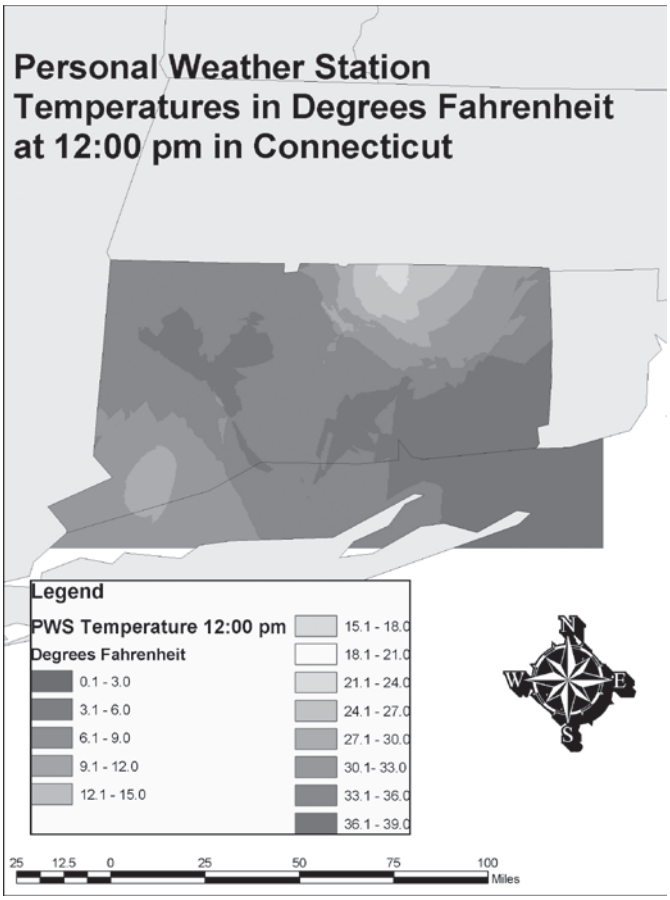

Figure 5.—Personal Weather Sites 1200 hours.

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