

The Network for Environment and Weather Applications (NEWA)

Juliet Carroll, Timothy Weigle and Curt Petzoldt

NYS Integrated Pest Management Program

New York State Agricultural Experiment Station, Cornell University, Geneva NY 14456

Weather data is fundamental for effective IPM, crucial for preventing crop loss, and essential for documenting damaging weather conditions. Over the last several years the New York State IPM Program's Network for Environment and Weather Applications (NEWA)

"Weather is the number one most important thing for a farmer to know," said an apple farmer.

has expanded through the work of Cornell University faculty, Extension educators, the Northeast Regional Climate Center, RainWise Inc. and farmers. Several apple producers, from Nassau to Niagara counties, recently installed weather stations in the network. RainWise, Inc. retrofitted their weather stations with leaf wetness sensors, developed and upgraded their software to deliver data to NEWA. NEWA's website, delivering the weather app's, was fully redesigned and launched November 2009: newa.cornell.edu. Our audience consists primarily of high-value fruit and vegetable producers. Workshops and presentations on NEWA were provided for these producers who offered suggestions for NEWA improvements. For apples, faculty revised and created pest forecast model web pages for apple scab, fire blight, sooty blotch/flyspeck, apple maggot, codling moth, oblique-banded leafroller, oriental fruit moth, plum curculio, and spotted tentiform leafminer. An apple evapo-transpiration model is in development and an apple carbohydrate model for thinning has become a proven success. These resources are made possible through coordination by the NYS IPM Program of a network of on-the-ground weather stations delivering weather data for its automated application to agricultural risk management.

Overview of NEWA

The Network for Environment and Weather Applications (NEWA) delivers weather data from weather stations primarily located on farms through the Internet at newa.cornell.edu and automatically calculates and displays weather data summaries and IPM forecast model results. NEWA provides weather information and IPM forecast models for more precise IPM and crop production practices. Our redesigned website was launched in November, 2009.

NEWA was formed in 1995 and continues to evolve to stay current with advances in pest and weather forecasting. It was founded by the New York State Integrated Pest Management (NYS IPM) Program and collaborates with the Northeast Regional Climate Center (NRCC), Department of Earth and Atmospheric Sciences, Cornell University. For more information, visit About NEWA at newa.cornell.edu/index.php?page=about-newa.

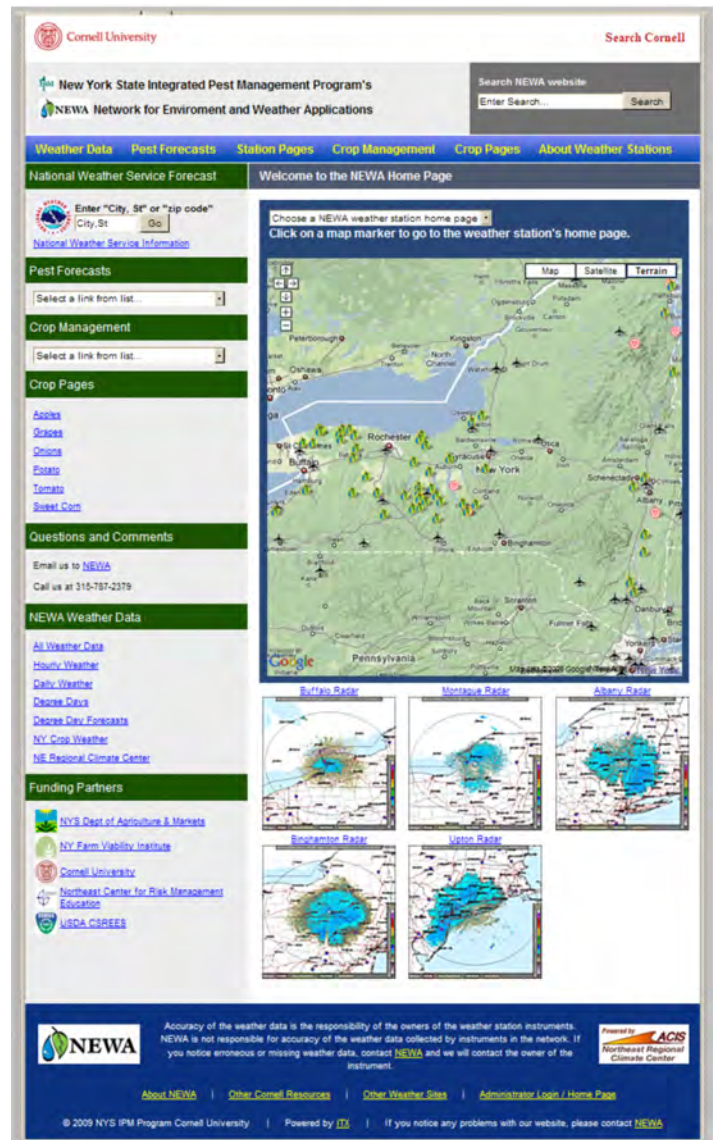


Figure 1. The NEWA Home Page of the new website launched November 2009, find it at newa.cornell.edu or www.newa.cornell.edu.

The weather stations are owned primarily by farmers, and also by the NYS IPM Program, Cornell University faculty, and agricultural industries. RainWise, Inc. is our partner for hardware and software development for the weather station network, see Get a NEWA Weather Station at newa.cornell.edu/index.php?page=get-weather-station. Campbell Scientific instruments are also compatible with the NEWA data format.

Weather data is collected via modem, ftp, or Ethernet interface as shown in Send Data to NEWA at newa.cornell.edu/index.

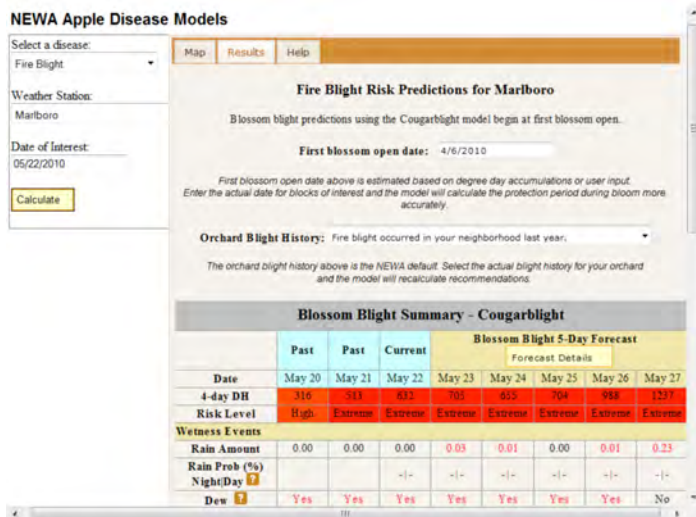


Figure 2. Fire blight model results page for the Marlboro weather station.

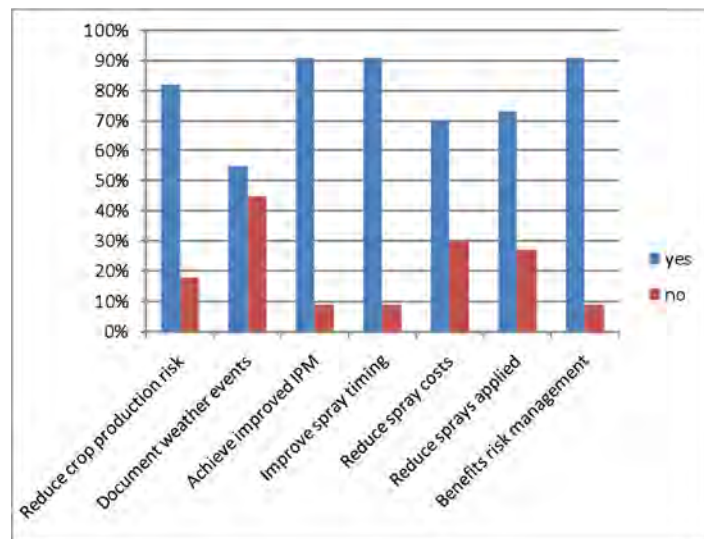


Figure 4. Farmers use NEWA information to reduce risks to their crops and to the environment.

[php?page=send-data-to-newa](#). Weather data is archived and run through quality control routines prior to calculating and displaying degree day accumulations and IPM forecast models.

Degree days (DD) for ten base temperatures, including growing degree days (GDD), are calculated and displayed. There are 24 weather-based IPM forecast models deployed in NEWA. References for the NEWA models can be viewed at [newa.cornell.edu/index.php?page=newa-pest-forecast-model-references](#), those for apple insects and diseases are cited in this article. More models are added as they become available or are developed and validated by faculty at Cornell University and partner institutions.

In addition, NEWA provides a portal to weather and IPM forecast products developed by other groups and researchers, such as the National Oceanic and Atmospheric Administration, the NRCC, Michigan State University, the National Weather Service (NWS), ipmPIPE and the North American Plant Disease Forecast Center.

Recent Advances in NEWA

The Website. In 2008-2010, farmers and Cornell Cooperative Extension Educators participated in NEWA web development meetings, in Eastern and Western NY, to learn about the

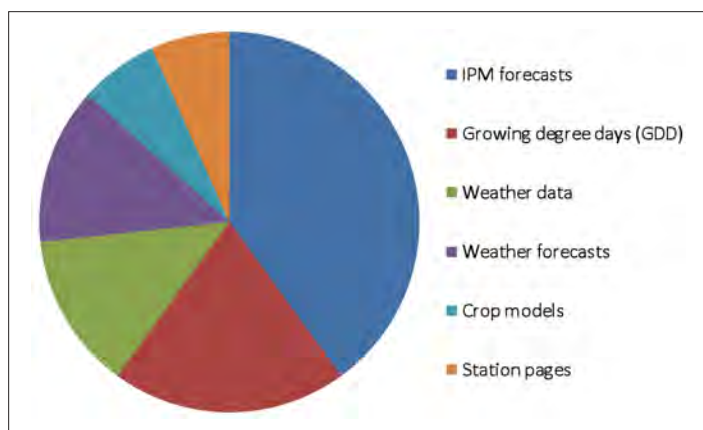


Figure 3. Favorite features of NEWA.

NEWA system, provide input on its improvement and begin using NEWA on their farms. This effort provided the basis for development of a new website, launched at [newa.cornell.edu](#), displaying weather-related risk information, with emphasis, for apple growers, on IPM forecast models for apple scab, fire blight, sooty blotch/flyspeck, apple maggot, codling moth, obliquebanded leafroller, oriental fruit moth, plum curculio, and spotted tentiform leafminer. All growers using the web site find it easy to use, with good to excellent navigation, website layout, and logical groupings.

The Weather Stations. Initially, Sensor instruments provided weather stations for the NEWA network; these stations are now obsolete. Today, RainWise, Inc. works with NEWA, developing compatible weather stations by adding needed leaf wetness sensors and key data allocation features. In the early days of NEWA, IPM forecasts were delivered to farmers via fax and phone messages. These delivery methods gave way to modem-collection of data and ultimately to our current web pages at [newa.cornell.edu](#). Rainwise continues to help NEWA develop data delivery software to eliminate the need for phone lines, including a new Ethernet interface which is currently being field tested.

Weather Data. The Northeast Regional Climate Center (NRCC) began working with NEWA in 2008 to archive data and run it through quality control to identify and correct missing data. Their database has allowed for rapid expansion of the weather station network in recent years. Further efforts are underway to enhance data quality control and improve data integrity. The NRCC also creates new forecast programs and has paved the way for interactive IPM models and the use of National Weather Service (NWS) forecasts in the model results pages.

Research and Extension. Extension educators feature NEWA model results and weather information in their newsletters, workshops, and presentations. Extension educators delivered daily or weekly NEWA information through their newsletters, reaching an audience exceeding 1800 farmers across NY, PA and New England. Research faculty paved the way for IPM forecast model creation, deployment, and revisions. For instance, in apple IPM, we now have linkage of the forecast model

Table 1. IPM and crop production forecasts currently available on NEWA.

apple scab infection events	black rot of grapes	onion Botrytis blight
apple scab ascospore maturity	grapevine powdery mildew	onion Alternaria blight
fire blight Cougar Blight	Phomopsis cane & leaf spot	onion downy mildew
sooty blotch & flyspeck	grapevine downy mildew DMCAst	onion maggot
obliquebanded leafroller	grape berry moth	Stewart's wilt of sweet corn
spotted tentiform leafminer	cabbage maggot	cucurbit downy mildew ipmPIPE
codling moth	tomato early blight TomCast	soybean rust Forecast Center
plum curculio	potato early blight	alfalfa weevil
oriental fruit moth	late blight BLITECAST	turfgrass diseases
apple maggot	late blight decision support system	turfgrass evapotranspiration (ET)

results with a pesticide selection tool. NEWA data is widely used for research projects, for example internal browning, and development of new models, such as the carbohydrate model for predicting thinning results in apples. Through their efforts farmers learn how to access the improved NEWA website and apply weather information to managing crop and pest inputs to achieve effective pest management, crop loss prevention, and documentation of damaging weather conditions.

Farmers. In response to the improvements to the NEWA website, its forecast models, and our educational efforts targeting growers, apple producers from Nassau to Niagara counties installed weather stations in the network. In the last few years, the number of NEWA weather stations on farms has almost doubled, going from around 40 to over 70. Courtesy of the NRCC, we now host weather data from Cornell agronomic research farms and NWS airport locations, bringing the number of weather stations in NEWA to over 140. Farmers use NEWA at least once per week or daily. Outside of the IPM forecasts, growing degree days, degree days, and daily weather summaries are most popular. 99.2% of farmers using NEWA say they would recommend NEWA to other farmers.

Table 2. Grower Quotes about the Benefits and Impacts of NEWA:

- "I really like the website and have been looking at the weather data daily from my site and comparing it to other sites nearby."
- "The website is right on target for delivering the needed IPM risk and weather risk information."
- "I was able to make more informed decisions on timing of sprays. I can also more accurately track growing degree days in my immediate area."
- "Risk management improved from spray timings. The possibility exists for reduction in number of sprays, but you must be experienced enough to know the ramifications."
- "Helped me keep track of things—difficult with so many crops (onions, potatoes, tomatoes, sweet corn, cabbage, cucurbits, berries, other veg)"
- "NEWA provided us with specific information to our crop that other weather programs do not provide."
- "I used GDD information to track insect/disease modeling and sustainable spray practices."
- "The biggest single value and the reason I invested in a weather station is the carbohydrate model produced by Dr. Terence Robinson for apple thinning. This model has a major impact on the total crop value. It's the best information of any kind anywhere in the world for apples!"
- "It's a great resource to direct growers to!"

Expansion Networks.

The Vermont Tree Fruit Growers Association and the University of Vermont have created a VT-NEWA network. The Eco-Orchard growers in New England formed the Eco-Orchard-NEWA network. And the University of Massachusetts Extension has created a MA-NEWA network. Expansion is considered a natural evolution of our collaboration with the NRCC by our climatology colleagues. In addition, our

IPM colleagues in the Northeast recognize the value of insect phenology models and plant disease forecasts for improving IPM practice and are willing to share the costs for NEWA.

NEWA's Impacts and Benefits

NEWA fills the need for agricultural weather information by summarizing weather data, displaying IPM forecast model results, linking to pertinent information, displaying weather radar images and linking to NWS forecasts. NEWA IPM forecasts allow growers to spray pesticides only when absolutely necessary, often reducing applications. Growers reported that they can save, on average, \$19,500 per year in spray costs and prevent, on average, \$264,000 per year in crop loss as a direct result of using the NEWA IPM forecast models.

"Avoiding apple scab can save me \$2 million a year," says apple grower Tre Green of Clinton County. Green uses NEWA's disease forecasts to stay on top of diseases like apple scab, spraying only if IPM's finely-tuned forecasts show a strong likelihood of disease.

In May 2010, NEWA served a key risk management function when several spring frosts occurred across New York's fruit-growing regions, affecting fruit trees, grapes and berry crops. Growers, crop consultants, extension educators, and research faculty utilized the NEWA temperature data to predict and explain the likelihood of crop damage from these cold temperature events.

The benefits of NEWA include:

- Technical support on weather stations and data collection.
- Targeted NEWA website development, including required updates, additions, and upgrades.
- Access to all the information on the NEWA website, newa.cornell.edu.
- Crop pages for apples, grapes, onions, potatoes, tomatoes, and sweet corn.
- National Weather Service information.
- New products, as they become available.
- Access to all the weather data programming within the NEWA website, newa.cornell.edu.
- Station pages for your weather station locations.
- Weather data summaries (hourly, daily, degree days, etc.).
- Crop management (growing degree days, forecasts, drought, ET models, etc.).
- New IPM and crop production models, as they become available.
- IPM forecasts (station-specific and regional), Table 1.

NEWA's vision is to become the source for weather-related information for the IPM *practitioner* in the Northeast. NEWA's mission is to deliver, to agricultural and green industries, weather information and applications to support and advance IPM and best management practices. In agriculture, farmers will use and apply weather information and pest forecasts for improving IPM practice, reducing crop production risks and for protecting against weather-related losses. Through NEWA they will be able to apply crucial weather information to managing pests and their crops.

NEWA's Opportunity

The funding for NEWA through the NYS IPM Program was eliminated due to New York State budget cuts. In the face of this, we firmly believe that NEWA will continue to exist because of the strength of its partnerships with growers, produce storage operators, buyers and processors, Cornell Cooperative Extension (CCE) County Associations, CCE Regional Programs, County Soil and Water Conservation Districts, the NRCC, the Pesticide Management Education Program, and Cornell University faculty.

After March 31, 2011, because of the New York State budget crisis, the NYS IPM Program may no longer receive any state funding allocation. There are several possible scenarios that will allow NEWA to continue into the future in the unfortunate event that the NYS IPM Program shuts its doors. At this time, we are certain that NEWA's future will be sustained by the NRCC with a strong collaboration with Rainwise and the continuing interest of research and extension faculty and staff at Cornell University, other institutions, and growers across the Northeast. The coming year will be a critical time for positioning the NEWA system for a bright future.

Despite the dire budget situation, our colleagues still resolve to partner with NEWA, our NY growers still continue to purchase weather stations connected to NEWA, our Cornell University faculty still pursue deployment of models within NEWA, and our Cornell Cooperative Extension educators still continue to offer NEWA workshops, run newsletter articles about NEWA, and encourage its use toward improved IPM practice. All are confident that the NEWA system will emerge from the funding crisis stronger than ever.

Acknowledgements

We gratefully acknowledge the dedicated service of the NEWA system staff: Cheryl Ten Eyck and John Gibbons. We also acknowledge the NEWA partners: Northeast Regional Climate Center, RainWise, Inc., and Pesticide Management Education Program. Funding has been provided by: New

The Nursery Connection - When Quality and Selection Count

Trees AVAILABLE for Spring 2011 Planting.

Those that have a line through them may be ordered as **pending**, or for spring 2012

APPLE VARIETIES	APPLE VARIETIES	APPLE VARIETIES	APPLE VARIETIES
Adams Apple™ Akane Arkansas Black Autumn Crisp (NY 674) Blondee® PP#19007 BraeStar™ Cameo™ Red Cameo Candy Crisp™ Cortland CrimsonCrisp PP#16622 Crown Empire (Crist) PP#11201 Dandee Red® Earligold™ Early Red One™ Early Spur Rome uspp7328 Empire Enterprise™ Grimes Golden Honeygold Jonathan Winter Banana GALA STRAINS: Big Red Gala® Brookfield Gala® Buckeye Gala® Crimson Gala™ Gala (Fullford) PP#7589 Galaxy Gala Gala Gala® Grand Gala Kidd's D-8 Gala Pacific Gala®	Royal Gala® Ultima™ Gala Ultirared Gala FUJI STRAINS: Autumn Rose™ Auvil™ Fuji Aztec Fuji Banning Fuji Day Break Fuji™ Fuji (Brak CV) Morning Mist™ Fuji Myra Red Fuji uspp9445 Rising Sun Fuji September Wonder™ Fuji Top Export Fuji® OTHER VARIETIES: Chrisalyn Jonathan Connell Red Fireside Ginger Gold® PP #7063 Golden Del. (Gibson) Golden Supreme® Goldrush® Granny Smith Honeycrisp™ Idared Jonafree Jonagold Jonagold Decoster® Jonagold Rubinstar® Jonamac JonaStar JonaGold (LF-1062)	Keepsake Kumeu Crimson® Braeburn Lady Law Red Rome Liberty Linda Mac Lodi Macoun Marshall Mac Melrose Midnight® Red Spur Delicious Mollies Delicious Morren's® Jonagored Mutu Northern Spy Northwest Greening Oregon Spur® II Paulared™ Pink Lady® (Cripps Pink) PP#7880 Pink Lady® Maslin Pioneer™ Mac (Greiner) PP#7002 Pristine® Red Free Red Gravenstein Red Haralson Red Idared Red Jonaprince™ Red Rome (Taylor) Redchief®	Redcort® Redfield™ Braeburn Rogers Red McIntosh Royal Court™ PP#10049 Royal Empire™ Ruby Jon® Ruby Mac® Sana Scarlet Spur 2 Schlect Spur Delicious Shizuka Smoothie® Snapp™ Stayman PP# 11071 SnappyMac® Snow Sweet™ Spartan Stayman Winesap (201) Summer Mac Suncrisp® Superchief® (Sandidge) PP#6190 Sweet Sixteen Swiss Gourmet™ Turley Winesap UltraRed Jonathan™ Ultragold™ Valstar (Elstar) Wealthy Williams Pride® Wolf River Yellow Transparent Zestar!
PEACH VARIETIES	PEACH VARIETIES	PEACH VARIETIES	PEACH VARIETIES
Allstar® Arctic Gem Autumnglo Auntumnstar® Goldmine (Arkansas #9) Baby Gold #5 Beekman Belle of Georgia Biscoe Blazingstar® Blushingstar® Bounty Brightstar Canadian Harmony Cander Catherina Contender Coralstar® Cresthaven Earlstar Early Loring™ Early Elberta (Gleason) Early Red Haven Earnie's Choice	Elberta Elberta Queen Encore® Fay Elberta Flamin' Fury® PF-1 Flamin' Fury® PF-5B Flamin' Fury® PF-5D Big Flamin' Fury® PF-7 Flamin' Fury® PF-7A Freestone Flamin' Fury PF-8 Ball Flamin' Fury Early 8 Ball Flamin' Fury® PF-9A-007 Flamin' Fury® PF-11 Flamin' Fury® PF-Lucky 13 Flamin' Fury® PF-15A Flamin' Fury® PF-17 Flamin' Fury® PF-19-007 Flamin' Fury® PF-20-007 Flamin' Fury® PF-22-007 Flamin' Fury® PF-23 Flamin' Fury® PF-24-007 Flamin' Fury® PF-24C Gold Hardy	Flamin' Fury® PF-25 Flamin' Fury® PF-27A Flamin' Fury® PF-28-007 Flamin' Fury® PF-35-007 Flamin' Fury® PF-Lucky 24B Flamin' Fury® Big George Flamin' Fury® Fat Lady Gala Garnet Beauty Glenglo™ PP#10652 Glohaven Glowingstar® Harrow Beauty Harrow Diamond Jersey Dawn Jersey Glo John Boy® John Boy® II Laural Loring Madison New Haven	Redhaven Redskin Redstar® Reliance Risingstar® Salem Saturn (Doughnut) Sentry Starfire™ Summer Pearl™ Sunhigh Sweet Breeze PP#15295 Sweet Cap™ (Doughnut) Sweet N Up PP#15063 Venture™ Vinegold Virgil Volcan White Lady Other White Fleshed, Sub-Acid, and Peento Varieties
CHERRY VARIETIES	CHERRY VARIETIES	CHERRY VARIETIES	CHERRY VARIETIES
Attika® (Kordia) Balaton® Benton™ (Columbia) Bing Black Gold™ Black Pearl® Black York™ Blushing Gold Burgundy Pearl® Cavalier® Chelan™ Cristalina™ (Sumnue™) Danube® Early Robin™	Ebony Pearl® Emperor Francis Gold Golden Heart Hartland™ Hedelfingen Hudson Index Jubileum® Kristin Lambert Lapins Selah™ (Liberty Bell) Meteor	Montmorency Napoleon North Star Radiance Pearl® Rainier Regina™ Royal Ann Royalton Sam Sandra Rose™ Santina™ Schmidt Schneider Selah™ (Liberty Bell)	Skeena™ Somerset Sonnet Stella Sumleta™ (Sonata) Summit Sunset Bing™ Sunfire™ Sweetheart™ Tieton™ Ulster Van White Gold™

Also, NECTARINES, APRICOTS, PLUMS, PEARS, ASIAN PEARS, SOUTHERN PEACHES, & FLOWERING CRABS...

Call us for our Complete Inventories!

THE NURSERY CONNECTION LLC

Toll Free: (800) 353-6086 • 269-468-3899

P.O. Box 875, Coloma, MI 49038 • Fax: 269-468-8195 • E-mail: nurseryconnection@yahoo.com

SERVICES ARE FREE! Shipping Coordination • Order Management Reporting • Source for Current Industry Developments and Information • Representing the best Nurseries in the United States



Van Moore

York State IPM Program, Cornell Cooperative Extension, New York State Department of Agriculture & Markets, New York Farm Viability Institute, Northeast SARE, Northeastern IPM Center, USDA National Institute of Food and Agriculture, Northeast Center for Risk Management Education, Natural Resources Conservation Service, New York State Agricultural Experiment Station, and Cornell University Agricultural Experiment Station

References

- Agnello, A.M., Helms, M., Smith, W., Landers, A.J., Rosenberger, D.A., Cox, K., Carroll, J.E., Robinson, T.L., Breth, D.I., Stiles, W., Curtis, P.D., Cheng, L., and Hoying, S.A. Pest Management Guidelines for Commercial Tree-Fruit Production. Cornell Coop. Ext., Ithaca. Updated yearly at <http://ipm-guidelines.org/treefruits/>.
- Agnello, A.M. and Reissig, W.H. 2010. Development and validation of a "real-time" apple IPM website for New York. NY Fruit Quarterly 18:25-28.
- Becker, C.M., and Burr, T.J. 1994. Discontinuous wetting and survival of conidia of *Venturia inaequalis* on apple leaves. Phytopathology 84:372-378.
- Brown, E.M. and Sutton, T.B. 1995. An empirical model for predicting the first symptoms of sooty blotch and flyspeck of apples. Plant Disease. 79:1165-1168.
- Carroll, J.E. 2008. Impact of NYS IPM Program's Network for Environment and Weather Awareness (NEWA) on agricultural production. NYS IPM Program Project Reports 2007-2008, NYS IPM Pub 506: 261-267.
- Dragoni, D., A.N. Lakso, and R.M. Piccioni. 2004. Transpiration of an apple orchard in a cool humid climate: measurement and modeling. Acta Hort. 664:175-180.
- Dragoni, D., A.N. Lakso and R.M. Piccioni. 2005. Measuring transpiration in apple trees using heat pulse sap flow gauges calibrated with whole-canopy gas exchange chambers. Ag. Forest Meteorol. 130:85-94.
- Gadoury, D.M., and MacHardy, W.E. 1982. A model to estimate the maturity of ascospores of *Venturia inaequalis*. Phytopathology 72:901-904.
- Hull, L. A., Myers, C., Ellis, N., and Krawczyk, G. 2003. Management of the internal lepidopteran complex in Pennsylvania. Compact Fruit Tree 36(1):21-25.
- MacHardy, W.E., and Gadoury, D.M. 1989. A revision of Mills' criteria for predicting apple scab infection periods. Phytopathology 79:304-310; Erratum, 81:809.
- NEWA Annual Reports. 1996-2009. <http://newa.cornell.edu/index.php?page=newa-news-reports>
- Onstad, D. W., W. H. Reissig, and C. A. Shoemaker. 1985. Phenology and management of the obliquebanded leafroller (Lepidoptera: Tortricidae) in apple orchards. J. Econ. Entomol. 78: 1455-1462.
- Reissig, W. H., J. P. Nyrop, & R. Straub. 1998. Oviposition model for timing insecticide sprays against plum curculio (Coleoptera: Curculionidae) in New York State. Environ. Entomol. 27: 1053-1061.
- Reissig, W. H., J. Barnard, R. W. Weires, E. H. Glass, and R. W. Dean. 1979. Prediction of apple maggot fly emergence from thermal unit accumulation. Environ. Entomol. 8:51-54.
- Riedl, H., B. A. Croft, and A. J. Howitt. 1976. Forecasting codling moth physiology based on pheromone trap catches and

One Bushel Crates



Well built and reliable, these boxes will protect your produce. In bulk, \$5.00 each

Hamlin Sawmill

1873 Redman Rd. Hamlin, NY 14464

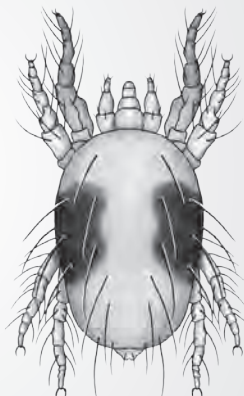
585-964-3561

art@rochester.rr.com

www.OneBushelCrate.com

- physiological-time models. Can. Entomol. 108:449-460.
- Schmaedick, M. A., and J. P. Nyrop. 1995. Method for sampling arthropod pests with uncertain phenology with application to spotted tentiform leafminer (Lepidoptera: Gracillariidae). J. Econ. Entomol. 88:875-889.
- Schmaedick, M. A., and J. P. Nyrop. 1993. Sampling second generation spotted tentiform leafminer: a means to reduce overall control costs and facilitate biological control of mites in apple orchards. NY Food & Life Science Bulletin No. 143, 4 pp.
- Smith, T.J. Smith, T.J. 2000. Cougarblight fire blight infection risk assessment model. Washington State University <http://www.ncw.wsu.edu/treefruit/fireblight/2000f.htm>
- Stensvand, A., Eikemo, H., Gadoury, D.M., and Seem, R.C. 2005. Use of rainfall frequency threshold to adjust a degree-day model of ascospore maturity of *Venturia inaequalis*. Plant Dis. 89:198-202.
- Stensvand, A., Gadoury, D.M., Amundsen, T., Semb, L., and Seem, R.C. 1997. Ascospore release and infection of apple leaves by conidia and ascospores of *Venturia inaequalis* at low temperatures. Phytopathology 87:1046-1053.

Juliet Carroll is the Fruit IPM Coordinator for the NY State IPM Program at Cornell University in Geneva and is the NEWA Project Leader. **Timothy Weigle** is the Grape IPM Area Educator for the NY State IPM Program and is located at Portland, NY. **Curt Petzoldt** is the Assistant Director of the NYS IPM Program and is located at Geneva, NY.



For effective control of all mite life stages in tree fruit

Nexter[®]
Miticide/Insecticide

European Red Mite · Twospotted Mite · Apple Rust Mite · Pear Rust Mite
Fast Knockdown · Application Flexibility · Long Lasting Control

Gowan[®]
The Go To Company

An American family owned and operated company focused on superior crop protection products
For more information: Dave Pieczarka · (315) 447-0560 · www.gowanco.com

Nexter[®] is a registered trademark of Nissan Chemical Industries, Ltd. EPA Reg. No. 81880-4-10163. Always read and follow label directions. AD11-Nexter_nyfq 020411