Northeast IPM Center Partnership Grants Program
IPM Working Group Priorities Final Report

2004 New England Pest Management Network

A. Grant Data

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Project Directors:
University of Maine
Glen Koehler
Associate Scientist Integrated Pest Management
Pest Management Office
491 College Avenue
Orono, ME 04473-1295
Voice: 207-581-3882, Fax: 207-581-3881
Email: gkoehler@umext.maine.edu

Dr. James Dill
Pest Management Specialist
Pest Management Office
491 College Avenue
Orono, ME 04473-1295
Voice: 207-581-3879, Fax: 207-581-3881
Email: jdill@umext.maine.edu

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$ 7,500 salary
$ 3,300 purchase weather data
$10,800 total

C. Introduction.

One of the defining characteristics of IPM is choosing interventions based on situation-specific need rather than following prescribed one-size-fits-all responses to pest threats. This principle is implemented through monitoring methods to determine the significance of a threat. Another aspect of IPM is to maximize the function of naturally occurring biological pest suppression through minimizing the use of pesticides that by their very design disrupt natural systems.

Except for greenhouse production, most food crop and ornamental plant pest management takes place outdoors where ever-changing environmental conditions determine the severity and timing of insect, disease, and weed threats. Pest managers understand this concept, and many of their daily decisions are made by informal rules of thumb, such as "an apple scab fungicide application is good for 7 days of growth or 2 inches of rain, whichever comes first." In addition, much research has been done to understand the relationship between temperature, rain and other weather variables and pest management needs.

But the application of "rules of thumb" is limited by the amount of detail pest managers have on recent and upcoming weather conditions. This puts IPM practitioners into a reactive mode where the number of options is limited by urgency. Early notice of pest management needs enable more strategic consideration of a wider range of IPM options. Likewise, research findings on weather-pest relationships have not been well utilized for day-to-day decisions. To do so requires real-time site-specific weather data with formulas that represent the known relationships to translate weather data into management guidance.

Farmers and other pest managers have many other responsibilities with finances, labor, sales, regulations, maintaining equipment, and agronomic/horticultural decisions. Pest management decision making has to take place in context with those other demands. Adding meteorology and additional equipment and data management tasks to an already complex set of responsibilities is not practical for many, if not most, IPM practitioners. Prior to the PRONewEngland pest models, biological understanding of pest - environmental relationships had not been combined with site-specific conditions to translate research into practice. The pest tracking/forecast models make the connection to put research into practice.

Apples are an important, but threatened, crop in New England. According the 2002 Census of Agriculture and New England Agricultural Statistics Service reports for 2003 and 2004, there are 16,910 apple orchard acres with annual production valued at $48–60 million. Potatoes (68,532 acres, $115,000,000 annual value), and other vegetables – including sweet corn , tomatoes, onions, and cabbage (29,414 acres, $116,000,000 annual value) are also important New England crops.

Each of these crops is subject to 100% crop failure from one or more pests. But

pesticide use on these crops incurs financial and other costs. In general, these crops are grown with higher yield and efficiency in other parts of the country and world. Global competition keeps wholesale prices low, and forces producers to minimize variable costs such as pest management, as much as possible. In order to remain economically viable, where possible, many New England producers have turned to retail marketing which offers higher returns to the grower, and a closer relationship between the grower and the end customer. This closer relationship brings with it customer awareness of pesticide use as a factor in marketing. Thus, pesticide use reduction is driven by direct financial and market opportunity costs.

It is more difficult to gauge the diffuse and aesthetic value of pest management guidance for home horticulture. With 2003 greenhouse and nursery sales at over $495,000,000 and over 14 million New England inhabitants, there can be no doubt that home horticulture is a significant pest management venue.

Promoting IPM implementation is at the heart of the New England Pest Management Network and Northeastern IPM Center mission. Pest tracking and forecast models allow pest managers to assess current and upcoming threats and give them real-world feedback on how previous pesticide applications can be expected to last. These tools empower fuller more effective use of IPM.

D. Objectives and Progress.

1. Provide daily updates for pest and crop phenology forecasts for tree fruit, vegetable, and woody ornamental pests at ten New England locations.

Infrastructure was completed for capture and processing of weather data for 13 sites in New England, plus 4 more sites in New York and New Brunswick, Canada was completed, i.e. a total of 17 sites.

For apples, a suite of individual 46 web model pages covering different aspects of 20 pest and horticultural issues was republished three times a day for the entire 2004 growing season. In addition, there were 17 different weather charts and tables, including a unique graphical display of the 5-day forecast and tables of degree day accumulations compared to historical norms for each month.

Progress was made on New England models for ornamental plant and vegetable insect and disease pests, but development was not complete enough to begin daily publishing in 2004.

2. Provide public access to the "Agfleet" regional pest forecast models.

PRONewEngland.org provided a link to the Agfleet models generated by a separate national project headquartered in Pennsylvania. These models provided developmental forecasts for major vegetable crops and pests.

E. Approach.

By centralizing and automating weather data capture, analysis, and presentation, the PRONewEngland pest models provide new and valuable tools for IPM decision makers that they did previously have available at any cost. What makes the system even better is that it is not based on brittle high-end programming needing constant intervention and end user support. The system uses off-the-shelf software (Microsoft Excel and web server on the supply side, an internet connection and a web browser is all that is needed on the user side). The use of common components not only makes the system technically reliable, it also provides makes it operationally robust and inexpensive. There is no need for high priced programmer maintenance on the supply side. Once built, the models run automatically for as long as directed. On the user side, there are no support costs because there is no unique software on the user end to support.

The existence of the models was made known through Extension tree fruit newsletters in each of the six New England states. A presentation was made at the 2004 New England Fruit Meeting. (PowerPoint presentation is included as an email attachment.)

F. Results and Impacts.

The apple pest models are being used by the Extension apple IPM programs in each of the six New England states. Model estimates are regularly cited in newsletters published to alert growers to current conditions. While not of the New England target audience, models run for two site in New York are now featured in each issue of the widely read Cornell Scaffolds tree fruit pest newsletter.

In a statistically rigorous Dillman method survey of New England apple growers in the fall of 2004, 23% of apple growers responded that they "used pest forecast and tracking models and equipment to determine need or adjust timing for sampling or control measures."

Web traffic statistics from 2004 are not available because of technical problems with the server. These problems have been corrected and 2005 traffic data are available. This analysis excludes all automated computer-to-computer activity. (Web traffic analyses that do not filter out such traffic will have inflated activity indicators.) The full 2005 model web traffic report is included as an email attachment.

In 2005, the PRONewEngland pest forecast pages had 3,634 unique visitors; 7,238 visitor sessions; and 24,889 page views. The number of pages viewed per visitor was 6.8.

Of the 3,634 unique visitors, 501 visited more than once during the 2005 growing season, 176 visited five or more times, 78 visited ten or more times. For comparison, a fall 2004 mail survey that used pre-survey notification cards to every grower on Extension mailing lists of the six states, survey mailings to each name, second reminder cards, and second survey mailings to non-respondents. This survey generated 170 replies from people growing apples in New England.

The fact that 176 visitors used the apple pest models five or more times in 2005, compared to 170 replies to quadruple requests for responses to every name on the Extension tree fruit mailing lists, suggests high awareness and use of the models by commercial orchardists, but we do not have independent direct survey data to verify that assumption. Interested home orchardists no doubt account for some portion of the frequent visitors to the web models. Either way, the models were used.

The 23% of the mail survey respondents reporting that they use pest models may be an undercount. It may be that some portion of the survey respondents interpreted that question as referring to their own direct use of pest model computer software. In responding to the survey, growers may not have considered referring to web pages as "use of a model" since it is something they would do along with checking email newsletters and other internet resources, not a separate activity.

Anecdotal reports from individual growers who use the models suggest that the information helps them to improve crop protection while minimizing pesticide use. A pest model user survey is planned for 2007 to document user characteristics and benefits.

An unanticipated development was the online models becoming an integral part of a University of Massachusetts Northeast IPM grant: "Biobased Methods of Reducing Insecticide Use Against Key Apple Pests." The two-year demonstration phase of this grant involved cooperators in five New England states and New York. The project protocol called for use of the PRONewEngland models as the criteria for determining the need for re-applying insecticide in the IPM test plots.

Developing and operating the models was more time consuming than anticipated. While the models only require a few observation dates for to recalibrate estimates to observed conditions, finding a reliable and prompt contact person for each site emerged as a requirement.

G. Appendices.

1. PowerPoint December 2004 presentation on pest modeling
2. Web traffic analysis for 2005 apple pest models