NEWA (Network for Environment and Weather Applications) 2013: A Year in Review

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Abstract: The Network for Environment & Weather Applications (NEWA) conducts onsite environmental monitoring and transmits weather data to NEWA's servers which automatically calculate and provide tabulated weather data summaries, degree days, and IPM forecast model results for 26 insects and diseases. Weather stations transmitting to NEWA via RainwiseNet have access to Rainwise features including graphing weather parameters and frost alarms. Sensatronics modem-connected stations were phased out saving $1500 in operating costs, but leaving poor coverage in the Keuka Lake vineyard region. NEWA is funded largely through fees from expansion networks in Massachusetts, New Jersey and Vermont. Pennsylvania joined in 2013. NEWA now has 249 station locations. In 2013, Rainwise AgroMET weather stations were improved to allow for plug-in of additional sensors and cellular modem communications. In NY, 11 presentations on NEWA were given, reaching over 1,000 people. The apple thinning and irrigation models were implemented in NEWA and this has greatly increased interest from apple growers to get weather instruments connected to NEWA. Data quality control messaging was implemented to alert people about station outages longer than 24-hours.

Objectives:
1) Operate and maintain the NEWA electronic weather network.
2) Track and promote NEWA usage.
3) Update the NEWA website and pest forecast models.
4) Collaborate with the Northeast Regional Climate Center (NRCC).

Procedures, Results, and Discussion:

1. OPERATE AND MAINTAIN THE NEWA ELECTRONIC WEATHER NETWORK.

Data transmission to NEWA. The modem-connected weather stations, primarily obsolete Sensatronic instruments, and associated phone lines were phased out on December 31, 2013. Nine weather stations remained in 2013 that were being called daily via modem to download data. Of the nine stations, Barrington, Branchport, Pulteney, and Waterport were disconnected by owner choice; Chazy (Grower), Gainesville, Geneva, Watkins Glen, and Williamson (Motts) will continue with either internet or cellular data delivery systems. This phase-out has left a large gap in climate data coverage in the Keuka Lake vineyard region.

In 2013, most weather data was retrieved from the weather equipment using the IP-100 interface. This device transmits data to Rainwise servers via the internet which then make the data available to the NRCC servers via RainwiseNet. Data is housed in two locations. NEWA personnel have made fewer maintenance and trouble-call field visits due to implementation of the IP-100. Most visits made to the field were to assist with station installations or to maintain IPM owned instruments. The IP-100 data transmission device has greatly improved trouble-free weather data transmission to NEWA servers. Assistance with weather stations is frequently accomplished via email.

Many NEWA station owners have upgraded to the IP-100, but some continue to use the FTP system which logs data to their computer. New from RainWise in 2013, is a cellular modem equipped instrument which can be stationed anywhere . there is cellular communications. RainWise manages the cellular connections making for easy installation at the growers site.

The RainwiseNet website allows growers to access their weather information at a second location and push data to other weather networks, such as Weather Underground. New applications are being developed by Rainwise for RainwiseNet, including the ability to create graphs (Fig 1) and set alarms (Fig 2) for monitoring weather conditions, such as frost.
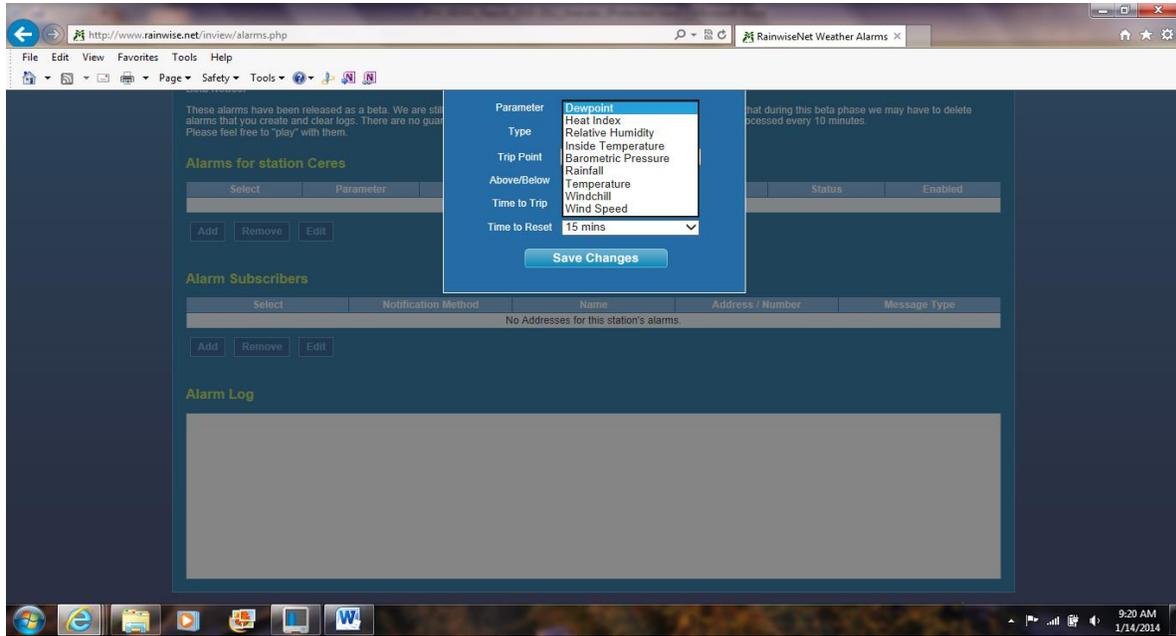

Figure 1. Expanded features on RainwiseNet – Weather Alarms.
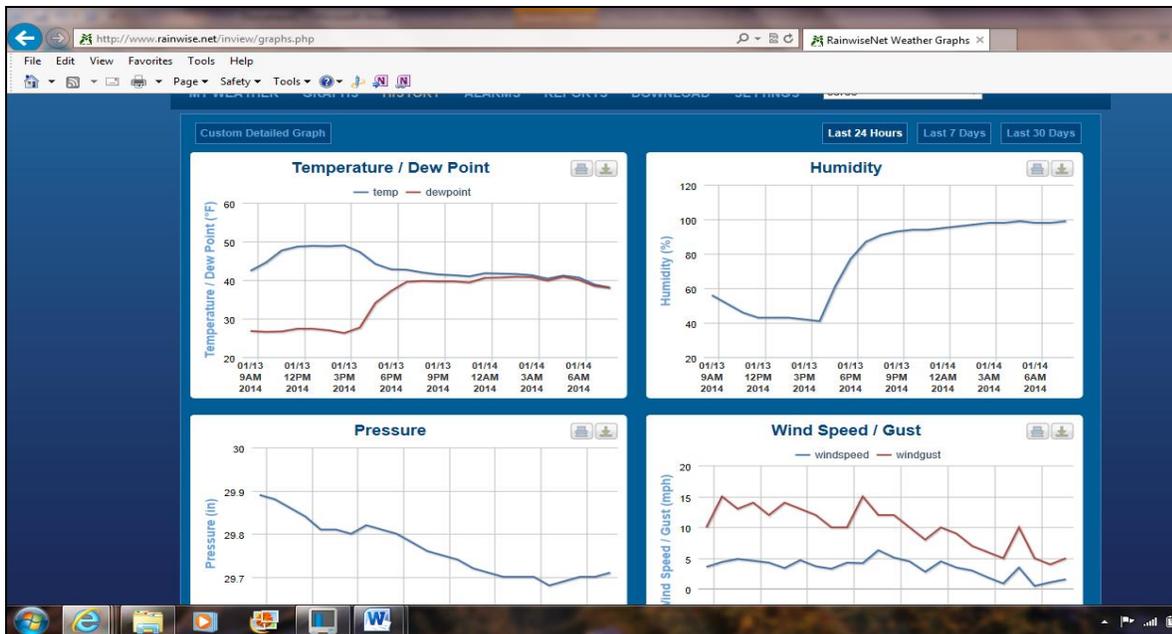

Figure 2. Graphing of weather parameters available on RainwiseNet.

Weather station locations. At year's end there were 249 weather station locations connected into NEWA, in NY, VT, MA, NJ and PA. New stations in NY are being added with increasing regularity and some highlights are listed.

Six Rainwise MKIII instruments were added to the NEWA network in 2013 that were purchased by growers and a consultant, as a result of work done by Debbie Breth, Cornell Cooperative Extension Lake Ontario Fruit Program and Randy Paddock, Paddock Agricultural Services. They were Medina, Sodus(Lake), Kendall, Wolcott, Butler, and Knowlesville. Kenneth Deegan and Becky Wiseman with Cornell Cooperative Extension of Suffolk County and the Agricultural Stewardship Program received grant support to purchase and install NEWA-connected Rainwise weather stations. Another five were added this year and when all installations are complete there will be over 20 weather station locations in Suffolk County. One of the new instruments transmitting data via cellular modem was purchased by Rick Reisinger, Reisinger's Apple Country, to replace an old Sensatronic instrument in Watkins Glen.

In 2013, Rainwise released a new version of the MKIII (now called AgroMET) weather station. This version has new modifications and capabilities. One of the best features will be the ability to add more sensors. Growers will be able to monitor conditions such as soil temperature and field moisture in addition to the other sensors. Improvements to how the station utilizes voltage have also been implemented.

NEWA Expansion Networks. Pennsylvania joined NEWA in March, 2013. The PA-NEWA network will likely be diverse with grape and apple farms making up the bulk of weather station locations. The EcoOrchard network in New England was absorbed by MA and CT. Connecticut was successful in obtaining grant funding to join NEWA in 2014. They will be installing 37 Rainwise AgroMET IP100 stations. Of the 37 stations, 16 stations will be county-based and utilized by turfgrass, grounds, and school IPM programs and 21 stations will be placed on farms. CT has one existing EcoOrchard NEWA station. There are another two on an apple farm, purchased in anticipation of CT joining NEWA, bringing the total to 40 locations in CT.

Inquiries were received from Illinois and Wisconsin apple extension and farmers about joining NEWA. The subscription fee for state participation in NEWA was reduced for 2014. The administrators for each of the six states (CT, MA, NJ, NY, PA, and VT) will be discussing mechanisms to generate revenue for yearly operating expenses and how to bring in individuals from non-member states.

2) TRACKING AND PROMOTING NEWA USAGE

Tracking NEWA usage has become a complicated task because several websites and servers contribute data and information through NEWA, including the ITX NEWA website, the NRCC NEWA servers, and the Late Blight DSS. Specific requests for web usage data have been received and we have provided this to our collaborators, as needed, but no longer track and chart these data routinely for the entire NEWA system. Website upgrades that would include Google Analytics on each page being planned.

NEWA weather and pest forecast information is also multiplied via extension newsletters and email alerts that reach many farms. At various meetings, talks were given on NEWA topics (Table 1). There continues to be interest in training sessions on the NEWA system as part of pest model implementation.

Table 1. Presentations promoting NEWA given in the period January to December 2013.

Presenter	Date	Title	Location	Audience	# of people
Carol MacNeil, Abby Seaman, Ian Small, J. Gibbons	3/19/13	Tomato/Potato Late Blight – An Advanced Forecast Tool *Review & Update of the LB Decision Support System – new features for 2013!*	Monroe County CCE	Vegetable Growers	10
Weigle	7/25/2012	Using NEWA Resources in Your Vineyard IPM Strategy	North East Lab, North East, PA	Growers and Industry Reps	100
Weigle	11/13/2012	Using GIS and Sensor Technology in Vineyards	National Grape Cooperative Annual Meeting, Erie, PA	Grape Growers and Staff of National Grape Cooperative	100
Weigle	11/14/2012	Using GIS and Sensor Technology in Vineyards	National Grape Cooperative Annual Mtg, Hamburg, NY	Grape Growers and Staff of National Grape Cooperative	100
Weigle	2/8/13	Using NEWA Resources in a Vineyard IPM Strategy	Viticulture 2013, Rochester, NY	Grape Growers and members of grape industry	60
Weigle	4/19/13	NEWA – Tools for IPM	Webinar	Long Island grape growers and extension agents	25
Weigle	4/19/13	NEWA – Weather Information for Vineyard IPM	Webinar	Long Island grape growers and extension agents	25
Weigle	5/8 – 7/25/13	Implementing disease and grape berry moth models found on NEWA in a vineyard IPM strategy	19 Coffee Pot meeting in various locations across Lake Erie grape belt	Grape Growers and members of grape industry	293
Weigle	7/25/13	Using NEWA Resources in Your Vineyard IPM Strategy	LERGP Summer Growers' Conference, Portland, NY	Grape Growers and members of grape industry	32
Weigle	8/8/13	IPM Roundtable, Using the Phenology based Degree Day Model for Late Season Grape Berry Moth	LERGP Twilight and Erie County Hort Society BBQ, North East, PA	Grape Growers and members of grape industry	207
Weigle	8/21/13	IPM Roundtable, Using the Phenology based Degree Day Model for Late Season Grape Berry Moth	LERGP Twilight and Thompson Ag Pig Roast, Hanover, NY	Grape Growers and members of grape industry	64
Total		**11 presentations**			**1016**

A daily email message alert, e-NEWA, including weather information and grape forecast model results was developed in 2013 for beta-testing in 2014. Conservative projections are that e-NEWA subscriptions could generate approximately $16,000 per year to support NEWA. Delivering NEWA information in this manner to smart phone devices could significantly increase NEWA usage and impact.

3) UPDATE THE NEWA WEBSITE AND PEST FORECAST MODELS.

The current NEWA website was launched in 2009 at the url addresses newa.cornell.edu and www.newa.cornell.edu. In the ensuing years, the growth of NEWA, demonstrated by the over 5-fold increase in weather station locations, the expansion into adjoining states, the widespread interest in development and implementation of crop-, pest-, and disease-phenology models, underscored the impact of the new website design in facilitating and promoting NEWA use. However, regional expansion in the Northeast has also identified needs for developing a new website structure.

NEWA website updates. Issues with the NEWA website Google map displaying on android smart phone devices, Google Chrome, Windows 7, and other platforms was investigated and was associated with one of the NRCC NEWA servers. The NEWA files, newa.cornell.edu, were moved to a different server to resolve the issue. NEWA stakeholders were queried to determine if the move resolved the display problems and they sent in glowing replies. NEWA is now accessible on their smart phones!

The NEWA website host company ITX sent in documentation on the steps needed for a planned NEWA website overhaul and a potential NEWA subscription portal. ITX provided a foundation for the next iteration of the NEWA website which will use RWD or responsive web design. Responsive web design allows display on any computer or device, regardless of size. The website responds to the device by displaying specific building blocks whose hierarchy on the page is pre-determined by the website developers.

New forecast models. The stage is set weed models (large crabgrass, giant foxtail, yellow foxtail, common lambsquarters, eastern black nightshade, smooth pigweed, common ragweed, and velvetleaf), using the soil temperature estimation algorithm developed by Art DeGaetano, Department of Earth and Atmospheric Sciences, with funding support from NYS IPM Program.

The apple thinning model, based on apple carbohydrate utilization, and the apple irrigation model, based on apple evapotranspiration, developed by Alan Lakso and Terence Robinson, Department of Horticulture, were implemented in NEWA and went live this spring.

Abby Seaman, NYS IPM Program, has received a Smith Lever grant, *Improving and enhancing vegetable pest forecast models on the Network for Environment and Weather Applications (NEWA)*, for three years (10/2013-9/2016) to upgrade the vegetable forecast models.

4) COLLABORATE WITH THE NORTHEAST REGIONAL CLIMATE CENTER.

The NRCC and NEWA have continued to collaborate in 2013, recognizing the benefits of building a stronger collective for weather information at Cornell University. NRCC data is compiled from information provided by airport observations and the Cooperative Observer Network in the Northeastern USA and they now have access to additional sources of weather data from the NEWA mesonets in NY, MA, VT, NJ, PA and CT.

Programming for new models and the web pages serving the results of the models is done by NRCC staff. Cornell University faculty members often work directly with the NRCC to develop new models and upgrade existing models. These models utilize NEWA data and are displayed within the framework of the NEWA website.

Data Quality Control (QC) measures have been recognized as paramount to good model results. Complementary projects at NRCC and NEWA, with the goal of implementing automated QC subroutines as data is ingested and utilized in model results, were completed and are being refined. An automatic email is now being generated via NEWA to alert the weather station owner that there is a problem with the station transmitting data, once data has not been received for a 24-hour period.

Work is beginning on automated emails to alert when erroneous or missing data is coming from one of the sensors on the instrument. Data QC in NRCC would identify and adjust out-of-range data to prevent its being utilized in the models. Current data QC extrapolates for small gaps in data transmission to the NEWA servers of up to 3 hours and "patches" larger gaps in data, up to one month, with data from a nearby weather station, the designated "sister" station.

Rainwise has also implemented an email system to alert growers when their weather station is not reporting data to their servers. Their email message contains the following text:

> This is an automated message from RainwiseNet support. It appears that your weather station
> http://www.rainwise.net/weather/ceres has stopped sending data to RainwiseNet.
> The last data we received was at 2013-11-17 10:00 PM. You may want to check your weather

station and Internet connection.
These alert messages are sent when a weather station has sent data in the last 72 hours but has failed to send in the last hour. If your station remains offline for more than 72 hours you will stop receiving alerts. Should you have difficulty getting your station back on line please email rwnetsupport@rainwise.com.

Work is underway to improve the NEWA email alert system and to consolidate the various databases being used in the system.

NEWA PUBLICATIONS

Gibbons, J., Carroll, J., TenEyck, C., Petzoldt, C., and Weigle, T. 2010. NEWA (Network for Environment and Weather Applications) 2010 - 2012. NYS IPM Program Project Report. http://nysipm.cornell.edu/grantspgm/projects/proj12/pgm_wide/gibbons.pdf

GRANTS SUPPORTING NEWA ACTIVITIES

Judelson et al. 2011-2016. Reducing losses to potato and tomato late blight by monitoring pathogen populations, improved resistant plants, education, and extension. USDA NIFA – AFRI CAP program. ($9,000,000, 26 Co-PI's.)

Loeb, Isaacs, Saunders, Weigle. 2010-2013. Testing the Use of a Degree Day Model to Time Control of Grape Berry Moth. Viticulture Consortium-East/LEGREP, Inc. $41,280