Final Report
USDA Northeast IPM Competitive Grants Program
August 25, 2008

A. Grant Data

- Title: **Promoting IPM Implementation in Greenhouses: Banker Plants, Grower Education and an Assessment of Consumer Attitudes**
- Lead investigator (name, title, institution, address, phone, fax, email):
  Margaret Skinner
  Entomology Research Laboratory, The University of Vermont
  661 Spear Street, Burlington, VT 05405-0105
  Tel: 802-656-5440 Fax: 802-656-5441
  Email: mskinner@uvm.edu
- Team members (name, title, institution):
  Cheryl Frank, Teri Hata,
  The University of Vermont, Entomology Research Laboratory
  Cheryl Smith & Alan Eaton, The University of New Hampshire
  Bruce Watt, University of Maine Extension System
- State(s) involved: **Maine, New Hampshire, Vermont**
- Years funded: **5/15/2005-5/14/2008**
- Funding amount: **$86,743**

B. Nontechnical Summary. Overview outlining context and key components f*or lay audience.*

The goal of maintaining productivity and profitability while reducing pesticide use in greenhouse crops is challenging. Greater adoption of IPM practices is essential to meet this challenge, yet lack of time, knowledge, and perceived costs are barriers to broader implementation. This project will promote ways of decreasing reliance on chemical pesticides by increasing opportunities to use biological controls, providing IPM education for growers, and assessing the public's awareness and appreciation of IPM, and its value to them and the environment.

C. Introduction. An introduction to the project of approximately *500 words.*

Historically, dairy farms have dominated the rural landscape in the Northeast, but this traditional farming sector is declining as production agriculture becomes more diversified. In contrast, the greenhouse industry is expanding, and has become a vital component of the Region's agricultural economy. In fact, revenues from greenhouse crops far exceed that of any other crop commodity in the Northeast, with annual sales in excess of $551 million in New England alone. Public demand has driven this expansion, as people seek to beautify their homes and gardens with flowering plants.

Arthropod pests and diseases limit productivity and economic returns in greenhouse crops. Growers rely heavily on conventional pesticide-based strategies for their control. The compounds used pose a risk to applicators, consumers and the environment, and there are many negative aspects associated with extensive pesticide use. Repeated pesticide applications can also adversely impact plant physiology and appearance.

Thrips, aphids and spider mites remain the most significant persistent insect pests in greenhouse ornamentals and bedding plants. The specific economic losses associated with these pests are unknown. However, growers repeatedly ask what non-pesticide strategies are available for their management. Concerns are regularly expressed regarding the potential for pesticide resistance to develop in these pest populations.

The goal of maintaining high levels of agricultural productivity and profitability while reducing pesticide use presents a significant challenge. Research and outreach efforts must focus on increasing IPM implementation on all crops–strategies that emphasize cultural and biological controls as the main defense against pests but include the judicious use of pesticides. IPM reduces risks associated with pesticides, yet growers assert that they must use these materials to meet consumer demands for 100% pest-free plants. To be successful, control agents and IPM programs that are appropriate to local conditions must be developed. Generic IPM techniques developed for large, year-round facilities in southern states – where pests may be year-round rather than seasonal threats –are often not applicable to small, family-run greenhouse operations that are predominant in the Northeast. Furthermore, if not accompanied by appropriate extension and outreach activities, they will have little chance of adoption. Educational efforts must not only target growers, but also consumers. Consumers are a driving force in our market society; if, through education about the value of IPM-grown crops in terms of human health and environmental quality, consumer demand could be created, this would serve as a valuable incentive for growers to implement IPM.

Adoption of IPM is essential to ensure that high-quality plants are produced, the greatest revenue generated, and the least amount of chemical insecticide used. Time, knowledge (or lack of), and ease of implementation are the greatest barriers to the wider adoption of IPM techniques. This project will promote ways of reducing risks associated with pesticide use. The research components address issues related to the cost and quality of natural enemies and novel strategies for their greenhouse use. Outreach/extension activities promote grower education and document consumer knowledge and attitudes about IPM.

D. Objectives. Restate objectives. and provide a brief narrative about whether you've achieved it; if it was modified, mention how.

1. Evaluate the use of banker plants for production of predatory mites in spring bedding plants. **Research for this objective is complete**. **The data has been analyzed and a manuscript reporting the results is in progress.**
2. Assess the quality of natural enemy shipments received at different times of the year from Regional and National distributors. **Research for this objective is complete**. **The data has been analyzed and a manuscript reporting the results is in progress.**
3. Develop, organize, and conduct hands-on IPM training programs for greenhouse growers in ME, NH and VT. **Workshops were held in January 2006, 2007 and 2008 in Maine, New Hampshire and Vermont.**
4. Conduct follow-up surveys at garden centers in ME, NH and VT to determine changes in consumer attitudes and knowledge about IPM. **This objective was completed in spring, 2008**. **The data has been analyzed and a manuscript reporting the results is in progress.**

E. Approach. *Briefly, in 1-2 paragraphs,* describe your approach, the methods used, and the overall design of your project.

Lack of time, knowledge, and ease of implementation appear to be the greatest challenges to increased adoption of IPM practices in greenhouse ornamentals. The research objectives evaluate banker plants for in-house production of natural enemies to provide a steady supply for control of spider mite in spring bedding plants. Cost, quality and availability are factors currently limiting growers' use of natural enemies. Banker plants reduce the need for multiple releases, and ensure a resident population is present should a pest outbreak occur. Few inputs are needed to achieve long-term suppression. The cost of shipping natural enemies is often higher than the cost of the beneficials themselves. Costs can be reduced by using ground shipping, which is one-third the price of overnight shipping. However, this can take 1-2 days longer, and it is unknown how this would affect the quality of the natural enemies received by the grower.

An assessment was made of the quality of predaceous mites used over a growing season by ordering natural enemies from three distributors and shipping via these two methods. We will distribute an informational pamphlet reporting results of our research, outlining methods to evaluate the viability of shipments. In the extension component of our proposal, we addressed grower-identified needs by offering effective hands-on educational IPM workshops, drawing on the expertise of specialists in Europe and North America. A survey of customers at garden centers and nurserys was conducted in Maine, New Hampshire, and Vermont. This provided valuable information about the knowledge level the public regarding IPM. In addition, through this survey public awareness about the value and benefits of IPM was raised. Understanding the criteria people use when purchasing a plant, and influencing these criteria, will play a key role in creating demand for IPM-grown plants.

F. Progress. *Describe, in 1-2 paragraphs, progress made over the life of the project.*

Early intervention is critical for successful biological control. We assessed banker plants as a reservoir for biological control agents. Banker plants serve as a food source, by producing pollen. These systems can be a cost effective means of providing a continuous supply of beneficials, which spread throughout the greenhouse. In 2005-2007 banker plants were tested in a 30x30 m research greenhouse containing bedding plants, managed according to better management practices (BMP), where pesticide applications were used sparingly as a last resort, relying on biological control when possible. Two varieties of marigolds and green pepper were tested as banker plants for sustaining predatory mites to control spider mite pests. The ability of the predatory mites to survive over the season on the plants was assessed. In addition, the ability of these plants to maintain the spider mite pest populations at low levels was also evaluated.

Biological control agents must be healthy and released in sufficient numbers to be effective. Natural enemies are commonly shipped long distances under adverse conditions which may reduce survival. The quality of shipments of three predatory mite species, *Amblyseius cucumeris, Hypoaspis miles*, and *Phytoseiulus persimilis*, were assessed, using different methods to determine the number of live mites per shipment.

Greenhouse IPM workshops were held in ME, NH and VT in January, 2006, 2007 and 2008, attended by about 150 growers, extension personnel and pest specialists annually. Insect and disease specialists presented IPM information focused on practical approaches to reduce grower reliance on chemical pesticides. Growers presented their IPM successes and challenges. This session is effective for stimulating discussion among growers.

A customer survey was conducted in ME, NH and VT in April and May 2008 to gain an undestanding of what consumers look for when purchasing bedding plants and ornamentals and assess their knowledge of IPM.

G. Results. Provide a brief explanation of your results *in 1-2 paragraphs*. Include a discussion of any unexpected events that seem noteworthy.

Three types of banker plants were assessed: Lemon gem marigolds, Hero yellow marigolds, and green pepper, as a reservoir for the predatory mites, *Amblyseius californicus* and *A. fallacis*, used against spider mites. In 2006, populations of the pest and predaceous mites were sustained on banker plants when both were released. However, insufficient control of the pest was achieved by the predators resulting in heavy mite damage. In 2007, we evaluated the ability of these three plant types to sustain predatory mites with their pollen in the absence of spider mite prey. Predator populations were determined with visual inspection and plant tapping. Predatory mites were sustained at higher levels on the Hero yellow marigolds than on the other two plant types tested. Blossoms were taken from each plant type and dissected to determine residual populations after visual and tapping

inspection. Significantly more mites were found in blossoms than from the visual inspections or plant tapping, indicating that standard scouting procedures used to monitor predatory mites underestimates the population level. In addition, more predatory mites were sustained in Hero yellow blossoms than on the other two plant varieties, demonstrating that over time, predatory mites can be sustained without prey on pollen from this variety of marigold. Although predatory mites were sustained on the banker plants, as in the other years of research, western flower thrips became a serious problem on the plants. Thus, predatory mites released on banker plants was insufficient alone as a method of managing pests on bedding plants and ornamentals. A more comprehensive IPM approach is needed.

Natural enemies are often shipped long distances in adverse conditions which may reduce their effectiveness. They must be released in sufficient numbers and be healthy to be effective. We assessed the quality of shipments of three predatory mites: *A. cucumeris*, *Hypoaspis miles* and *P. persimilis*. Our data showed that survival was greatest for *H. miles*. Using *P. persimilis* as a test agent, a visual count method growers could use to assess shipment quality was compared with Berlese funnel results. We found that a visual count provided results similar to those from the Berlese funnel, suggesting that growers could effectively evaluate mite shipments for survival. When mite survival following overnight shipping was compared with that after standard ground shipping, results indicated that mite survival was slightly higher following overnight shipping for all three mite species. The difference was most noticeable for *P. persimilis*, which had the lowest overall survival rate. *P. persimilis*, which is a voracious predator, is typically shipped with low numbers of spider mite, which may be consumed before release. *A. cucumeris* is shipped with bran mites as prey, which is typically not consumed before release. Though overnight shipping is expensive, it may be recommended for shipping *P. persimilis*, whereas overnight shipping may not offer a great advantage in terms of survival for *A. cucumeris* and *H. miles*.

Greenhouse IPM workshops were held in ME, NH and VT in January 2006, 2007 and 2008 attended each year by ~150 growers, extension personnel and pest specialists. Insect and disease specialists from northern New England and Canada presented IPM information focused on practical approaches to reduce grower reliance on chemical pesticides. We initiated what we called a Grower-to-Grower session whereby 1-2 growers presented their IPM successes and challenges. This session proved to be very effective for stimulating discussion among the workshop participants. Based on feedback in the evaluations, growers indicated it was generally useful to hear about experiences of other growers (see summary evaluations from 2008 workshop participants, and summary for the past 3 years in appendix).

In spring, 2008, a customer survey was conducted at several garden centers and farm stands in Maine, New Hampshire and Vermont to gain an understanding of what consumers look for when purchasing bedding plants and ornamentals and assess their knowledge of IPM. Surveys were conducted at large garden centers and small non-organic market gardens. The results provide insights into what factors influence consumer purchasing patterns, especially as they relate to IPM. Of the customers surveyed only 18.9% had heard the term IPM or Integrated Pest Management and could provide a definition. Among those who had heard of IPM, when asked what it meant, 26.5% gave an accurate definition (i.e., that it is a production system using multiple tactics, including chemical pesticides if necessary.). Over 59% thought it meant specifically using biological control. Over 32% thought it meant never using chemical pesticides. After hearing what IPM meant, over 69% said they would be willing to spend more for IPM-grown plants. (25.9% said 10% more, 20.9 said 20% more). When asked if they would be willing to drive further to purchase IPM-grown plants, 51.4% said no. Based on these findings, growers can develop strategies to increase their competitive edge by promoting their use of IPM. The survey also documents the public's current knowledge level about IPM. For this survey IPM was defined simply as the use of multiple production and pest control practices to produce healthy plants with as few chemical pesticides as possible.

H. Impacts. Describe and assess the impacts of your work--highlight the value of IPM research and education and the real-world impacts of project. Below are some questions that will guide you in assessing the impacts of your project. The relevance of each question may vary depending on whether yours is a research or extension project. Please answer as many as you can to the best of your ability, and feel free to discuss any impacts not mentioned below.

Growers need cost-effective and efficient methods to replace routine chemical pesticide sprays with biological control for management of their serious arthropod pests. They also need opportunities to learn about these novel IPM strategies. Through this project we investigated practical approaches to maximize the benefits and reduce the cost of the release of natural enemies by using banker plants. Our results show that indeed this approach can sustain natural enemies in a greenhouse in the absence of prey. These findings were disseminated through hands-on grower workshops held in ME, NH and VT every January. Growers indicated that this type of applied research is exactly what they need to increase implementation of IPM. They frequently tell us that the workshops we offer are the most useful for learning new methods to expand IPM use in their greenhouses and are the reason they are using biological control today. Twenty percent more growers this year indicated they use banker plants compared with last year (based on participant evaluations). This suggests that our workshops had a significant impact on grower behavior in this area of pest management.

1. *Safeguarding human health and the environment:*
   - **a.** Are there new IPM practices that have been or could be adopted as a direct result of your project? What is the total number of acres (or homes, schools, greenhouses, nurseries) on which these practices could be implemented? **This research demonstrated that marigolds have value as an indicator and banker plant. We learned that some growers who attended the workshops are now using marigolds as an additional means of early detection. The value of using of banker plants in conjunction with predatory mites is still uncertain based on our results. However, other types of banker plants are being adopted by growers based on information presented at our workshops.**
   - **b.** Has the project reduced risk (or could it potentially do so) by changing the use of pesticides on farms, or in homes, schools, etc.? For example, could it result in fewer sprays per season or a switch to lower-risk pesticides? **Yes. One grower who took part in our study is now using marigolds to detect thrips early. Because he made a spot spray to eliminate a small infestation, he reduced his overall use of chemical control. Another grower initiated use of banker plants combined with a parasitoid for aphid management, which enabled him to eliminate all chemical sprays on his vegetable starter plants.**
   - **c.** Are there any other impacts on human health or the environment as a result of your project? **The IPM brochure we designed has been given to growers throughout northern New England, who in turn are distributing them to their customers. This encourages homeowners to use IPM rather than relying heavily on chemical pesticides and will reduce their exposure to pesticides.**

2. *Economic benefits:*

   a. What is (or could be) the economic benefit (e.g., dollars saved) for clientele who adopt IPM strategies and systems you studied? Do you envision potential commercialization or mass production of these systems? **It is premature at this time to determine the economic benefit of the banker plants to growers. First we have to determine if they are effective.**
   b. How many IPM personnel might be employed as a result of your work? (e.g., private consulting services, nursery operators, food service growers) **Ideally a scout would be employed to assist in the maintenance of the banker plants and to ensure that pest populations are monitored regularly.**

c. How many clients are satisfied with IPM results (such as improved yield, quality of yield, reduced pest populations, more effective pest control, greater preservation of nonpest species)? **At least 94% of the growers who attended the workshops indicated they would try new IPM techniques this year as a result of learning about them from our program.**
d. Are there other financial benefits that might be realized as a result of your project? **With help from growers we are spreading the word to consumers about the positive aspects of IPM, and why it is worth purchasing IPM-grown plants. In time, this will hopefully result in increased revenues for growers who market their crops as IPM-grown.**

3. Implementation of IPM:

a. How many IPM strategies and systems have been validated through this project? **One strategy, banker plants, is being tested in research greenhouses.**
b. How many educational materials were delivered? **9** To whom? **Greenhouse growers and Extension specialists and educators who attended the workshops**
c. What is the number of growers/personnel trained? **480**
d. For a website, what volume of traffic and type of use has the site experienced? **Not applicable.**
e. How many more people adopted IPM practices as a direct result of your project, or how many people adopted new IPM practices? **Over 90% of the growers who attended the workshop indicated on their exit evaluations that they learned techniques they planned to use in the coming year. For example, several growers indicated they would use banker or habitat plants, others said they intended to implement better sanitation and preventative control programs.**
f. Are there other ways in which your work will result in improved use or increased implementation of IPM strategies in your region or across the Northeast? **Yes, growers were encouraged to distribute brochures about IPM. These included recommendations on how homeowners could implement IPM. Though there is no way to directly determine how many heed these recommendations, the information is being disseminated.**

4. Has your project or study enhanced collaboration among stakeholders interested in the development and implementation of improved IPM strategies and systems? (e.g., number of growers or other stakeholders that have participated in advisory committees, surveys).

The Tri-state Greenhouse IPM Advisory Group has worked together for over 10 years, putting on cost-effective workshops together. These workshops would not occur without external funding from organizations such as NEIPM. In recent years, Dr. Bruce Watt, Univ. of Maine Extension System, has assisted with the workshops and has become an integral part of the Advisory Group. We also enlisted Dr. Timothy Schmalz, plant pathologist for the VT Depart. of Agric. Who continues to participate in workhops in Vermont.

I. Appendices. Please attach to your report any of the following that will enhance our understanding of your project and its impacts:

• Photographs **Provided them in the past, nothing new this year.**
• Any presentations, such as in Powerpoint, resulting from this project. **Program and list of presenters for the 2008 Greenhouse IPM workshops are attached.**
• Printed fact sheets or other publications resulting from your work.

- Frank, C., M. Skinner and B.L. Parker. 2006. Commonly Used Predatory Mites for Greenhouse Biological Control Fact Card. Univ. of VT, Entomology Research Laboratory, Burlington, VT.
- Frank, C., M. Skinner and B.L. Parker. 2006. Predatory Mite Fact Card. Univ. of VT, Entomology Research Laboratory, Burlington, VT.
- Frank, C., M. Skinner and B.L. Parker. 2006. *Delphastus* Fact Card. Univ. of VT, Entomology Research Laboratory, Burlington, VT.
- Frank, C., M. Skinner and B.L. Parker. 2006. *Eretmocerus* Fact Card. Univ. of VT, Entomology Research Laboratory, Burlington, VT.
- Frank, C., M. Skinner and B.L. Parker. 2008. Greenhouse Integrated Pest Management (IPM) at the University of Vermont Entomology Research Laboratory: Summary of Current & On-going Research 2007-2008.
- Frank, C., M. Skinner and B.L. Parker. 2007. Greenhouse Integrated Pest Management (IPM) at the University of Vermont Entomology Research Laboratory: Summary of Current & On-going Research 2006-2007. Univ. of Vermont, Burlington.
- Frank, C., M. Skinner and B.L. Parker. 2006. Greenhouse Integrated Pest Management (IPM) at the University of Vermont Entomology Research Laboratory: Summary of Current & On-going Research 2005-2006. Univ. of Vermont, Burlington.
- Frank, C., M. Skinner and B.L. Parker. 2006. Habitat & Banker Plant Systems for Greenhouse IPM: 2005 Summary of Results & Future Plans. Univ. of Vermont, Burlington.
- Skinner, M. and B.L. Parker. 2008. Summary Public Perceptions about Integrated Pest Management: 2008 Consumer Survey of Maine, New Hampshire & Vermont Results Summary. Univ. of Vermont, Burlington.

A hard copy of these educational materials is being sent, as the file would be too big to include them in the report. Information relating to the 2008 Workshop (summary of participant evaluations and program) and the results from the customer survey appears below.

How to submit: electronically, as an attached MS-WORD file, to ckk3@cornell.edu and to jea@psu.edu. If you have questions, contact Carrie Koplinka-Loehr, 607-255-8879.

Public Perceptions about Integrated Pest Management

2008 Consumer Survey of Maine, New Hampshire & Vermont

Results Summary

By Margaret Skinner & Bruce L. Parker
The University of Vermont
Entomology Research Laboratory
661 Spear Street, Burlington, VT 05405-0105

August 2008

Over the summer, 260 customers at 25 garden centers and farm stands in Maine, New Hampshire and Vermont were surveyed to gain an understanding of what consumers look for when purchasing bedding plants and ornamentals and assess their knowledge of Integrated Pest Management (IPM). Two types of retail sites were selected, large garden centers/nurseries and small non-organic market gardens at which to conduct the surveys. The results provide insights into what factors influence consumer purchasing patterns, especially as they relate to IPM. Based on these findings, growers can develop strategies to increase their competitive edge by promoting their use of IPM. The survey will also document the public's current knowledge level about IPM. For this survey IPM was defined as the use of multiple production and pest control practices to produce healthy plants with as few chemical pesticides as possible.

Results

- Most of the customers surveyed were women **(79.2%)**, 26 years old or older [26-45 years old **(23.1%)**, 46-65 years old **(39.2%)**] and lived within 10 miles of the garden center or greenhouse **(51.5%)**.

- When customers were asked how much they spent annually on plants (averaged over the past 3 years), **6.9%** said ≤$50, **14.2%** said $50-$100, **11.9%** said $101-150, **23.5%** said $151-200, **30.7%** said $300-500. A few respondents said they spent several thousand dollars every year.

- Customers purchased plants primarily for their color **(41.5%)**, quality **(31.9%)**, and how healthy they were **(22.7%)**. Other important factors included ease of care (**20.0%**), the variety (**17.7%**) and cost (**15.0%**).

- When asked why they selected that location to purchase their plants, the following responses were commonly given: a wide variety of plants were offered **(39.6%)**, it was close to their home **(33.5%)**, plants were of high quality **(25.0%)**, and they had been there before and liked it **(19.23%)**. The method of production to grow the plants (i.e., IPM or organically grown) was rarely given as a reason for shopping there.

- Of the customers surveyed **18.9%** had heard the term IPM or Integrated Pest Management, and could provide a definition. Around **7**% of customers said that they had heard of IPM but were unable to define it.

- Among customers who had heard of IPM, when asked what it meant to them, **26.5%** gave an accurate definition for IPM (i.e., that it is a production system using multiple tactics, including chemical pesticides if necessary). Many thought it meant specifically using biological control **(59.2%)** or never using chemical pesticides **(32.7%)**. About **20%** thought it was the use of companion plants to repel pests.

- After hearing a standard simple definition of IPM, over **69%** said they would be willing to spend more for IPM-grown plants. When asked how much more, **10.8%** said less than 10% more, **25.9%** said 10% more, **20.9%** said 20% more and **7.3%** said over 20% more.

- When customers were asked if they would travel further to purchase plants grown using IPM, **51.4%** said no further, **13.9%** would travel less than 5 miles further, **12.0%** said up to 10 miles further, and **8.5%** would travel over 20 miles further. The high price of gasoline was commonly given as the reason they wouldn't travel further to purchase IPM-grown plants.

- When asked if they would purchase plants containing insects if they were beneficial, **77.2%** said yes. Of those who were not willing to buy plants with beneficial, **40.7%** said they didn't like bugs, **15.3%** were afraid the bugs would eat their other plants, **11.9%** said they wouldn't want bugs in their house, but might be willing to have them outside, and **17.0%** said they wouldn't know good bugs from bad one, and thus would need to be more educated about beneficials before purchasing plants with bugs on them. Respondents stressed the value of informing the public about beneficial insects, and suggested it might be a positive selling point for customers.

This survey was supported in part by the following sources: The USDA Northeast IPM Competitive Grants Program, The Vermont Greenhouse IPM Program and Extension System. Special thanks to Meagan McKenna and Judythe Parker for their assistance with conducting the survey. We also extend our appreciation to the growers who allowed us to carry out the survey at their business.

2008 Tri-state Greenhouse IPM Workshops, January
Executive Summary of Participant Evaluations

This year marks eleven years of holding our greenhouse IPM workshops in Maine, New Hampshire and Vermont, affectionately termed the "Traveling Road Show". As in past years, feedback from the attendees was generally positive and always constructive. It is clear from their written comments and personal conversations, these workshops are directly responsible for reducing grower reliance on chemical pesticides and increasing their use of biological control and biorational compounds. The evaluations clearly show we are having an impact on grower practices that is good for the environment and human health. This success would not be possible without our Tri-state collaboration involving growers, state Departments of Agriculture and the Extension systems. From its inception, this educational experiment demanded significant effort and dedication by the collaborators. This year we held the Vermont workshop in the southern part of the state. This was in response to participant comments that the drive to Burlington hard for growers in the south. Despite our efforts to reach growers in other parts of the state, we found that registration was down this year in Vermont, which may be that many of the loyal northern growers were unwilling to make the trip. In future years we may want to rotate the venue to different regions of each state to reach a different group of growers, though this does create different challenges for the organizers. The program this year focused on the basics of pest, beneficials and disease id. We assumed that more experienced growers would find it too basic, but in fact many of the participants were growers who had attended in other years. They said it was very useful to get this refresher course on identification. In the past growers who attended our workshops made it clear that IPM and biological control, though interesting, was not for them. In contrast, now most growers at these workshops are using IPM to a great extent and a large percentage are using biological control. Many growers indicate that they are using biological control because they learned about it and gained confidence in it from our workshops. Extension administrators often want or expect to see quick impacts. The results of these workshops show that it takes time to change grower practices. Growers need to hear an idea more than once, and even more important, to see and touch it, before they try it themselves.

<u>General Summary and Quotable Quotes</u> (in case you don't have time to read the full evaluation summary)

- 82% of the workshop attendees were greenhouse growers.
- In all states we had fewer attendees than last year, most likely as a result of providing 'basic' material. We reached over 115 people, including the presenters.
- 97% of the growers indicated that they learned new IPM techniques they would use this year.
- Many growers said they will try or used indicator plants or banker plants this year, a major focus of the workshops. This shows the message got through.
- 75% of the growers indicated they made new contacts. Many said they appreciated this opportunity to meet with other growers.
- Averaged over all of the individual sessions, growers gave the workshop program a ranking of 4 out of 5, about the same as the last two years.
- In general growers recognized the expertise and knowledge of all of the presenters, and appreciated the efforts we made to transfer IPM information to them.
- Many growers expressed their desire for more hands-on formats. This is definitely how these growers learn best. Growers don't like them. We must find effective ways to reach them without PowerPoint when possible. Our growers are doers--they learn by doing.
- Most growers liked the Grower-to-Grower sessions, though it is always an unknown how well they will go. It all depends on how the growers respond.
- Growers appreciated hearing what's going on for research in our region. They like knowing that their universities are doing research that addresses issues they face in their greenhouses.
- Last year we realized there was a significant gap between new learners and advanced growers. It is difficult to meet the needs of both levels of learners with the same program. This year we offered a workshop for "novices", with basic pest and disease ID and IPM principles. We lost some advanced growers, but many veterans claimed the basics were very useful as a refresher.

- The sessions were shortened this year in response to comments last year. Some claimed they still got tired, uncomfortable and overloaded with information, yet others suggested longer sessions extending for more than one day.
- Growers listed many topics they would like to learn about. A few common subjects mentioned were: quality assessment of biocontrols for growers, info on more specific biocontrols, more disease diagnostics, cost analyses of IPM/biocontrol, and specific guidelines for using biocontrol (the cookbook approach).
- A high percentage of growers use biological control: ME: 45%; NH: 67%; VT: 62%. The growers that attend these workshops may not be representative of all the growers in our states. There are thousands that don't make our events, but it does show there are a lot of growers who are shifting away from chemical control, and many of them are doing it because they learned about it and gained confidence in it at our workshops. You all deserve to feel proud of that!
- 20% more growers this year indicated they use banker plants compared with last year. This suggests that last year's workshop had a significant impact on grower behavior in this area.

Summaries for 2006 and 2007 workshops were submitted in previous reports. A summary of the evaluations over the past three years follows on page 13.

AGENDA

TRI-STATE GREENHOUSE IPM WORKSHOP

Wednesday, January 9, 2008
Longfellow's Greenhouses, Manchester, ME
(Similar program was used in New Hampshire and Maine)

8:30 - 9:00 **Registration & Coffee**
Cheryl E. Frank – Univ. of Vermont

9:00 - 9:15 **Welcome - What is IPM?**
Margaret Skinner – Univ. or Vermont

9:15 - 10:30 **Friend of Foe: Insects and Mites ***
Margaret Skinner – Univ. or Vermont
Alan Eaton – Univ. of New Hampshire
Michelle Ten Eyck – IPM Laboratories, Inc.

10:30 - 11:00 **Coffee Break**

11:00 - 12:15 **Friend of Foe: Diseases ***
Bruce Watt – Univ. of Maine
Cheryl E. Frank – Univ. of Vermont

12:15 - 1:00 **Lunch**

1:00 - 2:00 **Grower to Grower Discussions: Sharing Challenges and Solutions.**
Ron Paquette – Paquette Full of Posies, Williston, Vermont
Holli Andrews – Blackrock Farm, Cape Porpoise, Maine

2:00 – 3:00 **What's New for Greenhouse IPM in Our Region?**
Alan Eaton – Univ. of New Hampshire
Michelle Ten Eyck – IPM Laboratories, Inc.
Cheryl E. Frank – Univ. of Vermont

Award Door Prizes and Pesticide Credits (5 credits!)
Special thanks to the following organizations and companies, without whose help and support,

This workshop would not have been possible:

Longfellow's Greenhouses
UVM Entomology Research Laboratory
Univ. of Maine, Coop. Extension, IPM Prog.
Univ. of New Hampshire Extension, IPM Prog.
Univ. of Vermont, Extension System, IPM Prog.
Tri-state Greenhouse IPM Advisory Group
Northeast IPM Competitive Grants Program
IPM Laboratories Inc.
Gempler's
Koppert Biol. Syst.
The Green Spot Ltd.
USDA HATCH Program
Digital Blue Company
OHP
Vermont Department of Agriculture
New Hampshire Department of Agriculture
Maine Department of Agriculture
Griffin Greenhouse & Nursery Supplies
American Floral Endowment
APS Press

Tri-state Greenhouse IPM Workshops
Executive Summary of Participant Evaluations for Years 2006, 2007 and 2008

January 2008 was the eleventh year of holding our greenhouse IPM workshops in Maine, New Hampshire and Vermont, affectionately termed the "Traveling Road Show". Over these three years, we have reached at least 450 people, more than 85% of whom were greenhouse growers. Feedback from the attendees has been consistently positive and always constructive. The year 2006 marked a significant turning point. Growers that year began to state specifically that these workshops were directly responsible for reducing their reliance on chemical pesticides and increasing their use of biological control and biorational compounds. Over 60% of the attendees during these years indicated that they use biological control of some sort. These hands-on workshops are clearly having an impact on grower practices that is good for the environment and human health. This success is in large part because of the Tri-state collaboration involving growers, state Departments of Agriculture and the Extension systems. From its inception, this educational experiment demanded significant effort and dedication by the collaborators. Over the past three years we have offered a variety of programs with the goal of reaching a broad cross section of growers, and addressing issues faced by less experienced growers as well as those who have been producers for over 20 years. Programs have included sessions on pest and disease identification, novel methods of using biological control effectively (banker and habitat plants), production of plugs and plants from seed, indicator plants and reviews of current research in the region. We invited specialists from Canada and New York to participate in the workshop, providing attendees with different perspectives beyond the Tri-state region. We also initiated the Grower-to-Grower session, in which we enlisted growers to share their successes and failures with IPM. This has been a particularly popular addition to the programs. Growers often find reports from other growers to be far more credible than those from researchers or extension specialists. At least 20 growers and 10 out-of-state speakers took part in the workshops as presenters. Consistently, over 90% of the attending growers said they learned new IPM techniques they would use in the coming year, and on average 75-90% of attendees said they made new contacts that would help them in their business and IPM implementation. In addition, 20% more growers in 2008 than in 2007 indicated they are using banker plants to conserve natural enemies. Based on feedback from attendees we learned that growers prefer shorter sessions and a shorter workshop. We have always tried to fill the time full of lots of activities. Growers have made it clear that they get tired, and saturated with new information. It is more effective to plan a shorter workshop with fewer different sessions. We continue to hear that growers learn best with hands-on sessions rather than Power-point based lectures, yet it is difficult sometimes to encourage presenters to break away from the standard format. Growers also still request simple guidelines for using biological control. The complexity of these natural systems, though perhaps more effective, can be extremely challenging to implement, especially for small operations with a limited number of employees. The results of these workshops reinforce the fact that it takes time to change grower practices. Growers need to hear an idea more than once, and even more important, to see and touch it, before they try it themselves.