

Final Project Report to the NYS IPM Program, Agricultural IPM 2006

Title: NEWA (Network for Environment and Weather Awareness) 2006: A Year in Review

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Project location(s): all counties in New York, one in Pennsylvania. Website accessible internationally.

Abstract: NEWA operated and maintained the electronic weather network in 2006 with funding support from the NYS IPM Program. There are now 829 users in the NEWA database compared to the 512 users in 2005. As a result of continued free access, NEWA usage in 2006 is up over 400% compared to 2001. NEWA information delivery is multiplied via dissemination in Cornell Cooperative Extension Educator and private consultant newsletters and crop updates. The National Weather Service (NWS) provided weather forecasts and weather radar images. Improvements to the NEWA website spanned apple, tomato and potato pest forecast model information and a comprehensive NEWA Site Map was written. New in 2006, the Northeast Regional Climate Center (NRCC) prepared daily degree day forecasts for various base temperatures based on NWS max/min temperature forecasts. The NEWA network successfully transitioned to RainWise, Inc. instruments and installed, tested and supported their less expensive wireless weather station plus software for Internet delivery of data to the NEWA network.

Objectives:

- 1) Operate and maintain the NEWA electronic weather network.
Source new weather stations and data delivery.
- 2) Update the NEWA website and pest forecast models.
- 3) Tracking and promoting NEWA usage.
- 4) Collaborate with the Northeast Regional Climate Center.
- 5) Expand NEWA into Eastern NY.

Procedures, Results, and Discussion:

1. OPERATE AND MAINTAIN THE NEWA ELECTRONIC WEATHER NETWORK.

During the 2006 growing season, NEWA successfully maintained and operated the electronic weather network of 40 weather stations collecting and delivering data to server sites in Geneva and Canandaigua. In November, the Geneva server was upgraded and is now faster with greater capacity. In addition NEWA realized an 80% savings in telephone charges at the Geneva server site. Most NEWA weather stations provided data year-round and winter data was used for Stewart's wilt forecasts on sweet corn and to track low temperature in vineyards and apple

orchards. The year 2006 featured abnormally hot and wet conditions during the early part of the growing season, followed by cool and wet conditions later.

The network was operational on 100% of the days between April 1 and October 31, although five individual instruments experienced limited down time. Down time was usually remedied within one or two days of occurrence. NEWA personnel made over 65 visits for maintenance, troubleshooting, and repair in 2006. Thunderstorm activity continued to cause sporadic problems to the network. Lightning destroyed the instrument in Scriba, necessitating its replacement. Hobo weather monitors (Onset Corp.), purchased in 2005, were used to test and validate temperature and relative humidity readings of three weather stations.

In 2006, NEWA established information templates to keep records of maintenance and calibration history and descriptions of each weather station in the network. As National Weather Service (NWS) interest in weather mesonets, such as NEWA, increases, keeping records of this information, termed metadata, becomes a priority. As the NEWA network expands in size and scope, maintenance of metadata will be vital.

Source new weather stations and data delivery. NEWA completed the transition to RainWise, Inc. weather stations in 2006. The Field Monitor weather stations previously utilized in the network were manufactured by Sensatronics Co. However, Sensatronics stopped manufacturing the Field Monitor in 2004, though the company will continue to service existing NEWA Field Monitors. NEWA contracted with RainWise to customize their MK III SP2 with a leaf wetness sensor (critical for disease forecasting models) and to create and debug software for NEWA-compatible data output matching the programmed output from the Field Monitors. These NEWA RainWise weather stations will collect and deliver air temperature, relative humidity, precipitation, leaf wetness, wind speed, wind direction, solar radiation and barometric pressure.

Each MK III SP2 weather station is powered by solar energy and relays data to a receiver via radio wave, eliminating the danger of battery failure and vulnerability to lightning, respectively. Radio frequencies transmit data up to either 400 ft or 7 miles distance (line of site). RainWise created software to automate FTP data delivery to the NEWA server directly from the growers' computer over the Internet. An obstacle to FTP delivery from growers' computers is lack of broadband Internet access. A work-around that RainWise is working on is a scheduling program that would connect their computer to the Internet at scheduled intervals. For locations without computer or Internet access, weather data can be sent via modem to the NEWA server. RainWise is proving to be an important collaborator and other possibilities for collecting and delivering data from their instruments are being investigated (i.e. satellite link).

An MK III SP2 weather station was installed and tested in Sodus, NY. Installation was straightforward and software set up was equally easy. The software has a component to download real-time weather data to the grower's computer and archive and display that data. The second component is an FTP client set up to deliver weather data to the NEWA server at predetermined time intervals daily. The new equipment and FTP software in Sodus, NY performed well in the first season. Except for an occasional grower computer lockup, Internet outage or radio interference, data delivery was reliable. A second wireless MK III SP2 weather

station was installed during summer to replace a Sensatronics unit and more wireless units will be installed this winter, see Objective 5.

2) UPDATE THE NEWA WEBSITE AND PEST FORECAST MODELS

The weather data collected into the NEWA servers was summarized daily and used to operate pest forecast models for potatoes, onions, apples, grapes, cabbage, sweet corn, and tomatoes and to calculate degree-day accumulations for several base temperatures using different degree-day formulas as needed by the stakeholder groups. The National Weather Service (NWS) provided forecast information, weather radar images, and other products useful to growers. Links to new NWS products are added to the NEWA website as they become available. In 2006, NEWA continued to provide degree day forecasts based on NWS max and min temperature forecasts, in collaboration with the Northeast Regional Climate Center (NRCC), see Objective 4.

NEWA assisted with the maintenance of the apple scab Ascospore Maturity Degree Day Model and Cougar Blight fire blight forecast model for the plant pathology Tree Fruit and Berry Pathology website. These forecasts continued although the faculty member had left the position. Complete instructions on how to update the system on an annual basis were developed. Apple scab Ascospore Maturity Degree Day Model changes were also implemented this year in collaboration with David Gadoury, Plant Pathology, such that ascospore maturity stops progressing after seven consecutive rain-free days accumulate; maturity continuing again after the next rain. The Fire Blight Degree Hours table was posted on a separate web page at <http://newa.nysaes.cornell.edu/apples/fireblight.htm>. An Apple Leaf Wetness Periods page and a leaf wet and dry log was improved to meet the apple scab information needs of NEWA users.

A tomato and potato seasonal log was developed and tested on both the Canandaigua and Geneva servers. These logs are under continuous construction and improvement. A new Tomcast model iteration using relative humidity as well as leaf wetness data was placed in NEWA for field testing under New York conditions prior to full deployment in NEWA. Tomcast use was down in 2006 because of the increasing prevalence of bacterial diseases in tomato production fields. Limited field testing suggested the new version would accrue fewer disease severity values than the current Tomcast model requiring growers to tolerate higher risk. Therefore, full deployment will be delayed to allow further testing of the model.

The programmer who developed the weather database that runs the grapevine downy mildew forecast, DMcast and the NEWA Degree Day Calculator left his position. NEWA personnel met with the programmer for instructions so that maintenance of the weather database continued after his departure. The Degree Day Calculator and Apple Pest Degree Day Calculator were updated for 2006 and debugged.

A comprehensive document mapping the entire NEWA website was written in 2006. The "NEWA Site Map" 57-pg-long manual provides a summary of all the links contained on the NEWA web site and will be used to identify and update dead links. This Site Map will also lay the foundation for transition to a database-driven system and website, as per the Spider Graphics web plan that was developed in 2005.

3) TRACKING AND PROMOTING NEWA USAGE

Since May 29, 2002 access to the NEWA website, weather data, and pest forecasts has been provided free of charge, courtesy of the NYS IPM Program with funding from the NYS Department of Agriculture and Markets. Announcements about free access to NEWA were again placed in local Extension newsletters. NEWA usage continued to increase in 2006 (Table 1 and Figure 1).

Table 1. NEWA web hits for 2001, 2002, 2003, 2004, 2005, 2006. In May 2002 NEWA access fees were eliminated (*). No data is available for January 2005 (na).

Month	2001	2002*	2003	2004	2005	2006
January	791	1960	3131	6260	na	9083
February	1891	769	3515	2986	11535	6182
March	1860	2330	2933	2695	6697	8633
April	3022	4272	3967	5902	8341	15305
May	6105	9432	9533	9969	14759	14084
June	4940	11323	9286	8810	11422	12848
July	5082	6472	6934	7590	10542	11434
August	3592	5309	5846	6371	9899	10708
September	1853	4469	4060	4627	8515	10044
October	1428	3240	3104	3423	9028	9034
November	1040	1895	2776	3296	9151	5649
December	636	1420	2088	4210	7438	6662
Total	32240	52891	57173	66139	107327	119666

NEWA usage was up, on average 5%, for the months of February to December, in 2006 compared to 2005. NEWA hits have increased over 400% since the elimination of fees (comparing 2001 to 2006).

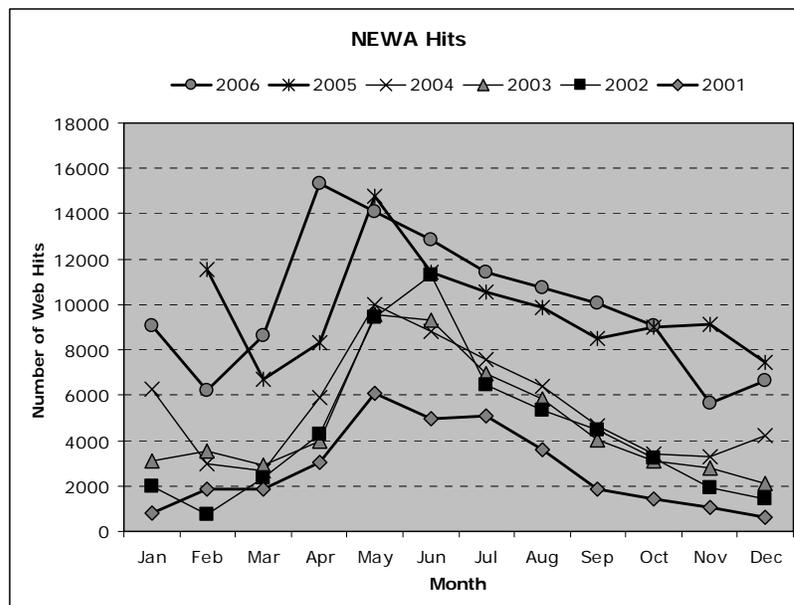


Figure 1. Number of web hits to the NEWA website for the years 2001 to 2006. In 2002 NEWA access fees were eliminated. No data is available for January 2005. Peak NEWA usage occurs in April, May & June.

Perhaps a more important statistic for 2006 was the increase in NEWA users from 526 to 829. New users continue to sign up and fill out a brief questionnaire. NEWA users consisted of growers, processors, homeowners, Extension faculty and field staff, consultants and students.

NEWA weather and pest forecast information is also redistributed in several newsletters, which reach many farms. IPM projects conducted in 2006 used NEWA data and informed growers on how to access and use NEWA data on their farms. A very wet year precluded monetary savings on spray applications but allowed growers to see the relationship between weather and disease and insect development as forecast by NEWA.

At various meetings talks were given describing NEWA, the new RainWise weather instruments and details on how to use pest forecasts in potatoes, onions and apples (Table 2), reaching an estimated 385 people. Documents describing the RainWise MK-III weather instruments and associated NEWA connection requirements were circulated to growers and Cornell Cooperative Extension (CCE) Educators.

Table 2. Presentations on NEWA given during 2006 by John Gibbons, on vegetables, and Juliet Carroll, on fruit.

Date	Title	Location	Audience	#
Feb 22	Utilizing NEWA Information to Inform IPM Intervention	Hudson Valley Fruit School, Kingston, NY	Apple growers, CCE Educators & Faculty	130
Mar 7	Utilizing NEWA Information for Informed IPM Intervention	NE NY Fruit School, Lake George, NY	Apple growers, CCE Educators & Faculty	80
Apr 4	Delivering Weather-Related IPM Information To Fruit Growers Via The NYS IPM Program's NEWA System	National IPM Symposium, St. Louis, MO	Educators & researchers	25
Jun 29	Description of Weather and Pest Forecast (Onions and Potatoes) Available On NEWA and Description of New Weather Equipment	Twilight Meeting on Muck Vegetable Pest Control, Potter, NY	Onion & potato growers, consultants CCE Educators & Faculty,	20
Jul 11	Description of Weather and Pest Forecast (Onions and Potatoes) Available On NEWA and Description of New Weather Equipment	Onion Council Tour	Onion growers, consultants, CCE Educators & Faculty, industry rep's	50
Oct 24	Utilizing NEWA Weather Information for Informed IPM Intervention	Fruit Pest Management Meeting, Burlington, VT	Extension & research faculty and staff, and consultants	80

4) COLLABORATE WITH THE NORTHEAST REGIONAL CLIMATE CENTER.

In 2006, the Northeast Regional Climate Center (NRCC) continued to provide links to evapotranspiration (ET) maps, degree-day maps, daily ET readings, and a seasonal log was prepared and displayed on the NEWA website. NRCC data is compiled from information provided by airport observations and the Cooperative Observer Network. The NRCC also provided a NY map showing the Stewart's Wilt forecast for 2006. Automated degree day forecasts were provided by NRCC in 2006, based on data from NWS forecasts. Maximum and minimum NWS-forecasted temperatures were run through degree day model algorithms for six base temperatures and a text document was emailed to NEWA for posting on the NEWA website. The degree day forecasts were available daily for various weather station locations in the region. These forecasts had been done manually by NEWA staff in prior years. We met with

Keith Eggleston, Regional Climatologist, and Arthur Degaetano, Associate Professor, NRCC, to discuss NEWA weather data archives, other possible applications, and the potential for future collaborations. We plan to explore these more fully in 2007.

5) EXPAND NEWA INTO EASTERN NEW YORK

NEWA expanded its network into Eastern NY apple orchards with four installations in this region in 2005. The biggest challenge is to trouble-shoot, as needed, the weather stations and network connections in this region, given its distance from Geneva, NY. Expansion was funded through a NE Regional IPM grant and a NE SARE grant. Full reports for each of these grants will be included in the 2007 NYS IPM Reports. One of the sites used an existing Sensatronics Field Monitor. The other three installations used industrial weather stations manufactured by RainWise, Inc. Two of the apple growers are in the Hudson Valley and two in NE NY. Five additional apple growers will cooperate on the project with weather station installations going in this winter using the MK III SP2 RainWise weather stations.

The projects' goal is to support weather-based IPM practices for eight major apple pests using the weather information that NEWA provides. Growers have purchased weather stations with help from the grants and connected to NEWA. These growers collect insect trap catch data and orchard phenology information for the various model biofix dates. Cooperating growers are learning how to use NEWA, source weather data, interpret weather data and pest forecast models, and integrate weather data with scouting and monitoring to improve IPM practices. The outreach plan will target all other apple growers in Eastern NY who will benefit from the expansion of NEWA into their region.

PUBLICATIONS

Carroll, J., Fargione, M. and Iungerman, K. 2006. Delivering weather-related information to apple growers via the NYS IPM Program's NEWA system. 5th National Integrated Pest Management Symposium, St. Louis, MO.
<http://www.ipmcenters.org/IPMsymposiumV/posters/006.pdf>