

APRSWXNET/CWOP - a beneficial partnership of NOAA, Amateur Radio, And Other Good Citizens

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Abstract

APRSWXNET/CWOP is a group of amateur radio operators and other citizens who have an interest in weather measurements and contribute those data to NOAA for important uses. This paper describes how the data is collected via packet radio and via the Internet. Where the data go and how they are used is also covered. Maps of the location of the data contributors for both packet radio and for the Internet are presented.

Key Words

Public service, meteorological data, citizen contributors, weather prediction, weather stations, amateur radio, citizen weather, packet radio, Internet

Introduction

Originally, APRSWXNET was a way to collect amateur radio weather data through the findu.com server and send them to the National Oceanic and Atmospheric Administration (NOAA) for research use by Forecast Systems Laboratory (FSL). The success of this effort and the amount of data routinely collected have led to use by other research labs and by operational parts of NOAA.

Currently, there are nearly 600 amateur radio operators who have sent data to NOAA through this system. Most of these are from home weather stations with suitable APRS programs generating digital data that a terminal node controller (TNC) interfaces to a radio. The radio sends weather data packets out on a frequency of 144.390 MHz and these data are repeated by APRS digipeaters and often received by APRS Internet Gateways. The packets are checked and then sent to the APRS IS (APRS Internet System). The findu.com server monitors the APRS Internet data stream and saves the data in a database. Every 15 minutes, the server assembles a file where each line represents the data from the last data packet from a particular station in that 15-minute period. The NOAA FSL Central Computer Facility acquires that file by anonymous FTP every 15 minutes. This arrangement has worked well.

Expansion to Citizen Weather

It became clear that the system and method of weather data collection from widely separated citizen weather stations was also applicable to persons not holding an amateur radio license if there was no radio transmission of the data into the APRS IS. If the user has internet capability (dedicated or dial-up) and can send properly formatted APRS weather data packets to any APRS server, those packets will get to the findu.com server and be available for routing to NOAA.

The available APRS programs interface with only a limited number of home weather stations. However, the Weather-Display program, written by Brian Hamilton of New Zealand, readily interfaces to almost all of the home weather stations currently available. In addition, Weather-Display was already finding use as a weather application under APRS programs. All that remained was to add the capability to connect to an APRS IS server as an unverified user, send a properly formatted APRS weather data packet, and then disconnect. This way of getting data to findu.com and on to NOAA can be used by both hams and non-hams alike.

The addition of citizen weather capability brought about a change in the name of the program. The original name of APRSWXNET was expanded to APRSWXNET/Citizen Weather Observer Program and this was shortened to APRSWXNET/CWOP. Many people have shortened this even further to CWOP. The program logo, developed by Dave Helms (CW0351), is shown in Figure 1.



Figure 1. Logo for APRSWXNET/Citizens Weather Observer Program.

Currently, (Aug 1, 2002) there are about 520 non-ham citizens who have expressed an interest and joined the group. The total membership is about 1100. However, these numbers are growing steadily as more citizens and amateur radio operators become aware of the activity. Membership lists and links to each of these members and their data along with much other useful information are given here,

<http://wxqa.com>

<http://dhelms.mystarband.net/cwop.html>

MADIS

The APRSWXNET/CWOP weather data contributed to NOAA goes to the Meteorological Assimilation Data Ingest System (MADIS), developed and operated by FSL. Information about MADIS is given on this web page,

<http://www-sdd.fsl.noaa.gov/MADIS/index.html>

Data of various types, including surface meteorological data, radiosonde data, profiler data, hydrologic data and automated aircraft data are acquired, quality checked and managed. The purpose is to add value and make them useful for data assimilation, numerical weather prediction (NWP) and other hydro meteorological applications.

The data collected through MADIS is subjected to hourly quality checks that indicate if a station produces data of questionable quality. This quality checking becomes very important when the primary use of the data is as input to NWP programs used for automated forecasting. Any ham or non-ham that contributes data to APRSWXNET/CWOP can view the quality checking results on an hourly, daily, weekly or monthly basis through this FSL web page,

http://www-sdd.fsl.noaa.gov/MSAS/qcms_messages.html

The main purpose here is to provide objective feedback to the station operator to indicate if a problem exists so that corrective or suitable maintenance actions can be taken.

Organizations can subscribe to receive parts or all of the MADIS data set, which is available via ftp or by using Local Data Manager (LDM) software available to university users. The access to the database has also been designed so that the data formats are entirely compatible with the NWS Advanced Weather Interactive Processing System (AWIPS). This means that the MADIS data set, and in particular the APRSWXNET/CWOP mesonet data are easily used, processed and displayed by the standard work station deployed at every NWS Weather Forecast Office.

Users of APRSWXNET/CWOP Data

The original goal was for the data to become part of the research data stream in FSL. Not only was this goal achieved, but also it was soon passed. The APRSWXNET/CWOP data were used with other mesonet data in high-resolution, short-term NWP research in FSL as well as in the National Center for Atmospheric Research (NCAR) supported by the National Science Foundation. In addition to these users, the mesonet data now go to the National Center for Environmental Prediction (NCEP) and to a number of NWS Weather Forecast Offices (WFO). A detailed explanation of how the APRSWXNET/CWOP data are used at the MelbourneWFO is presented here,

<http://www.srh.noaa.gov/mlb/ADASLDIS.html>

There are also other uses of the data carried out in a less structured way. For example, the Long Island Railroad uses the data to monitor the weather conditions along their routes. This is especially useful during the winter months. Also, the Lake Tahoe Fire Protection District uses the data for wildfire assessment. This is especially useful during the summer months. The point being that there is a wide range of uses for this data.

Identifying APRSWXNET/CWOP Stations

Member stations have three different means of identification in the APRSWXNET/CWOP database. First is the provider ID, which is a 5 or 6 character name starting with ap or CW (like apxxx or CWxxxx). The x indicates a number 0-9. A provider ID like apxxx indicates that the data is from a ham. A provider ID like CWxxxx can be for either a ham or a non-ham. The second means of identification is the NWS ID, which is a 5-character name like APxxx or Cxxxx. This identifies the station on the NOAA mesonet display and also identifies the quality checking results for each station. The third means of identification is call sign, which for hams is the call sign or alias that their data are carried under on the findu.com server. The call sign ID can also be CWxxxx for non-hams or for hams wishing to use it and is assigned when that person completes a sign-in process on findu.com.

The process of registering a station in APRSWXNET/CWOP starts with getting a “call sign”. For hams that want to be registered under their call, they already have this “call sign”, i.e. their ham call with or without a SSID attached. Others simply need to fill out an Internet form on findu.com and they will be assigned a CWxxxx “call sign” where the xxxx value is sequentially assigned. The registration process is to simply check on a findu.com map and verify that the plotted location is correct and send e-mail to chadwick@fsl.noaa.gov indicating that the location is correct. Then that call sign will be added to the list of stations which have their data transferred from the findu.com server to the FSL Central Facility every 15 minutes. The reason for this registration process is to ensure that the location for the weather data is correct. The station operator is the best person to verify the location of the station.

This registration process gives rise to three distinct classes of members. The first is of registered amateur radio operators who have sent data. The second is of citizen weather operators who have filled out a web-based form, sent in data, verified their location and registered their station. The third is of citizen weather people who have filled out the web form, may have sent data, but have not verified their location or registered their station. Maps for these three classes of members are shown in Figures 2, 3, and 4 below.

Acknowledgements

Many unselfish people have contributed in no small way to the ongoing success of this unique cooperative program. A list of those people would include Steve Dimse K4HG; Patty Miller FSL4; Mike Barth FSL4; Dave Helms NWSH; Dick Stanich KB7ZVA; Bill Diaz KC9XG; Brian Hamilton W-D; Joe Schmidt W4NKJ; Scott Stierle FSL3 and Joe Chadwick KB0TVK.

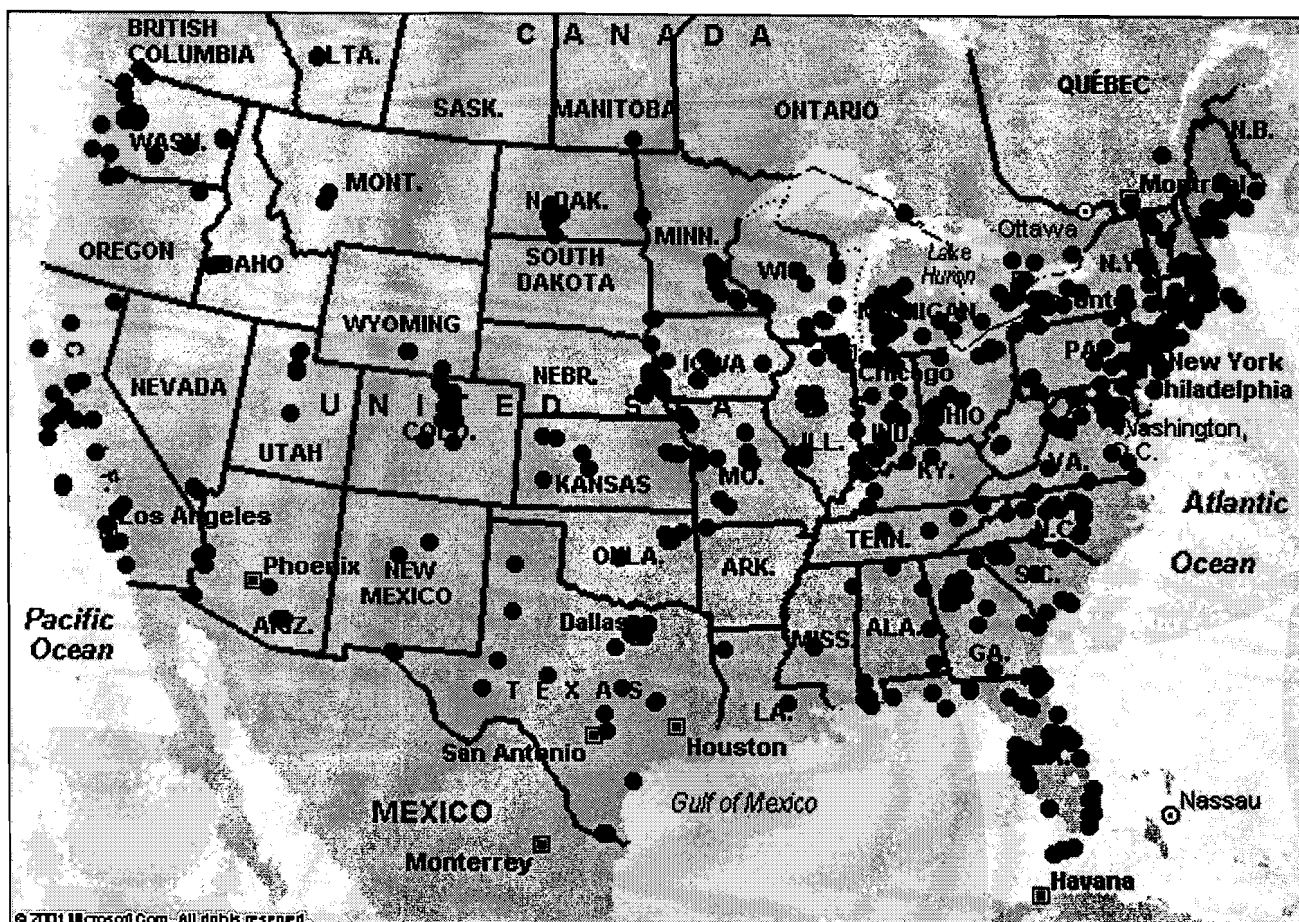


Figure 2. There have been nearly 600 amateur radio weather stations registered into the APRSWXNET/CWOP database. This map shows the locations of those near the contiguous United States. Each of these stations has or is contributing weather data to APRSWXNET/CWOP through the findu.com server and those data are being routed to NOAA.

To register an individual station, there must be reasonable weather data in the findu.com database. It is assumed that if an amateur radio operator has sent weather data to findu.com for more than a few days, then the plotted location must be correct. This map was created 01 Aug 2002.

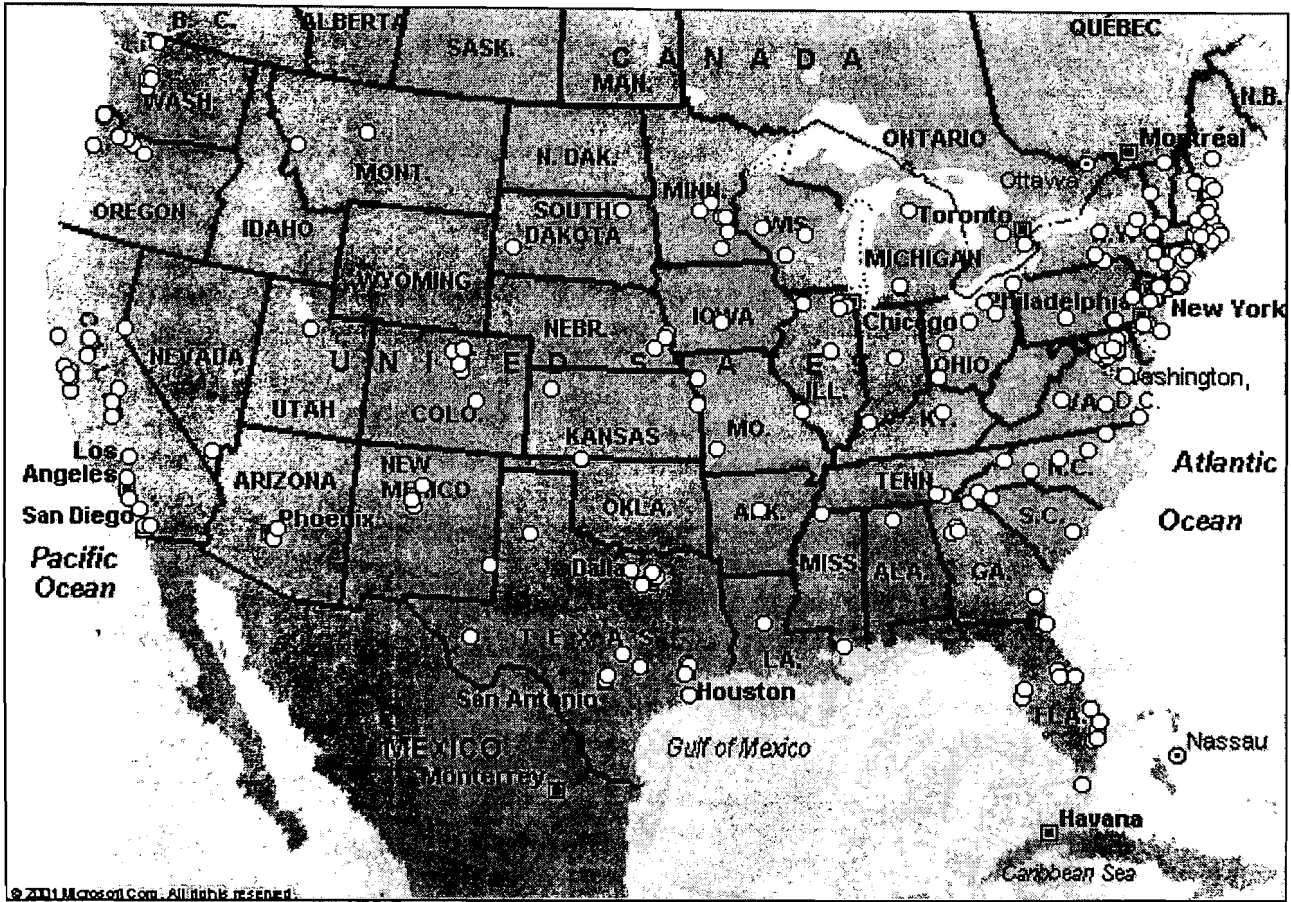


Figure 3. There have been over 600 persons (ham and non-ham) who have filled out a form on findu.com indicating an interest in APRSWXNET/CWOP. They have each been assigned a CWxxxx designator. Most of the hams decide to use their ham call sign rather than the CW designator.

This map shows the locations of the approximately 240 persons in the contiguous United States who chosen to use the CW designator, and have sent data to findu.com under that designator, then verified the location plotted on findu.com and have registered their stations with NOAA. This registration procedure (after they have sent in data under the assigned provider CW designator) safeguards against data being assigned to the wrong location. This map was made on 01 Aug 2002.

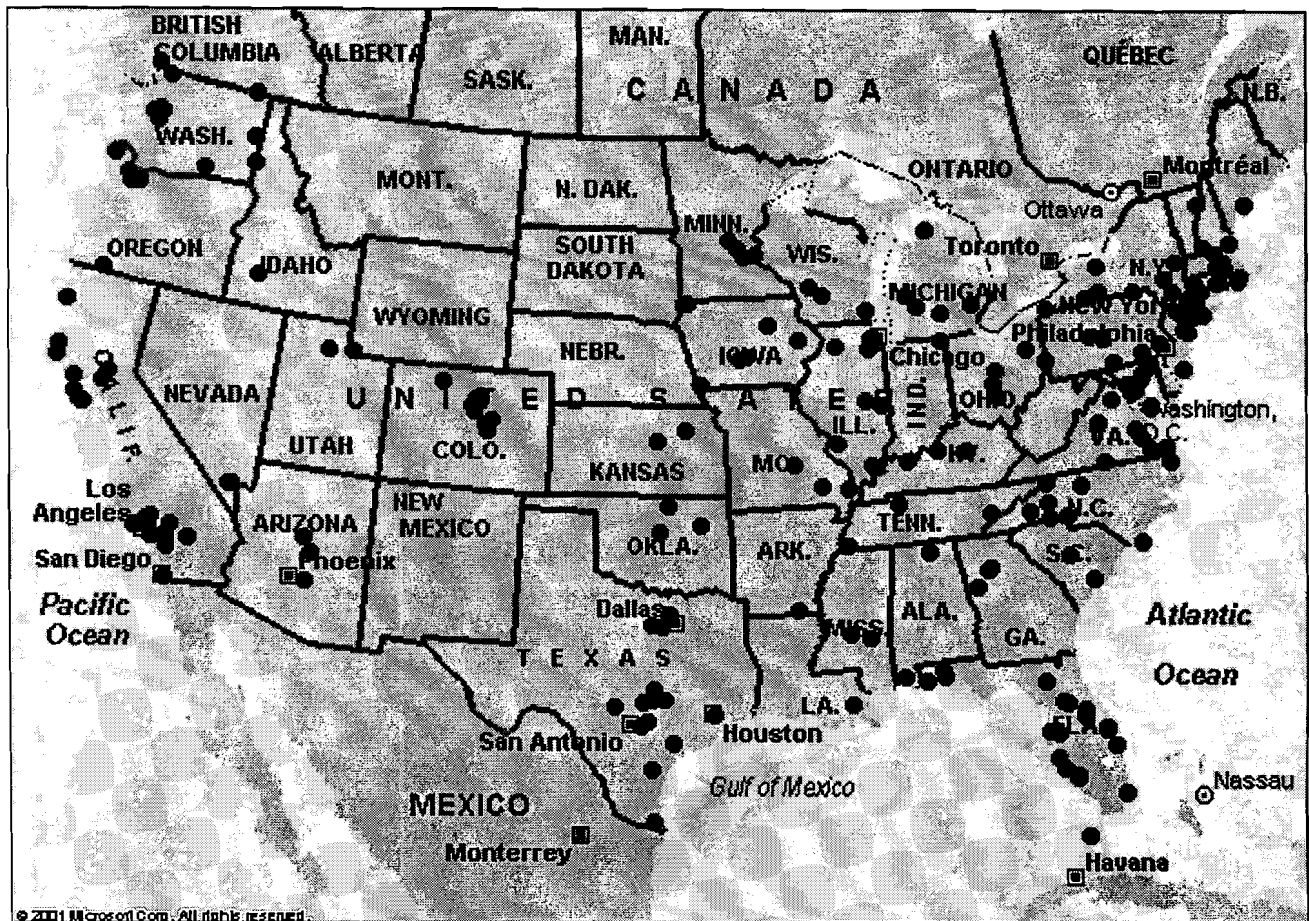


Figure 4. Of the over 600 persons (hams and non-hams) who have filled out a findu.com form, some are not heard from again. If e-mail to them bounces, they are removed from the APRSWXNET/CWOP database. Of the rest, some send in data and some don't.

This map shows the given locations of about 280 persons in the contiguous United States who have filled out the web-based form, possibly contributed data, but have not verified their location as given on findu.com. Some of these are operating stations contributing data, but the location associated with the data cannot be verified. None of the data from these stations are passed from findu.com to NOAA. These data are displayed on findu.com, but are not displayed on the NOAA mesonet web page and are not checked for quality. This map made 01 Aug 2002.