NEWA (Network for Environment and Weather Applications) 2014: 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, Currently, over 25 tools are freely available in NEWA. Weather stations transmitting to NEWA via RainwiseNet have access to Rainwise features including graphing weather parameters and alarms for monitoring every parameter on the weather station. Connecticut joined NEWA in 2014. Individual membership was extended to farmers and Gays Mills, WI came online. NEWA has 290 station locations in Connecticut, Massachusetts, New Jersey, New York, Pennsylvania, Vermont, and Wisconsin. Rainwise AgroMET weather stations using cellular communications were deployed successfully. Twenty-eight presentations on NEWA were given, reaching almost 800 people. Station outage quality control messaging was implemented to alert people about station outages longer than 24-hours. NEWA Coordinators will work towards deploying virtual weather station locations and a responsive mobile web design in the future.

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).
  5) Future Plans

Procedures, Results, and Discussion:
1) OPERATE AND MAINTAIN THE NEWA ELECTRONIC WEATHER NETWORK.

  Data transmission to NEWA. In 2014, 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 these two locations. Assistance with weather stations is frequently accomplished via email through an automated email alert system that identifies data outages in the NEWA weather database on the NRCC servers.

NEWA personnel have made fewer maintenance and trouble-call field visits and phone calls 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.

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 - 2014, is a cellular modem equipped instrument (Fig 1) which can be stationed anywhere there is cellular communications. RainWise manages the cellular connections making for easy installation at the growers site.   Two of these instruments are now in the network. One is located in Watkins Glenn and the other is located in Williamson.

Figure 1. Cellular interface (telmet) weather station.

Figure 2. Example of Alarm setup on RainwiseNet Pro.

The RainwiseNet website provides access to the Rainwise instrument's weather information in graphical and tabular format. The alarm feature in RainwiseNet Pro allows growers to watch parameters and receive an alert when certain conditions are met (Fig 2). Email or text alerts are sent out at a user set interval to warn of certain weather conditions (Fig 3).

Figure 3. Email Alert about RainwiseNet Alarm results.

A grant was secured from the NY Apple Research and Development Program to provide a review of weather station sites situated on apple farms in NY. Each site was visited and a

checklist was provided for each grower, going over station maintenance. A comprehensive field manual on maintenance and troubleshooting was developed and given to each grower and will be available on the NEWA website.

Weather station locations & NEWA Expansion Networks. At year's end there were 290 on-the-ground weather station locations connected into NEWA, in Connecticut (CT), Massachusetts (MA), New Jersey (NJ), New York (NY), Pennsylvania (PA), Vermont (VT), and Wisconsin (WI). Approximately a third of these are airport National Weather Service stations, about 40 of these are in the New Jersey state climatology weather system, and the remaining are Rainwise instruments.

A Rainwise station was installed at the Cornell University NY State Agricultural Experiment Station, Geneva, to replace the Campbell Scientific station that was there. The Campbell station used a modem to retrieve data and an Ethernet connection was desired for this site. In 2014, all modem connected weather equipment was phased out of NEWA.

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The coordinators of the six land grant university partners in the NEWA system help guide the direction and development of NEWA. We are focusing on ways to generate revenue for yearly operating expenses. Ideas being considered include advertising on the website, requesting donations via the website, subscriptions to NEWA products such as email alerts, etc.

Individual farmers in non-member states can now join NEWA for a yearly fee. One apple grower in Gays Mills, Wisconsin has joined NEWA, one in Hollis, New Hampshire will join in 2015, and the Minnesota Apple Growers' Association is also planning to join NEWA in 2015. Information on this opportunity has been shared with interested Extension colleagues in Maine, New Hampshire, and Rhode Island and with Rainwise Inc. Colleagues in Virginia and Nova Scotia that work in tree fruit have expressed interest in joining NEWA.

The NEWA Coordinators received a Northeast planning grant to fund a region-wide meeting to develop a proposal to fund NEWA innovations including (1) a mobile-ready website platform and (2) virtual weather station locations.

2) TRACK AND PROMOTE NEWA USAGE

Tracking NEWA usage has become a complicated task because several websites and servers contribute data and information through NEWA, primarily the ITX NEWA website and the NRCC NEWA servers. Specific requests for web usage data have been received and we have provided this to our collaborators, as needed, although usage of individual forecast tools cannot be split out at this time. None the less, the current analytic software for the ITX NEWA website and the NRCC provided data indicate that NEWA enjoyed 722,145 page views and visits during the year, January to December 2014, as shown by month in Figure 4. We are targeting Google Analytics for placement on the NEWA webpages. In addition to providing insight on NEWA

webpages of greatest utility to growers, these usage statistics will allow tracking of the chronology of visits to better time website improvements.
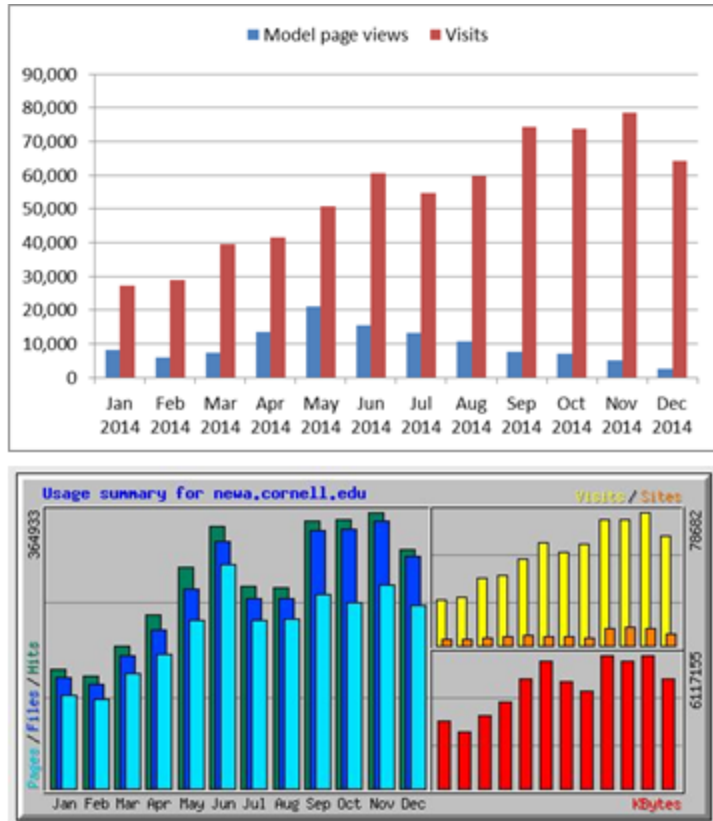

Figure 4. NEWA monthly usage statistics for the period January 1, 2014 to December 22, 2014. Shown at top are the statistics for the forecast models via NRCC (blue bars) and for the NEWA website (red bars) and at bottom are the usage statistics from WebStats for the NEWA website.

NEWA weather and pest forecast information is also multiplied via extension newsletters and email alerts that reach many farms. At various meetings, 28 talks were given on NEWA topics reaching almost 800 people. These are shown for New York in Table 1. There continues to be interest in training sessions on the NEWA system as part of pest model implementation.

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

The relative ease with which a weather station can be installed, the low cost of the Rainwise NEWA-configured instruments, and the ability to retrieve data via the internet have contributed to the growth in the number of weather stations (Fig 5). Related to this is the launch of the current NEWA website in 2009 that is easy to navigate and provides users with interactive tools for key IPM and crop forecasts.
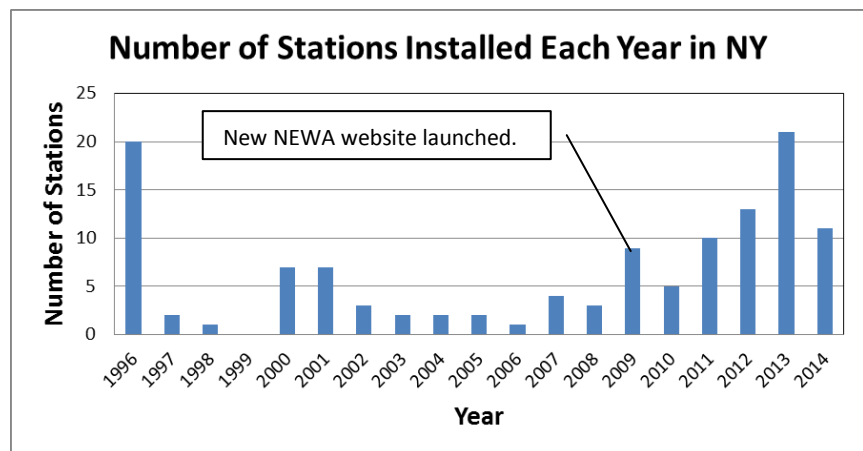

Figure 5. Cumulative numbers of weather stations has grown significantly in the last six years.

Table 1. Presentations on NEWA given in 2014 by NYS IPM Program educators.

Presenter	Date	Title	Location	Audience	# of people
Weigle	1/16/14	NEWA – A Weather Station Network to Enhance Crop Production and Pest Management	Long Island Ag Forum, General Session, Riverhead, NY	Ag producers and members interested in Long Island agriculture	225
Carroll	1/16/14	Using NEWA weather data for apple IPM.	Long Island Ag Forum, Suffolk County CCE, Riverhead, NY	Fruit growers, extension educators, faculty	25
Seaman	1/16/14	NEWA resources for vegetable growers	Long Island Ag Forum, Riverhead, Suffolk Co.	Growers, extension field staff	78
Weigle	1/17/14	Implementing NEWA into A Vineyard IPM Strategy (0.75 hours)	Long Island Ag Forum, Viticulture Session, Riverhead (Suffolk)	Grape growers and industry members	49
Weigle	3/20/14	Implementing NEWA into a Vineyard IPM Strategy (o.5 hours)	LERGP Growers Conference, Fredonia (Chautauqua)	Grape growers and industry members	110
Seaman	3/20/14	Late blight forecasts on NEWA and what's available on usablight.org	Late blight Decision Support System training, Rochester, Monroe Co.	Growers and consultants	8
MacNeil, Seaman, Small, Gibbons	3/22/14	Late Blight Forecast Training/Review for your Farm. Online Workshop	Monroe County CCE	Vegetable Growers and Consultants	10
Weigle	4/8/14	Implementing NEWA into A Vineyard IPM Strategy (2 hours)	CLEREL Portland (Chautauqua)	Grape growers and industry members	6
Weigle	4/8/14	Implementing NEWA into A Vineyard IPM Strategy (2 hours)	PSU Extension - Erie County office Erie, PA	Grape growers and industry members	3
Weigle	5/8 – 7/25/14	Implementing disease and grape berry moth models found on NEWA in a vineyard IPM strategy	17 Coffee Pot meetings, various locations across Lake Erie grape belt	Grape Growers and members of grape industry	225
Carroll	8/8/14	Building site-specific capacity by integrating weather networks and proven predictive models in NEWA	7th Annual Meeting of the Midwest Weather Working Group, Minneapolis, MN	North Central IPM Center Midwest Weather Working Group	19
Seaman	10/21/14	Late blight forecasting	Disease Management Workshop NOFA-NY, Geneva, NY	Growers, extension field staff	35
Total		**28 presentations on NEWA topics**	**includes 17 Coffee Pot mtgs**		**793**

3) UPDATE THE NEWA WEBSITE AND PEST FORECAST MODELS.

The current NEWA website, launched in 2009, proved highly user-friendly. In the ensuing years, the impact of the new website design in facilitating and promoting NEWA use among farmers, extension educators, consultants, and researchers has been proven by the growth of NEWA. This growth is exemplified by over 5-fold increase in weather station locations in NY, the expansion of NEWA into five neighboring states, and the widespread interest in development and implementation of crop-, pest-, and disease-phenology models as tools for IPM.

NEWA website updates. NEWA tools are increasingly sought on smart phones and other devices that are easier to carry into the field. We are actively engaged in working towards a responsive website design (RWD) that would display seamlessly on any device, from desktop computer to smart phone. Plans are underway to set this goal as a primary objective for the coming year with plans for completion in 2016.

New forecast models. The cabbage maggot phenology model was revised and launched this fall by Abby Seaman, NYS IPM Program, and Tony Shelton, Department of Entomology. Many suggestions on the apple scab, fire blight, sooty blotch/flyspeck, and apple insect models were received last spring. Kerik Cox, Department of Plant Pathology and Plant-Microbe Biology, Art Agnello, Department of Entomology, and Juliet Carroll, NYS IPM Program, are working on associated model improvements.

4) COLLABORATE WITH THE NORTHEAST REGIONAL CLIMATE CENTER (NRCC).

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

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.

One of the things that NRCC accomplished this year was to consolidate databases used for metadata making it easier to keep weather station information complete and up to date. This also facilitated sending the automated outage emails implemented this year, following development and testing. After 24-hr of not receiving data, an email is sent to the weather station contact; follow up emails are sent at one, two, and three weeks of continued data outage; the third week email indicates the station will become inactive with reduced NEWA availability. Many positive comments were received on the automated outage reports. Station owners appreciate learning of data transmission outages.

Work is continuing on automated emails to alert when erroneous or missing data is coming from one of the sensors on the instrument. Data quality control (QC) emails will be implemented in much the same way as the station outage emails, though these are specific to weather data sensors. Data QC in NRCC would identify and adjust out-of-range data to prevent its being utilized in the models. Precipitation QC will be implemented first, followed by solar radiation QC. 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.

5) FUTURE PLANS.

The NEWA Coordinators and members of the NYS IPM Program have set the following goals for a large, multistate project: (1) Develop and implement a mobile application with Responsive Web Design (RWD) to improve user experience and accessibility. (2) Implement freely available climate and forecast digital data into a NEWA map layer on which to create virtual weather station locations, allowing for efficient and fast network expansion.

Two workshops on weather station equipment are planned for growers and consultants for early 2015 to cover maintenance and troubleshooting.

Regional expansion in the Northeast has identified the need for targeted website revisions which will be undertaken ahead of the multistate project.

A survey of NEWA users and potential users will be done in 2015. This survey will build on the survey done in 2007. The economic impact of NEWA will be investigated again, as well as the perspectives of users about mobile applications, virtual weather stations, a custom NEWA tools dashboard, and a wish list for new IPM and crop production tools for NEWA.

GRANTS SUPPORTING NEWA ACTIVITIES

Bates, T. et al. 2014-2015. A System Approach to Concord Productivity and Fruit Quality in the Lake Erie Production Region. LERGREP Inc. and NY Wine & Grape Foundation. $60,033

Carroll, 2014-2015. Apple Research & Development Program, Building expertise and capacity for accurate Integrated Fruit Production models in the Network for Environment and Weather Applications (NEWA), $16,242.

Carroll, NEED & NERA 2014-15 Integrated Research and Extension Planning Grants Program, Mobile platform and virtual weather stations to improve fruit and vegetable industry access to IPM and crop management tools in the Network for Environment and Weather Applications (NEWA), $3981.

Grant, et al. 2014-2017. USDA NIFA, Crop Protection and Pest Management, An Integrated Pest Management Program for New York State, (contributed section on Precision IPM with NEWA).

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.)

Seaman, A.J. 2014-2017. Improving and Enhancing Vegetable Pest Forecast Models on the Network for Environmental and Weather Applications (NEWA). Smith-Lever $69,614

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Carroll, J., Gibbons, J., Weigle, T., Seaman, A., and Petzoldt, C. 2014. NEWA (Network for Environment and Weather Applications) 2013: A Year in Review. NYS IPM Program, Cornell University. 6 pp.
http://nysipm.cornell.edu/grantspgm/projects/proj13/pgm_wide/carroll.pdf

Weigle, T. 2014. Assessing NEWA Resources on the Web, Lake Erie Regional Grape Program *Vineyard Notes*, Newsletter #1, February. pp 7-10

Weigle, T. 2014. NEWA Update, *The Crop Update*. January 9.

Weigle, T. 2014. eNEWA for Grapes, *The Crop Update*. February 6.

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Weigle, T. 2014. Computer or Calendar? – Choose NEWA for Better IPM. NYS IPM Program blog. March 25.

Weigle, T. 2014. eNEWA poster displayed at LERGP Growers Conference, Cornell CCE Regional Ag Staff Conference.