

SUPPLEMENT TO CRIS FINAL REPORT: Building Bridges between IPM and NRCS— Workshops and Guidelines, August 2006—August 2008

Project Summary

This two-year project, funded by USDA—CSREES, resulted in more than six hands-on workshops in four states that were attended by at least 370 growers, Natural Resources Conservation Service (NRCS) staff, Extension educators, and others. At these workshops, farmers learned how to minimize environmental impacts while improving crop yield and pest control. At the same time, IPM and NRCS professionals learned how to help growers earn financial incentives for using practices that protect the environment while managing pests. Project cooperators developed and shared handouts that were available to participants and have been posted on the Center's website on pages specifically designated for this topic: <http://northeastipm.org/nrcs.cfm>. The site contains IPM-NRCS success stories, definitions, contacts, links to existing guidelines, and information on the workshops funded by this proposal. We wrote a *Guide to IPM Elements and Guidelines*, which explains how to write checklists that will benefit NRCS and IPM audiences. Farmers who attended the workshops plan to increase their use of weed mapping, crop disease forecasting, insect traps, synthetic row covers, greenhouses, crop rotation, disease resistant varieties and pest scouting. Attendees rated the workshops high (4.5 on scale of 5) and also improved their understanding of NRCS, IPM, and how IPM fits within the framework of farm conservation planning and implementation. The Vegetable IPM Tool has been distributed to workshop participants and web audiences, whom we anticipate have begun to use it. The *Guide to IPM Elements and Guidelines*, although just released, coalesces existing knowledge into one document that may be used nationwide to encourage the adoption of IPM in audiences that previously had limited knowledge of it.

Objectives and how they were met

Objective 1. Offer four NRCS-IPM on-farm workshops demonstrating pest management practice standards and other IPM practices.

Planning via Conference Calls

We partnered with Maine, Massachusetts, Connecticut, and Maryland to plan and host on-farm workshops—the goal was one per state—showcasing successful implementation of IPM practices within the specifications of NRCS Environmental Quality Incentives Program (EQIP) programming. To build rapport among the partners on this project, the Center organized a series of conference calls. In 2006 these were held September 15, October 13, and November 27; in 2007 one was held February 7. During these calls, the six collaborators shared their goals for the workshops and the guidelines. We also invited Craig Hollingsworth from Massachusetts, recipient of an NRCS Conservation Innovation Grant, and numerous NRCS partners to join. Participation was excellent, and information was shared that kept everyone up-to-date. Topics included:

- Connecticut as an example of a successful IPM-NRCS collaboration; how it works;
- Summaries of meetings between Impress and NRCS staff in each state;
- Ideas for making the upcoming workshops hands-on;
- Offering pesticide certification credits to workshop participants;
- Format of the guidelines; point systems; incorporation of nutrient management concepts;
- How to include growers in the creation of the guidelines.

At the conclusion of our February 2007 phone call we determined that the conference calls had served their purpose and could be replaced by calls between individuals collaborators.

Goals of the Workshops

Every IPM host worked with local stakeholders to plan an IPM workshop or educational event. All four states arranged speakers; planned the agenda, food, and farm tours; and advertised the workshop (usually with help from the Center). Some states finalized and awarded pesticide credits, wrote pre- and post-evaluation tools, administered these, and analyzed the data.

Goals central to all workshops were to increase the following: IPM practitioners' understanding of NRCS terms and concepts; NRCS personnel's understanding of basic IPM concepts; the potential for future collaborations between NRCS and IPM; and the potential for successful integration of pest management concepts into NRCS projects. More specific goals are a) to identify how conservation plans can be tailored to unique on-farm environments, such as nearby streams, wells, steep slopes, sandy soils, endangered species, and other aspects needing protection; b) to help Extension educators and others to better understand conservation practices and when on-farm mitigation is necessary; and c) to help NRCS staff better understand economic thresholds, biological controls, reentry intervals, and other concepts.

Massachusetts

Of the numerous workshops Massachusetts offered with funds from this grant, the first was on June 19, 2007 at the Warner Farm in Sunderland. The day was divided into two segments: a morning session for NRCS staff (who prefer workshops during daytime hours) and an evening for growers (who need to work the fields during the day). Ten NRCS staff attended the morning in-field session and toured the farm. They participated in a hands-on scouting exercise for sweet corn (rated as extremely helpful by participants) and discussed how they are using the pest management calculator and guidesheets (IPM protocols). They also shared how they write plans for IPM. In the evening, a diverse group of 25 growers toured the farm, conducted the same scouting exercise and discussed it with the farmer, and talked about resistance management as well. See Appendix C for an evaluation.

On July 22, 2008, our Massachusetts cooperator Ruth Hazzard offered another workshop tailored to NRCS staff at the Kosinski Farm, in Westfield, MA. Attendees spent the day learning about vegetable and blueberry IPM and were extremely enthusiastic. Two concluding comments were, "Great information, great format. Thank you. These trainings are really very helpful," and "Thanks—this should be mandatory for all planners! Great if we can do it with each type of crop, over time." See Appendix C for a summary of the workshop evaluation.

Ruth Hazzard obtained funding from the EPA, Northeastern IPM Center, and other sources for *additional* workshops that greatly leveraged the impact of this grant and educated approximately 150 people in IPM techniques. For example, another workshop specifically tailored to NRCS occurred on July 24, 2007, at Foppema's Farm in Northbridge, MA. For purposes of this Building Bridges grant, we are including an evaluation of only the Warner and Kosinski workshops, but it should be noted that we delivered almost double the number of workshops that were promised in the original proposal.

Maine

Two Maine workshops were held with funds from this grant. The first, on June 25, 2007, in Nobleboro and Jefferson, attracted 65 people from Extension, NRCS, and the private sector, including growers and scouts (see article and photos in appendix). Kathy Murray coordinated the event, and four northeastern states were represented. Participants toured two farms and learned about weed management, no-till farming, plant nutrition and crop health, and pest trapping and identification. An article summarizing the event is appended to this proposal, along with a summary of the pre- and post-workshop evaluation showing how participants' knowledge of IPM and water quality increased after attending the workshop.

The following list shows the percent of participants with an interest in learning more about a given topic:

- 76%** Identifying pests and damage (insects, crop diseases, weeds, wildlife)
- 67%** Measuring and improving soil quality
- 61%** Pest monitoring methods
- 58%** Environmental impacts of pesticides
- 48%** No-till and reduced tillage methods
- 48%** Conservation planning
- 45%** Cover cropping
- 39%** Soil fertility effects on crop health
- 36%** Integrated Pest Management and Pest Management Planning
- 36%** Seed selection and seedling production methods
- 6%** Other (please specify): Maine NRCS; how it works

The second Maine tour was held at the Thomas Farm in East Corinth, Maine, on July 15, 2008 for 26 individuals. Each participant received a workbook and there was a lot of informal discussion about weed I.D., insect scouting, avoiding plant diseases, and IPM, which contributed to mutual understanding. An evaluation of this workshop can be found in Appendix D. In brief, 100% rated the workshop either a 4 or 5 on a scale of 5, with 5 being very useful; all 16 respondents said the workshop met their expectation. About half rated their post-workshop knowledge of IPM as medium-high to high; about half also rated their post-workshop knowledge of conservation practices as medium-high to high. Most said they recognized that IPM and conservation share some common goals and practices such as soil quality and plant productivity, and said they were likely to practice crop rotation. Specific comments: “This needs to be hosted at least biannually; Hands-on practical workshops like this are the best; Excellent job! Very good. Informative. Excellent presentation. More technical training would be a good thing!! Thank you!”

Connecticut

On April 23, 2007, collaborator and IPM Program Coordinator Ana Legrand held a meeting with NRCS staff involved in the EQIP program and IPM educators from the University of Connecticut and the Connecticut Agricultural Experiment Station. Twenty people attended. They reviewed the activities from the past three years of the EQIP IPM program, evaluated procedures, and discussed future actions. A presentation was made about the UConn IPM program work for growers enrolled in the EQIP IPM training. Staff from the three agencies also gave feedback on the EQIP IPM training program and discussed future actions. NRCS staff expressed interest in shadowing IPM educators rather than meeting in a large workshop at a farm.

Thus in 2008 the IPM program arranged several opportunities for NRCS staff to go out with IPM educators and observe what is done in a typical IPM training day. IPM extension educators Jude Boucher, Lorraine Los, and Richard Kiyomoto arranged several opportunities to include NRCS staff during their IPM training sessions at several sites. One or two NRCS staff were invited to visit at each given time. Invitations were extended on the following dates: Visits with Jude Boucher, Vegetable IPM extension educator, weeks of July 28th and August 11th, 2008; visit with Lorraine Los, Fruit IPM extension educator, July, 25th, 2008 in East Lyme; visit with Richard Kiyomoto, Grape IPM educator, September 19th, 2008 in Goshen.

In addition to these opportunities, IPM staff and NRCS staff presented information about their programs at a twilight meeting held at Holmberg Orchards (Gales Ferry, CT) on April 29, 2008. Lorraine Los, Jude Boucher, and Ana Legrand taught about IPM. Javier Cruz from NRCS described EQIP opportunities for growers, and other NRCS staff were present to answer questions during the meal time. About 70 people attended. See the Leveraging section of this report for the names of some of the handouts.



Lorraine Los, Fruit IPM educator, explains the use of weather stations for disease forecasting during a twilight meeting at Holmberg Orchards.

Maryland

Maryland’s situation differs from those of the three other participating states. In Maryland, the vast majority of cost-shared IPM services are provided by commercial agribusinesses and a smaller portion by independent

consultants. Maryland Cooperative Extension generally does not provide any IPM services and does not provide oversight to those who do provide services. Extension has provided guidelines for scouting procedures and economic thresholds for the most common crops through print and web versions of agronomic and vegetable recommendations. NRCS approves IPM plans and determines whether a specific action on an individual field qualifies for IPM cost share. Both Extension and NRCS wanted to see an improvement in the overall quality of IPM implementation.

Under the leadership of project collaborator Betty Marose, NRCS and Extension representatives met several times to work toward improved communications and implementation of Pest Management under EQIP and CSP. Fruitful discussions focused on qualifications of service providers, the availability of programs for specialty crops, and IPM guidelines. EQIP guidelines for pest management in fruits and vegetables have been an important topic, since the existing guidelines were not very commodity specific and did not adequately reflect the costs of IPM for specialty crops. To date, they have been able to significantly increase the cost share rates for several practices within the tree fruit and vegetable production areas and are implementing these on a limited basis this year.

On July 22, 2008, Betty Marose, Joanne Whalen, and four other presenters (Jerry Brust of UMD, Kate Everts of the University of Maryland and the University of Delaware, consultant Luke McConnell, and consultant Bill Marose) hosted a bus-load of 37 NRCS participants. They toured sites in Maryland and Delaware for a day, learning IPM concepts such as hands-on scouting. Each participant received a binder of information with the booklets and fact sheets covering:

- IPM Overview
- Mid-Atlantic Guide to Insect Pests and Beneficials of Corn, Soybean, and Small Grains
- Northeast Vegetable and Strawberry Pest Identification Guide (UMass, EPA, Northeastern IPM Center)
- Insect Attractants and Traps
- Biological Control
- Disease Forecasting
- Pesticide Resistance Management
- IPM Elements & Checklists for Apples, Beans, Cucurbits, Field & Sweet Corn
- EQIP Checklists
- Pest Management Standard 595

The 41 NRCS personnel who attended this tour evaluated it highly: 4.5 (with 5 being the highest rating for excellence). Comments on what NRCS personnel would do differently and a complete evaluation of this workshop can be found in the Appendix E.

Objective 2. Develop two *new* and update two *existing* crop- and region-specific IPM guidelines to fit the NRCS Pest Management Practice Standards.

The Center partnered with Thomas Green of the IPM Institute, who altered the original objectives of creating two new sets of guidelines and updating two additional sets. He dedicated greater time and energy to learning about a new format that would make the guidelines much more useful to NRCS. To begin with, he coordinated with stakeholders and gathered input about the format. He served as a bridge for the development of comparable Vegetable IPM Tools for both the North Central and Northeastern IPM Centers. In the process, our Center sponsored several conference calls between the IPM Institute of North America and the Northeastern Vegetable IPM Working Group to develop this tool (posted at <http://northeastipm.org/nrcs/resources.cfm>). We identified and collected all current IPM Elements and Guidelines completed by Land Grant Universities and established a directory with links (see www.ipminstitute.org/Fed_Agency_Resources/IPM_elements_guidelines.htm). We determined that the following crops are most deserving of guidelines, roughly in order of highest to lowest priority: Eggplant; Cucumber (possibly with melons and summer squash); Legumes (including snap beans, peas, edible soybeans and dry beans); Lettuce and mesclun; Spinach; Brassicas, carrots, field corn, potatoes, pumpkins and tomatoes. We expect to develop new guidelines with the IPM Institute of North America and the Northeastern Vegetable IPM Working group for the highest priority crops listed above. We also helped revise The Massachusetts Sweet Corn IPM Guidelines by Craig Hollingsworth, now available to NRCS through our website.

Objective 3. Create a *Guide to IPM Guidelines* that explains how IPM guidelines can be constructed to serve the needs of both IPM and NRCS audiences.

The Center partnered with Thomas Green of the IPM Institute, who wrote the *Guide to Elements and Guidelines* (see Appendix F for a copy). Our next steps will be to circulate this document and revise it accordingly. It will be posted at <http://www.ipmcenters.org> with the collection of IPM Elements and Guidelines by the end of the year. We will work on a press release to publicize the availability of the Centers' directory and the Guide.

Objective 4. Post web documents of all products from the project, including guidelines.

We created two distinct sets of web pages with links to guidelines. One, on the Northeastern IPM Center's site, is organized by crop (http://northeastipm.org/ipm_standard.cfm); the other, at the IPM Institute's site, is organized by state (http://www.ipminstitute.org/Fed_Agency_Resources/IPM_elements_guidelines.htm). The Center's website was set up and went live in 2007. Topics covered on the site are the mission and definition of IPM, contacts, pest management practices, and resources. For each of these, there are parallel sections for NRCS and land grant Extension IPM programs and resources. Additional documents and editing have been added over time.

Objective 5. Produce a final report, including impact stories and photographs.

Center staff and project cooperators documented the workshops by gathering photographs, handouts, and other information that could contribute to impact stories. Many of these materials are included in this report and others are on the website (<http://Northeastipm.org/nrcs.cfm>). Please see the appendices.

Leveraging of this grant

Increased partnerships and trainings

Through this grant, participants greatly increased their knowledge of regional and national partners. These connections will continue long after the objectives of the grant have been met. The Northeastern IPM Center will continue to communicate the results of this project to the region and nation; the IPM Institute will help to revise and advertise the *Guide to Elements and Guidelines*; staff with IPM responsibilities at the Maine Department of Agriculture, University of Connecticut, University of Massachusetts, and University of Maryland will continue to promote IPM and NRCS through their involvement with related projects (for example, the Vegetable IPM Working Group of the Northeastern IPM Center is planning a meeting of NRCS and IPM professionals for February 2009).

Many NRCS staff participated in this project, including Tom Akin, Conservation Agronomist, MA; Alice Begin, Resource Conservationist, ME; Kathy Johnson, District Conservationist, CT; Tim Pilkowski, State Conservation Agronomist, MD; and John Timmons, Agronomist, DE. Grower and other organizations involved were Maine Vegetable and Small Fruit Growers Association; Maine Sustainable Agriculture Society; Maine Organic Farmers and Gardeners Association; Maine Cooperative Extension; Maryland State Horticultural Society; New England Vegetable and Berry Growers Association; North American Strawberry Growers Association; Soil and Water Conservation District Staff.

The North Central IPM Center is currently funding a working group that is strengthening its connections to NRCS and we have connected to them through a number of individuals.

Funding

Numerous other granting agencies are currently augmenting the impact of this project:

- An NRCS Conservation Innovation Grant (\$75,000—Rhode Island), awarded to Craig Hollingsworth, Coli, Hazzard, Casagrande, and Faubert. This grant funds the revision of guidelines for numerous crops in Massachusetts, training for ag consultants, technical serviced providers, and NRCS and Extension personnel.
- The Northeastern IPM Center, through its IPM Partnership Grants Program, awarded a 2008 grant to Ruth Hazzard to increase connections between IPM and NRCS staff in the Northeast.

- EPA Region 1 helped to fund the seven Massachusetts IPM Field Schools held in 2007.

Publications and Presentations

Hazzard, R. and K. Murray, C. Hollingsworth & C. Koplinka-Loehr. November 16, 2006. Encouraging Adoption of IPM through NRCS Conservation Programs: Update from the Northeast. North Central Region NRCS/IPM Working Group, St. Louis, MO. PPT Presentation.

Koplinka-Loehr, C. PowerPoint presentation to the Northeast Tri-Agency Regional Meeting, September 22–24, 2008. Explained the Building Bridges project.

Legrand, Ana. April 23, 2007. Connecticut NRCS and IPM Partnership: sustaining on-site IPM training. PPT presentation available at <http://www.hort.uconn.edu/ipm/>.

Legrand, Ana. Incentives for IPM Training and Practice. 2008. Article available at <http://www.hort.uconn.edu/IPM/general/htms/nrcsincent2.htm>

Myers, Elizabeth. October 2008. Incentives could boost IPM adoption: workshops help NRCS to help growers. IPM Insights. Article available from <http://NortheastIPM.org>

Appendix A: Photographs of the Workshops



Connecticut workshop: Lorraine Los speaks fruit IPM training and the use of weather stations for disease forecasting at Holmberg Orchards. This orchard's weather station was purchased through the NRCS EQIP project by us as part of the IPM training.



Connecticut workshop: The hanging white sticky trap monitors tarnished plant bug and eastern apple sawfly; the red sticky trap on the trunk monitors apple blotch leafminer.



Maine workshop: Nearly 90 people learn about reduced tillage machinery and ways to increase soil tilth.



Maine workshop: At the same workshop, Lauchlin Titus, crop consultant, shows corn infested with ragweed and other weeds.



Maryland workshop: A group of NRCS personnel listen to Luke McConnell explain IPM for limas.



Maryland workshop: Joanne Whalen shows a weakened root system to participants in the NRCS workshop.



Massachusetts Workshop: The group gets a look at the contents of a pheromone trap.



Massachusetts Workshop: Participants learn about scouting sweet corn.



Massachusetts Workshop: Greenhouse at the Kosinski Farm



Massachusetts workshop: Ruth Hazzard teaches about vegetable pests and beneficials.

Appendix B: Sample workshop agenda

INTEGRATED PEST MANAGEMENT TOUR FOR NRCS

Date: July 22, 2008

Time: 7:30 am - 5:00 pm (including travel time)

8:30 - 9:30 am - Purpose and Details of the Tour - Betty Marose and Joanne Whalen, Extension IPM Specialists, Universities of Maryland and Delaware (in route on bus)

9:30 - 11:30 am - Tour the Hurlock Area of Maryland - Stops will include 2 vegetable and grain farms. Participants will learn about production and pest management issues facing growers. They will also get a chance to sample for pests in the field and then be asked to make management decisions using real life scenarios. Instructors: Luke McConnell, McConnell Agronomics and Kate Everts, Plant Pathologist, Universities of Maryland and Delaware

11:30 am - 12:30 pm - Travel to Fifer Orchards -
Discussion of Morning Activities (in route on bus)

12:30 - 1:30 pm - Lunch at Fifer Orchards

1:30 - 3:30 pm - Tour a fruit and vegetable farm - Participants will take a short wagon tour past major production aspects at Fifer Orchards including orchards, high tunnels and fresh market vegetable fields. Participants will also get a chance to compare sampling techniques, control options and decision-making in tree fruits and fresh market vegetables with scenarios covered in processing vegetables and field crops. Instructors: Bill Marose, Marose Ag-Consulting, Luke McConnell, Jerry Brust, Vegetable Specialist, University of Maryland and Kate Everts

3:30 - 5:00 pm - Tour Wrap by NRCS - Tim Pilkowski, Maryland NRCS and John Timmons, Delaware NRCS - on bus back to drop off locations.

Appendix C: Evaluation of Massachusetts Workshop Conservation Practices & IPM for Vegetables and Blueberries

NRCS and UMass Extension Field Workshop

Kosinski Farm, Westfield MA

July 22, 2008 10am-3pm

Overall, the most mentioned topics or comments about what was valuable

Reference Guides	9
Scouting	8
Want more training/education	6
Food	6
Farm visits with extension	6
Extension staff as resource	6
Farmers at meeting were helpful	5
IPM knowledge gained	4
Improved farmer record keeping	4
EQIP boosts IPM use	4

Compiled responses to each survey question

(N=9 respondents)

New/Helpful tools

Reference guides/take home material	7
IPM knowledge	4
Knowing Extension staff as resources/reference	4
Scouting	1
Greenhouse irrigation	1
Ask farmers about their pest concerns	1
Trap crops/Blue Hubbard	1
Flood Bench info	1
Corn Heat info	1
Discussion with Farmer	1
Connect with and help farmers doing IPM	1

How IPM can help conserve or protect natural resources

Less pesticide/fuel/money/time	3
Trap Crop/Blue Hubbard save pesticides & \$	2
Scout to determine if spray is needed	1
Grape juice to prevent bird damage	1
Greater emphasis on timing	1
not much	1

How are NRCS programs encouraging farmers to use IPM

Farmers keep better records	4
EQIP incentives boost farmers	4
Give farmers new ideas about pest management	2
Farmer(s) try trap crop	1
Emphasis on Conservation	1
Plan spray schedule more carefully	1
Farmers want to meet with Extension staff	1

Favorite part of workshop

Food/Pie	6
Scouting for pests	6

Farmers discussing IPM experience	3
Take home material	2
Greenhouse	2
Technical knowledge	1
Sonia's presentation	1
Networking with extension people	1
Flood Benches	1
Lectures	1

What tools would help you better assist farmers with IPM?

Farm visits with extension	6
More technical training/education	4
Regular session with NRCS planners and farmers applying for EQIP 595	2
Carefully reviewing questionnaire sheets	1
More straightforward certification records	1
Extension contact list for support with specific crops/pests	1
Seasonal calendar of IPM milestones/practices	1

Additional Comments

Good Workshop/Thanks	5
This increased my confidence with pest management plans	1
Farmers were very helpful	1
EQIP grant is very good	1
Workshops for each type of crop in the future	1

Summary of the 2007 IPM Field Schools: the host farm, location, and topics covered
NRCS and UMass Extension IPM Field Schools

Warner Farm, Sunderland MA, May 22, 2008 9-12pm

Compiled responses to each open ended survey question

(N=8 respondents*)

*response # is greater or less than the number of surveys collected because question was open-ended with more than one response written

Overall, the most mentioned topics or comments about what was learned	number of responses
scouting methods	13
use of cultural practices	12
insect identification and biology	10
disease identification	5
Use of Trichogramma	5
combining NRCS practices with IPM	2

What new practices do you plan on encouraging on farm as a result of this meeting?	number of responses
cultural practices (trap cropping, hilling)	6
scouting	3
working more closely with Extension	1
using organic production techniques	1

What was your favorite part of this field school?	number of responses
learning about scouting	5

Hands-on techniques used	4
Question and answer session	2
ECB scouting	2
Information given to read	1

How could this field school be improved?	number of responses
longer training	2
mix group pf NRCS staff and growers	1
more trainings to learn how to discuss IPM with growers	1
show and demonstrate different kinds of sprayers	1
Have a series of trainings on different crops	1
cover all major insects and diseases per crop	1
more scouting, bring in samples	1
tie into WINPST	1

What other topics would you like to see us cover at future meetings?	number of responses
more on various crops and pests	2
organic production	1
chemigation & spray equipment	1
use of growing degree days in scouting methods	1

Compiled responses to each yes/no ended survey question

Did you learn something about the following	Responses		(N=8 respondents)
	Yes	No	
Scouting & Monitoring	8	0	
Insect ID and Biology	8	0	
Disease ID and Biology	8	0	
Weed ID and Management	8	0	
Cultural Management (for prevention of insects or diseases)	8	0	
Decision Making (when and what to spray)	8	0	
Biological Control	8	0	
Other	3	5	

Appendix D: Evaluation of the Maine 2008 Workshop

(8 Growers; July 15, 2008)

1. Have you ever applied for EQIP? 6 yes, 2 no
2. If you have applied for EQIP in the past, what project(s) did you receive program funds for?
Fencing, manure storage (2), tile, compost facility, IPM, crop production, grass waterway, access road
3. Were you aware that EQIP is available for implementing IPM practices? 2 yes, 3 no
4. Do you think you may apply for EQIP as a result of this program? 4 yes, 1 no, 2 possibly

Why/why not? Non-farm; may apply if go into vegetables

5. What did you learn tonight about NRCS programs and conservation plans?
Good programs upcoming for forestry
All the different programs and that they will be changing
New programs, cost share for IPM and other cultural practices for vegetables and residue management and cover crops
More about HMA
Good overview from Autumn
Good presentation, but already familiar with program
Trees are an agricultural crop
6. What did you learn tonight from the Thomas' presentation?
Vegetable growing on such a large scale requires a great deal of labor, equipment, and fuel
Weeding equipment/some interesting equipment
Cultivation practices
We can make some of the equipment
Rotation of vegetables
Machinery renovation, marketing, and planting
7. How could the program be improved: length, amount and depth of information presented, time for questions, and other topics to be presented?
It would be interesting to see either the planting or harvesting of the crops.
All good
The interaction with the farmers was really helpful.
I was expecting the Thomas's to explain their own IPM practices.
Very good the way it was – informal, informative
8. Did this program meet your expectations? 8 yes 0 no
9. Additional comments:
Food was great
Nice meal
Mr. Titus was very helpful.
Need more of these types of programs for small growers to pass the knowledge around.

(17 Conservation Professionals, July 15, 2008)

10. Your job title:
Soil conservationist – 6
Soil conservationist technician – 3
Soil conservation aid – 1
District conservationist – 1
Coordinator – 1
ASTC-OPS – 1
Certified professional agronomist -
None listed - 4

11. Please circle the number indicating your level of knowledge about IPM (Integrated Pest Management) **after** today's workshop.

Low	High			
1 (0)	2 (0)	3 (6)	4 (9)	5 (2)

12. Please circle the number indicating your level of knowledge about conservation practices **after** today's workshop.

Low	High			
1 (0)	2 (0)	3 (2)	4 (6)	5 (8)

13. Please circle the number that best describes your attitude about IPM and conservation practices **after** today's workshop.

- 1 (1) = IPM and conservation are different sets of practices with different goals.
- 2 (1) = IPM and conservation probably share some goals and practices but I can't give examples.
- 3 (13) = IPM and conservation share some common goals and practices such as (please specify)
 - Soil quality (3), plant productivity (2), nutrient management
 - Increased quantity and quality of crop production
 - Cover crops: breaks up disease and pest cycles, adds OM, reduces soil erosion
 - Soil and water conservation, water quality, improve the resources
 - Conservation crop rotation, pest scouting
 - Soil health, plant health, yield, pest management, economic –short and long term
 - Preserving natural resources, minimizing damage to environmental resources
 - Crop rotations reduce compaction/disease cycles and increases soil quality/tilth
 - Reducing pesticide use; many pest management practices/strategies (crop rotation, cover crops) are also good for erosion control, soil quality, etc.

14. Please circle the number below best describing the degree to which you will use (or advise others to use) the following practices **after** this workshop. *Parentheses indicate # of responses for that rating.*

	<u>Will Never Use</u>			<u>Might Use</u>			<u>Will Likely Use</u>		
Crop rotation		1	2	3	(2)	4	(2)	5	(14)
Synthetic row covers		1	2 (5)	3 (5)	4 (3)	5 (3)			
Disease-resistant varieties	1	2 (1)	3 (3)	4 (6)	5 (6)				
Pest scouting		1	2	3		4 (5)	5 (11)		
Insect traps		1 (2)	2	3	(3)	4 (6)	5 (6)		
Insect, disease, & weed identification		1	2	3	(1)	4 (3)	5 (11)		
*Weed mapping	1	2 (4)	3 (4)	4 (3)	5 (5)				
Pest record-keeping		1	2	3		4 (6)	5 (10)		
Cover cropping	1	2	3	(1)	4 (4)	5 (11)			
Mechanical or flame weed control	1 (2)	2 (3)	3 (2)	4 (4)	5 (4)				
Selective pesticide use to conserve natural enemies, prevent run-off or leaching, etc	1	2	3	(1)	4 (5)	5 (10)			
Application of soil amendments and fertilizers based on annual soil test results	1	2 (1)	3	4 (2)	5 (12)				
Reduced tillage	1	2	3 (2)	4 (5)	5 (9)				
Other (specify) _____	1	2	3	4	5				

No till; *Weed mapping not described

15. Please circle what best describes your level of understanding in using the following documents:

IPM Practices "Tool"					IPM Practices Job Sheet				
Low	High				Low	High			
1	2 (3)	3 (4)	4 (5)	5 (2)	1	2 (2)	3 (4)	4 (6)	5 (2)

16. How helpful were the following workshop components. *(Please circle the appropriate rating)*

Component	Not Useful			Very Useful	
	1	2	3	4	5
Overview of Thomas Farm’s crop production and IPM practices – F. & P. Thomas	1	2	3	4 (7)	5 (9)
Weed identification, ecological weed management strategies, demonstration of weed control equipment – E. Gallandt & Thomas Farm staff	1	2	3	4 (2)	5 (14)
Vegetable insect scouting & pest ID workshop, including information resources available (sweet corn, cucurbits, brassica) – T. Jackson & K. Murray	1	2	3 (2)	4 (8)	5 (6)
Recognizing, preventing, & avoiding plant disease and promoting plant health through cropping practices, including cover-cropping and management of soil conditions and fertility – L. Titus	1	2	3	4 (8)	5 (8)
Introduction to IPM practices ‘Tool’ & how IPM fits into conservation planning and implementation to mitigate resource concerns – A. Begin, A. Birt, K. Murray	1	2	3 (2)	4 (6)	5 (8)
Entire Program Overall	1	2	3	4 (8)	5 (8)

17. How could the program be improved: length, amount and depth of information presented, format of hands-on activities, time for questions, other topics to be presented?

- Very well done, good host farm and site, good speakers, maybe have a little more time for weed ID with Mr. Gallandt and farm staff very important section
- Would like additional weed training
- Good workshop – Eric Gallandt seemed to be short on time – but all info presented was helpful.
- Make some demonstration activities or display of weeds.
- Great program, learned a lot of useful info.
- More insect ID
- Good length – excellent “cool” place to have lunch, etc.
- More ?/results of scouting/tests prescription
- Break into segments addressing the various aspects of IPM
- More specific examples of what farms are doing for IPM. Otherwise excellent training. Great handouts/publications!

18. Please circle your opinion of the lunch.

- Very nice.
- Ran out of food.

Low		High	
1	2	3 (4)	4 (8) 5 (4)

19. Did this program meet your expectations? Yes 16 No 0

20. Additional comments:

- This needs to be hosted at least biannually.
- Hands-on practical workshops like this are the best.
- Excellent job!
- Very good
- Informative
- Excellent presentation. More technical training would be a good thing!!
- Thank you!

Appendix E: Evaluation of Maryland Workshop

47 people attended (6 were speakers; 41 were from NRCS).

1. Was the tour worthwhile to you? Rate 1-5 with 5=high

Average rating: 4.5

Comments:

- Great field experience
- Great leaders and speakers
- Enjoyed farm tours
- Very worthwhile
- Experienced crop consultants were key to this tour. Real world situations are key to guiding policy and program guidelines to create us: programs to address resource concerns.
- Yes, very worthwhile
- Yes, can apply what I have learned to improve NRCS perspective of pest management
- Tour was very helpful

2. What was the main thing you learned about IPM?

- IPM is much more complicated and specialized especially for truck crops
- CRP issues with pest management
- IPM manual a big plus and will be used to ensure quality work
- Diversity in production and crops is important info because in any given day we may be dealing with several cooperators with different concerns.
- Variability in technical and program assistance is important to meet their needs.
- Complexity, glad there are professionals doing it
- How professionals do it
- Very complex info, need strong grower input
- The negative impacts of buffers and wildlife on vegetables and food safety issues
- NRCS cares enough to show up and interact
- Very complicated – 1 size does not fit all
- Commercial ag still depends on judicious use of pesticides; private consultants needed to help growers stay in business; organic ag is a way off still
- The modeling used to predict infestations like powdery mildew
- How complex it is!
- We have a great opportunity for EQIP \$ and BMP implementation
- Very complex, not a one size fits all! Also very hard to do.

3. If we were doing another tour, what would you do differently?

- Add more time between tour stops
- Keep tours on this side of Bridge (east side); Eastern Shore Rocks
- Logistics of tour were great. Key sites as opposed to multiple sites were nice.
- Refreshments were great
- Expand to farmers
- Change some research and some presentations
- We should have more of these!

Some people answered question (3) as “Are you going to do anything differently?”

- Rethink some of the requirements for cost-share. Very limited though due to national guidance
- Maybe in the fruit IPM arena, flexibility?
- Try to keep paperwork short
- I’m going to treat my cucumbers
- I’ll write a better report to USDA because of this tour.
- We need more IPM guidelines

4. Rate the logistics (1-5)

Average: 4.7

- Lunch was good; the whole day was well organized
- Bus and lunch perfect; ice cream was delicious – there went my diet
- Excellent bus, sound, lunch and tour
- Great, good lunch
- Good bus, great lunch
- All great
- Good bus and lunch
- Great day!
- Bus and lunch were great

5. Please make any additional comments

- Was sometimes a little too technical for those of us not familiar with pest management
- A very specialized field which really requires experts dedicated to IPM management
- We need very general observation methods so we can direct the farmer accordingly
- How can we get this info to food consumers?
- IPM for standard grain rotations and rotations with one season of truck crops
- Do it again next year
- Strengthened my respect for private consultants and the knowledge they have.
- Importance of creating a relationship with clients as opposed to strict business relationship
- Hope to get some recs (?) out of this
- Great tour, well organized, good binder
- I'd like to hear about some of the technology used to reduce the impact of spraying like site specific technology, mapping of problems areas, etc.
- Make sure EQIP and IPM are compatible and make sense
- Would have liked to go to a farm with resource concerns to show challenges
- Would have liked to visit a small farm to see the challenges for these operations
- Would like to see NRCS, U of MD, U of D, consultants and other interested parties get together to discuss best way to improve and implement pest management for cost-share programs
- More in field and maybe a bad operation to see a comparison

Appendix F: Guide to Elements and Guidelines

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IPM Program**

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2. Using IPM Elements and Guidelines
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1. Introduction

We will always be faced with pests—those living organisms that interfere with our pursuit of life, livelihood and happiness to the extent that action is called for. History teaches us that we must act carefully, for our attempts to manage pests have resulted in undesired, serious and life-threatening consequences to humans, other organisms and our environment.

Integrated Pest Management, or IPM, is a science-based decision-making process that identifies and reduces hazards from both pests and pest management-related strategies. IPM users employ knowledge of pest biology, information about the environment and specially designed techniques and technology to prevent unacceptable hazards to people, property, resources and the environment.

While many tactics used against pests throughout history are compatible with an IPM approach, IPM was formalized in the 1970s and continues to be enhanced to meet the challenge of keeping pests and pest damage to acceptable levels while minimizing collateral damage.

IPM for those who must manage pests can be practically defined by cataloging the IPM practices available to them. For example, IPM for apple production in New York includes using time-tested techniques such as placing monitoring traps in apple trees in early July to determine if apple maggot flies are present in sufficient numbers to justify the cost of applying an insecticide. Using mating disruption for codling moth, which involves releasing pheromones throughout the orchard to prevent mating and can reduce the need for insecticides, is another practice. Compiling a list of these and all other IPM tactics available to the NY apple grower provides a practical, working definition of IPM.

IPM Elements and Guidelines (Figure 1) are concise presentations of IPM practices applicable to a specific environment. These environments can include a specific crop and region or a nonagricultural environment such as a school, golf course, or residential lawn. IPM Elements and Guidelines are designed as efficient resources for determining which practices are available and recommended by land-grant university scientists and other stakeholders. Elements and Guidelines answer the question, “What practices should I be doing to benefit from IPM in my home, work or school environment?”

The goal of this document is to explain the significance of IPM Elements and Guidelines to advancing and supporting IPM adoption and to provide guidance to those developing and using these tools.

These tools complement but do not replace production guides or similar publications that provide comprehensive “how to” information for IPM and other practices. IPM Elements and Guidelines list the practices. Production guides describe in greater detail when the practice is most appropriate, how it can be implemented and how results can be evaluated.

Other names for IPM practice lists include IPM protocols, checklists, standards, and definitions. A variety of formats and approaches are used. Many of these assign point values to each practice, facilitating use as a performance assessment tool. Point values can be assigned based on a practice’s priority and/or degree of difficulty, with high priority or more challenging practices receiving greater point values. Priorities can be determined based on the importance of the practice for effective pest management and/or potential to reduce unintended impacts.

Excel worksheets have been used in some cases which generate scores automatically (Figure 2). In addition to point-based elements, these documents may also include minimum requirements or practices that must be in place to achieve a passing score. They may also include supporting information, such as a list of pests considered and a list of cited references.


Elements and Guidelines are typically created by a broad stakeholder group including Extension, researchers, growers, crop advisors and others, and published by a Land-Grant university and/or state lead agency such as a department of agriculture. They often include additional Best Management Practices (BMPs) that improve conservation such as water, soil, and nutrient management. While not strictly meeting the definition for IPM, these additional practices may impact pests or pest management. For example, excessive nutrient use can aggravate aphid problems in some crops.


The number of Elements and Guidelines are growing (see the end of this document for a list). A current compendium is maintained at

www.ipminstitute.org/Fed_Agency_Resources/IPM_elements_guidelines.htm

In addition, a directory of non-governmental IPM eco-label programs that require IPM for participation can be found at <http://www.ipminstitute.org/links.htm>. Some of these programs use tools similar to IPM Elements and Guidelines to qualify producers and service providers for participation. Other programs use more general standards or criteria that simply indicate that IPM is required, or indicate that general IPM practices are required, such as the use of thresholds for key pests where available. Participants in these programs can use IPM Elements and Guidelines to document their performance of specific practices recommended for their working environment.

Figure 1. Page one of the three-page Elements of IPM for Fresh Market Sweet Corn in New York State developed in 2001 (nysipm.cornell.edu/elements/fmswccorn.asp).





Cornell University
Cooperative Extension

Elements of IPM for Fresh Market Sweet Corn in New York State

Listing the major pests lets the reader assess how closely these match up with pests at their location.

Crop and geographic scope.

MAJOR PESTS		
Insects	Diseases	Weeds
European corn borer	common rust	broadleaves
corn earworm	smut	annual grasses
fall armyworm	northern corn leaf blight	perennials
corn flea beetle	Stewart's wilt	
corn leaf aphid	anthracnose	
western corn rootworm	maize dwarf mosaic	
seed corn maggot	seed rots	
cutworms	barley yellow dwarf virus	
common armyworm		
sap beetles		

In this case, users can receive five points for implementing this element on 50% of their acreage.

A. Site Preparation	Priority	Points	Acreage Goal	Achieved
1) Review weed map/list of fields to choose appropriate weed control strategies. See the Weed Assessment List available for use in satisfying this element.	M	5	50%	
2) Crop Rotation. Plant only in fields where sweet or field corn has not been grown in the previous year to avoid corn root worm, anthracnose, smut, and northern corn leaf blight				
a. Fields harvested before Aug. 15:	L	3	25%	
b. Fields harvested after Aug. 15:	H	10	75%	
3) Soil test at least every three years; fertilize according to recommendation	H	10	100%	
B. Planting				
1) Use tolerant or resistant varieties whenever possible for controlling common rust, smut, and Stewart's wilt, NCLB, maize dwarf mosaic, barley yellow dwarf	M	5	25%	
2) Seed treatment. Use fungicide treated seed or biological seed treatment for control of root and seed rots				

The user enters points scored, e.g., this practice was completed on 25% of the producer's acreage.

Points allow developers to signal priority or level of difficulty, and users the flexibility to pick and choose practices that fit their operation.

Nutrient management practices are included. Although not typically considered an IPM practice, nutrient management addressed water quality concerns and can also impact pest populations, e.g., excessive nitrogen can sometimes flare aphid populations.

In this example, practices are prioritized by importance. Users earn more points for practices that are more likely to improve health, environmental or economic impacts.

1

Figure 2. Excerpt from Microsoft Excel worksheet for sweet cherry elements for New York. Percent score (row two) is calculated automatically after all questions are answered “yes” or “no”. (<http://nysipm.cornell.edu/elements/SweetCherryIPMElements.xls>).

Elements of IPM for Sweet Cherries in New York State			
80% of the Sweet Cherry IPM Elements points qualifies a crop as "IPM-grown."			
IPM Elements provide a basis for self-assessment of your IPM practices.			
Percent of the IPM Elements points earned, based on answers in column D:			
Total IPM Elements plus Bonus points earned, based on answers in column D:			
Total possible IPM Elements points, not including Bonus points:			102
Orchard Location		Acres	
Grower Name and Address			
Grower Signature		Date	
Assess the sweet cherry IPM elements practiced in your orchards.			
Soil and Nutrient Management and Cultural Practices	Points Available	Points Earned	Enter YES or NO
1. A water quantity and placement plan that minimizes disease development, optimizes water use, and minimizes erosion and runoff is used.	4		
2. Fertilizer recommendations are based on soil and leaf analysis. Balance nitrogen with tree growth to eliminate fall growth. (Choose only one and enter in yellow box.)	In the yellow cell type A, B, or C or select from the drop-down list.		
A. Soil and leaf analysis conducted every year.	5		
B. Soil and leaf analysis conducted every 2 years.	4		
C. Soil and leaf analysis conducted every 3 years.	3		
3. Pruning should be done annually for bacterial and cytospora canker control. Prune as close to bloom as possible or immediately after harvest (within two weeks).	3		
Pesticides and Pesticide Records	Points Available	Points Earned	Enter YES or NO
<i>Only pesticides registered in the state and approved for the target pest and crop will be used. Records of pesticide applications including date, field identification, targeted pest, pesticide name and EPA number, formulation, rate, and number of acres treated are maintained.</i>			
1. Insecticide/fungicide sprayer is calibrated at least once a year.	5		
2. Herbicide sprayer is calibrated at least once a year.	5		
3. Spray records are maintained and organized.	7		
4. Among pesticides of comparable efficacy, the one with the lowest EQ value (farmer safety, natural enemies, etc.) is selected.	3		
Disease Management	Points Available	Points Earned	Enter YES or NO
1. The application of fungicides for blossom blight and brown rot are based on disease models, including weather and disease pressure (cherries are most susceptible to infection from bloom to pit hardening and 3 weeks pre-harvest to harvest).	5		
2. Different fungicide chemistries are used for blossom blight sprays and for fruit rot to reduce resistance.	5		
3. For cherry leaf spot, weather conditions are monitored and severity of leaf infection is determined by Table 28 in Cornell Guidelines.	5		
4. For other diseases (bacterial canker, powdery mildew, Phytophthora, etc.) cultural control tactics are employed to reduce severity (water management, pruning timing, brush removal etc.) and sprays are applied only when appropriate.	5		
Arthropod Management (Insect and Mites)	Points Available	Points Earned	Enter YES or NO
<i>Arthropod monitoring methods and thresholds should conform to state IPM program guidelines. Records should be kept of all monitoring information collected and threshold used.</i>			

2. Using Elements and Guidelines

The first document in the growing series of crop and region-specific IPM Elements and Guidelines was published by Boutwell and Smith in 1981 in the *Bulletin of the Entomological Society of America*. These authors developed this practice list as a tool to assess the level of adoption of IPM in cotton in Alabama. Since then, more than 75 sets have been developed for crops ranging from alfalfa in Ohio to wine grapes in Massachusetts to macadamia nuts in Hawaii.

IPM Elements and Guidelines have been used by growers, crop advisors, and other educators for a variety of purposes, including to

- identify additional IPM and other conservation practices appropriate for their crop and region, i.e., “Are there new practices that may be worth experimenting with on my own or my clients’ farms?”
- assess how many of the available practices are in use on a specific farm or field, i.e., “Where does my operation sit along the IPM continuum from basic to advanced IPM practices?”
- document the extent of IPM adoption to others including buyers and government incentive programs, i.e., “We’ve worked hard to implement IPM on our farm and here’s how we measure up.”

Researchers have used these documents to:

- measure IPM practice adoption over time or across programs or regions;
- help identify which practices have low adoption and thus may need work to improve utility or benefits to growers; and
- identify opportunities for research such as thresholds or cultural practices needed for specific pests.

Conservation program administrators including NRCS professional staff have used these documents to

- identify practices that may be eligible for incentives or technical assistance; and
- assess performance and qualify producers for incentive and technical assistance programs including the Environmental Quality Incentives Program (EQIP) and the Conservation Stewardship Program (CSP).

Buyers of products and services have used IPM Elements and Guidelines to

- establish collaborative programs with suppliers to implement and document reductions in potential impacts of production on health, environment and economics;
- assess supplier performance; and
- set a minimum threshold for performance to qualify suppliers and products for purchases.

IPM has emerged as a key requirement for market-based programs with more than 28 million US food and fiber-production acres enrolled and 233 million worldwide (IPM Institute 2008). IPM Elements and Guidelines can support comprehensive practice standards such as Food Alliance, the US Green Building Council's Leadership in Energy and Environmental Design (LEED) Green Building Rating System, or Rainforest Alliance's Standards for Forest Management or SYSCO's IPM/Sustainable Ag Program. These standards and programs require participants to implement IPM along with a broad range of other best practices but do not necessarily detail which IPM practices should be in place. Using IPM Elements and Guidelines in conjunction with these programs can help document that the user is aware of the IPM practices available and has implemented a substantial number of them.

Buyer use of these tools for assessing supplier performance or to make claims to consumers has not been without controversy. Concerns include potential for creating false impressions about practices and performance by non-participating producers. Concerns have also been raised about Cooperative Extension's involvement in market-based programs, including drawing distinctions among producers on the basis of IPM performance and potentially alienating those who might benefit the most from a supportive relationship with Extension IPM professionals.

For more information

Hollingsworth, C.S., and W.M. Coli. 2000. Massachusetts Integrated Pest Management Guidelines: Crop-Specific Definitions. *Journal of Extension* 38 (3). www.joe.org/joe/2000june/tt1.html

Food Alliance. 2008. About our Standards.
www.foodalliance.org/certification/certification_program/our-standards

IPM Institute of North America. 2008. IPM and Sustainable Ag Certifiers Experience Continued Growth in 2007. *IPM in the Marketplace* 9:1 http://www.ipminstitute.org/newsletter/newsletter_v9i1.htm

Rainforest Alliance. 2008. *Generic Standards for Assessing Forest Management*. www.rainforest-alliance.org/forestry/documents/generic_standards.pdf

UMass Extension. 2000. Why Partners with Nature? Addressing Consumers' Concerns.
www.umass.edu/umext/ipm/ipm_projects/education/partners_with_nature.html

US Green Building Council. 2008. LEED Rating Systems.
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3. Developing IPM Elements and Guidelines: A Step-by-Step Guide

Developing a set of IPM Elements or Guidelines is an educational process in itself. Typically a need is identified, resources are secured, an initial draft is prepared and then presented to a broad group of stakeholders for feedback. The draft is refined often through a series of iterative drafts and finally published. Periodic updates are advisable to keep these documents current including addressing new pests and best practices. By engaging in this process, needs are often identified, including issues requiring additional research or practices requiring more education to increase awareness and implementation.

Step 1. Identify the need

When developing these tools, key prerequisites to determine include the use and users for the tool. Why is it needed? What purposes and which user groups will it serve? Are there similar documents from other regions or for related crops that already exist and might be adapted to meet the need? Answering these questions can provide guidance for subsequent steps including selecting a format and identifying stakeholders.

Typical reasons for developing Elements and Guidelines:

- Educate pest managers and pesticide users about IPM practices available to them.
- Qualify producers for market incentives such as access to existing or new markets.
- Help identify research, extension and other needs and priorities by comprehensively assessing IPM tactics available.
- Provide an assessment tool for NRCS staff to help determine grower eligibility for technical assistance and incentive programs.

Step 2. Secure resources

Required resources can include the time of experts, stakeholders and administrative support; travel to development meeting(s); overnight accommodations; meeting space and audiovisual equipment; refreshments; telephone and conference calls; postage; and office supplies. A variety of sources have supported these needs:

- In-kind contributions of time by both experts and stakeholders; meeting space by hosts who have a vested interest, including Extension educators, producer groups, state agencies, universities, etc.
- Funding from grants, including USDA CSREES Extension IPM grants, USDA NRCS Conservation Innovation Grants, US EPA Strategic Agriculture Initiative, US EPA Pesticide Environmental Stewardship Program, and Regional IPM Center grants.

Economies can be often be created by combining development meetings with other related meetings, such as annual producer association meetings. Some documents have been developed without in-person meetings, although group interaction can be very beneficial to the process.

Step 3. Refine your geographic and subject scope

Over what geographic area might the same list of practices generally apply? Is there potential to create a tool that will be useful in more than one state? Conversely, a large state or states with highly diverse climates, cropping systems and/or pest complexes may require different sets to cover each unique zone.

Similar crops or crops within a cropping system or rotation might be considered for inclusion in one tool. For example, Rutgers Cooperative Extension has published *IPM Guidelines for Cucumbers, Melons and Summer Squash* as a single document

(www.pestmanagement.rutgers.edu/IPM/Vegetable/IPMGuidelines/melon.htm).

Nearly all IPM Elements and Guidelines to date have addressed the entire host of key pests for the geographic and subject scope including insect pests, diseases, weeds, vertebrate pests, nematodes, etc.

Most have also included IPM-related practices such as nutrient management that can impact pest management and reduce unintended consequences.

Step 4. Identify relevant experts and stakeholders

A broad group can help ensure adequate input to end up with a consensus document that represents the best thinking of and earns the support of all stakeholders. Participants can include:

- University and industry researchers
- Extension
- NRCS staff
- US EPA
- State lead agency, e.g., department of agriculture
- Producers of the subject crops or services
- Producer association representatives
- Key buyers
- Crop consultants
- Environmental advocacy organization representatives
- Input suppliers

Consider all potential uses of the tool and include those users in the development process if possible. Consider identifying one or more key participants to help with the steps immediately following this one, including formatting and drafting a preliminary list of practices.

Step 5. Review potential formats and issues, and develop your recommendation(s)

A variety of formats have been used including text-based documents and spreadsheets. To review formats in current use, see the directory at

www.ipminstitute.org/Fed_Agency_Resources/IPM_elements_guidelines.htm

Familiarizing yourself and/or your initial development group with potential formats, reviewing potential uses and developing a recommendation or deciding on a format can speed the development process. Some formatting issues to consider:

- Assigning a point value to each practice is one mechanism for highlighting more important or more challenging practices, which might “earn” the user more points. Assigning points also enhances use as a performance assessment tool, especially in combination with a designated “minimum score” or threshold for earning a passing grade or other incentive.
- Using a point-based approach that allows practices to be scored as “not applicable” can help accommodate a degree of differences in pests and other conditions. For example, if one area within the geographic scope of the tool does not experience problems with a particular pest, practices specific to that pest can be scored as not applicable and not affect the user’s overall score.

- A set of minimum or prerequisite practices can identify those which are most important to implement, or so basic as to be a *de facto* requirement. These might include meeting minimum record-keeping or pesticide applicator certification or licensing requirements that are important for users to be aware of and should not be optional.
- Several IPM Elements or Guidelines include a “percent of production” component. This device allows points to be scored or a practice to be considered implemented even if all of the subject production is not included. For example, a user might be rewarded with points for an advanced practice that may be more expensive to implement, even if that practice is only in place on 50% of the production. Alternatively, percent of production can be used as a multiplier so that if 75% of the production has the practice in place, the user can earn 75% of the available points.

Step 6. Draft a preliminary document

Relevant experts can accelerate the development process by producing an initial draft list of practices. Placing this list within the recommended format can speed the process further. Taking these steps, however, should not prevent stakeholder input on additions or revisions to the practice list or format. Any straw document should be presented as an initial draft—subject to discussion and revision as needed to ensure a sense of ownership and to generate buy-in among the development group.

Step 7. Call a stakeholder meeting

An in-person meeting, while not essential, can be extremely valuable. Reserving a day or the better part of a day for an informed group to work together will improve concentration, focus, and an ability to generate solutions to conflicts that will satisfy at least the majority of potential users and other stakeholders.

The agenda should include reviewing the need for the document, how the need was identified, additional uses, goals for the development process and the tool, surveying existing tools and formats, and discussing any other steps taken prior to the meeting including developing an initial practice list, selection of a format and/or development of a draft for discussion.

Additional agenda items can include brainstorming additional practices, settling on a final format, and a line-by-line review of the draft. Breakout sessions can be helpful especially for extensive documents and can be organized around pest type (e.g., insects, diseases, weeds, etc.).

Step 8. Refine your document

Prior to the meeting, or as soon as possible after the meeting, provide a draft to those not able to attend for their review and comment, even if the draft is rough and includes significant gaps. Asking for feedback from key nonparticipants can help reduce revisions and increase buy-in.

You will have specific follow-up actions after the meeting to pursue answers to questions generated at the meeting, incorporate input from nonparticipants, etc. Complete this work and circulate a revision to your development group for additional comments while the subject matter is fresh to avoid losing momentum. Provide a specific deadline for input on any drafts circulated for comment.

Consider a list of references that includes production guides and fact sheets; these provide more detail on how to implement practices listed in the document. Acknowledge any foundation documents you

might have adapted and sources of funding. Include a publication or revision date so that those using your document are aware of how old the document is and can cite it properly.

Step 9. Finalize and publish

Finalize your document and publish it on your program website. Consider submitting the document to the IPM Centers website (www.ipmcenters.org) for posting or linking to your site to increase visibility and awareness. To avoid confusion over multiple versions of the same document, consider asking anyone interested in posting the document, e.g., producer associations, to link to your original posting rather than posting a separate document.

IPM programs in Hawaii, Massachusetts, New Jersey, New York, and Ohio have compiled sets of IPM Elements or Guidelines on their websites and included introductory pages with directories and explanatory information.

Step 10. Create awareness and train users.

Short articles about the new tool published in your own and development group participants' communications are a good way to increase awareness of the tool and provide "how to" information. The article should include the rationale for the tool, how it can be accessed and used, and any unique features. Acknowledge participants and funders.

To those who are familiar with best practices for the subject area covered by the tool and with more detailed resources including production guides and fact sheets, IPM Elements and Guidelines can be readily adopted for identifying additional practices, self-assessment, and other basic uses. For other applications, and for users with little exposure to IPM or other IPM resources, more extensive training will likely be required. These users can include USDA Natural Resources Conservation Service staff who may need both basic general and crop-specific IPM training. Workshops have been developed to provide this training in some cases.

Step 11. Keep your document current

To continue to be relevant, the tool will need to be kept up to date. For example, new pests may emerge and others diminish in importance, new tactics may be developed and others become obsolete. Scheduling a review by key experts every one to three years can help identify aspects that might need updating.

For more information

[IPM Protocols for Hawaii](http://www.extento.hawaii.edu/IPM/) - www.extento.hawaii.edu/IPM/

[IPM Guidelines for Massachusetts](http://www.umass.edu/umext/ipm/guidelines/index.html) - www.umass.edu/umext/ipm/guidelines/index.html

[IPM Guidelines for New Jersey](http://www.pestmanagement.rutgers.edu/IPM/Vegetable/guidelines.htm) - www.pestmanagement.rutgers.edu/IPM/Vegetable/guidelines.htm

[Elements of IPM in New York](http://nysipm.cornell.edu/elements/default.asp) - nysipm.cornell.edu/elements/default.asp

[Elements of IPM in Ohio](http://ipm.osu.edu/element/index.htm) - ipm.osu.edu/element/index.htm

Murray, K. 2008. Checklist for Organizing NRCS/IPM Farm Tour and Workshop.
neipmc.org/nrcs/resources/checklist_for_organizing_nrcs-ipm_workshop.pdf

4. Elements and Guidelines in NRCS Programs

The USDA Natural Resources Conservation Service (NRCS) provides agricultural producers with technical assistance and incentives aimed at protecting our environment. Resource concerns addressed by NRCS programs include soil, water, air, plants, animals plus humans (SWAPA+H).

NRCS is staffed by resource management and conservation specialists. Unlike Extension or crop advisors, NRCS professionals do not make recommendations on inputs such as pesticides and fertilizers. Rather, they administer programs and assist producers with conservation planning.

This planning process involves identifying general and site-specific resource concerns and identifying practices with the potential to affect those resources. Streams, lakes, and ponds adjacent to production sites, and wellheads with potential to carry runoff into groundwater are examples of site-specific resource concerns. Pesticide and nutrient applications are two practices with the potential to negatively affect those resources.

Mitigation measures are then developed to protect vulnerable resources. These measures might include cover crops to reduce soil erosion or buffer or filter strips to reduce pesticide runoff into ground or surface water.

The Environmental Quality Incentives Program (EQIP) and the Conservation Stewardship Program (CSP, formerly the Conservation Security Program) are two NRCS programs that provide technical assistance with planning and financial incentives to producers who implement conservation practices. As part of these programs, producers must implement a number of basic practices and may earn higher incentives for additional practices. The great majority of assistance provided through these programs has been for practices other than pest management. Manure and nutrient management have been broadly supported by these programs in many states and across many production systems, particularly livestock and row crops.

New collaborations between NRCS and IPM professionals in a growing number of states are extending the benefits of EQIP and CSP to IPM. NRCS professionals are increasingly employing IPM Elements and Guidelines to identify practices that may be eligible for incentives, and to assess producers for eligibility to participate in and earn higher incentives through EQIP and CSP.

Two working groups funded by the USDA Regional IPM Centers have developed tools specifically designed to facilitate this use. Members of the Northeast Vegetable IPM Working Group have developed several tools, including a calculator for tallying EQIP incentive payments for sweet corn IPM practices and a planning guide sheet that facilitates IPM plan development from a list of IPM practices for vegetable crops. Determining the cost of each practice or set of related practices is a key need for NRCS as they use IPM Elements and Guidelines to determine incentive and cost-share rates.

Significant changes can occur in EQIP, CSP, and other farm-bill programs with each new farm bill. NRCS state offices generally have a degree of flexibility in implementing these programs within a given state. By working with NRCS staff in your state, substantial improvements can be made in accessibility to these programs to support IPM. IPM and NRCS professionals in states that have made considerable progress, including CA, CT, MA, ME, MI, PA, and WI, are available and willing to share information

on how this process has worked in their states. See also the Northeast and North Central working group websites listed below for resources and contacts.

For more information

Hamerschlag, K., and J. Kaplan, 2007. *More IPM Please: How USDA Could Deliver Greater Environmental Benefits From Farm Bill Conservation Programs.*

www.nrdc.org/health/pesticides/ipm/contents.asp

Maine Department of Agriculture. 2008. A Guide to NRCS Environmental Quality Incentives Program (EQIP) for Vegetable and Fruit Growers - Maine Department of Agriculture.

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Northeast Vegetable IPM Working Group. 2008. IPM Plan Guide Sheet Practices for Vegetable Production. www.ipm.msu.edu/work-group/pdf/VegetableIPMToolRev9-3-08.pdf

Northeast Vegetable IPM Working Group. NRCS and IPM Working Together.

northeastipm.org/nrcs.cfm.

North Central Region NRCS and IPM Working Group. Grower Incentives for IPM.

www.ipm.msu.edu/work-group/home.htm

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northeastipm.org/nrcs/resources/2005_EQIP_PMCalculator_MABlank.xls

USDA NRCS. Conservation Security Program. www.nrcs.usda.gov/programs/csp/

USDA NRCS. Environmental Quality Incentives Program. www.nrcs.usda.gov/PROGRAMS/EQIP/

5. Additional References

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6. Directory of Elements and Guidelines by State

[IPM Protocols for Hawaii](#) - Published by University of Hawaii's IPM Program

Banana

www.extento.hawaii.edu/IPM/Certification/banana/default.asp

Macadamia Nut

www.extento.hawaii.edu/IPM/Certification/mac/default.asp

Pineapple

www.extento.hawaii.edu/IPM/Certification/Pineapple/default.asp

Sugarcane

www.extento.hawaii.edu/IPM/Certification/Sugarcane/default.asp

[IPM Guidelines for Massachusetts](#) - Published by University of Massachusetts Extension

Apple

www.umass.edu/umext/ipm/guidelines/ipm_guidelines_apple.html

Blueberry, Highbush

www.umass.edu/umext/ipm/guidelines/ipm_guidelines_blueberry.html

Cole Crops

www.umass.edu/umext/ipm/guidelines/ipm_guidelines_cole_crops.html

Cranberry

www.umass.edu/umext/ipm/guidelines/ipm_guidelines_cranberry.html

Pepper (1999)

www.umass.edu/umext/ipm/guidelines/insect_management_in_peppers.html

Poinsettia

www.umass.edu/umext/ipm/guidelines/ipm_guidelines_poinsettia.html

Potato

www.umass.edu/umext/ipm/guidelines/ipm_guidelines_potato.html

Pumpkin & Squash

www.umass.edu/umext/ipm/guidelines/ipm_guidelines_pumpkins.html

Raspberry

www.umass.edu/umext/ipm/guidelines/ipm_guidelines_raspberry.html

Strawberry

www.umass.edu/umext/ipm/guidelines/ipm_guidelines_strawberry.html

Sweet corn

www.umass.edu/umext/ipm/guidelines/ipm_guidelines_sweetcorn.html

Tomato, Field

www.umass.edu/umext/ipm/guidelines/ipm_guidelines_field_tomatoes.html

Tomato, Greenhouse

www.umass.edu/umext/ipm/guidelines/ipm_guidelines_greenhouse_tomatoes.html

Wine Grapes

www.umass.edu/umext/ipm/guidelines/ipm_guidelines_wine_grape.html

[IPM Guidelines for New Jersey](#) - Published by Rutgers Cooperative Extension

Beets

www.pestmanagement.rutgers.edu/IPM/Vegetable/IPMGuidelines/beet.htm

Cabbage

www.pestmanagement.rutgers.edu/IPM/Vegetable/IPMGuidelines/cabbage.htm

Carrots

www.pestmanagement.rutgers.edu/IPM/Vegetable/IPMGuidelines/carrot.htm

Cauliflower

www.pestmanagement.rutgers.edu/IPM/Vegetable/IPMGuidelines/cauliflower.htm

Cucumbers, Melons and Summer Squash

www.pestmanagement.rutgers.edu/IPM/Vegetable/IPMGuidelines/melon.htm

Peas

www.pestmanagement.rutgers.edu/IPM/Vegetable/IPMGuidelines/pea.htm

Peppers

www.pestmanagement.rutgers.edu/IPM/Vegetable/IPMGuidelines/pepper.htm

Pumpkins and Winter Squash

www.pestmanagement.rutgers.edu/IPM/Vegetable/IPMGuidelines/squash.htm

Snap Beans

www.pestmanagement.rutgers.edu/IPM/Vegetable/IPMGuidelines/Bean.htm

Sweet corn

www.pestmanagement.rutgers.edu/IPM/Vegetable/IPMGuidelines/sweet_corn.htm

Tomatoes

www.pestmanagement.rutgers.edu/IPM/Vegetable/IPMGuidelines/tomatoe.htm

Elements of IPM in New York - Published by Cornell University's New York State IPM Program

Alfalfa and Field Corn (2000)

nysipm.cornell.edu/elements/alfcorn.asp

Apples (2004)

nysipm.cornell.edu/elements/apple/default.asp

Asparagus (2001)

nysipm.cornell.edu/elements/asp.asp

Beets (2002)

nysipm.cornell.edu/elements/beet.asp

Blueberries (2000)

nysipm.cornell.edu/elements/blueb.asp

Brussels Sprouts (2001)

nysipm.cornell.edu/elements/bsprouts.asp

Cabbage (2002)

nysipm.cornell.edu/elements/cabbage.asp

Carrots (2002)

nysipm.cornell.edu/elements/carrot.asp

Cauliflower (2001)

nysipm.cornell.edu/elements/caul.asp

Cucumber, Melon and Summer Squash (2001)

nysipm.cornell.edu/elements/ssmelcuke.asp

Dry Beans (2001)

nysipm.cornell.edu/elements/drybean.asp

Grapes (2007)

nysipm.cornell.edu/elements/grapes.asp

Greenhouses

nysipm.cornell.edu/elements/ghouse.asp

Lettuce (2001)

nysipm.cornell.edu/elements/lettuce.asp

Onions (2004)

nysipm.cornell.edu/elements/onions.asp

Peas (2002)

nysipm.cornell.edu/elements/pea.asp

Peppers (2005)

nysipm.cornell.edu/elements/peppers.asp

Potatoes (2003)

nysipm.cornell.edu/elements/potato.asp

Raspberries (2000)

nysipm.cornell.edu/elements/raspb.asp

Snap Beans (2002)

nysipm.cornell.edu/elements/snapbean.asp

Strawberries (2000)

nysipm.cornell.edu/elements/strawb.asp

Sweet Cherries (2000)

nysipm.cornell.edu/elements/swcherry.asp

Sweet Corn, Fresh Market (2001)

nysipm.cornell.edu/elements/fmswcorn.asp

Sweet Corn, Processing (2002)

nysipm.cornell.edu/elements/prswcorn.asp

Tomatoes, Fresh Market (2001)

nysipm.cornell.edu/elements/fmtom.asp

Tomatoes, Greenhouse (2001)

nysipm.cornell.edu/elements/ghtom.asp

Winter Squash and Pumpkin (2001)

nysipm.cornell.edu/elements/wspump.asp

Elements of IPM in Ohio - Published by Ohio State Extension

Alfalfa

ipm.osu.edu/element/alf.htm

Apple

ipm.osu.edu/element/apple.htm

Cabbage

ipm.osu.edu/element/cabbage.htm

Carrot

ipm.osu.edu/element/carrot.htm

Cherry

ipm.osu.edu/element/cherry.htm

Corn, Field

ipm.osu.edu/element/corn.htm

Corn, Sweet

ipm.osu.edu/element/sweet.htm

Cucumber (Pickles)

ipm.osu.edu/element/pickle.htm

Lettuce

ipm.osu.edu/element/lettuce.htm

Peach

ipm.osu.edu/element/peach.htm

Pear

ipm.osu.edu/element/pear.htm

Pepper

ipm.osu.edu/element/pepper.htm

Plum

ipm.osu.edu/element/plum.htm

Potato

ipm.osu.edu/element/potato.htm

Radish

ipm.osu.edu/element/radish.htm

Residential Turfgrass

ipm.osu.edu/element/resturf.htm

Snap Bean

ipm.osu.edu/element/snapb.htm

Soybean

ipm.osu.edu/element/soy.htm

Squash and Pumpkin

ipm.osu.edu/element/pumpkin.htm

Tomato, Processing

ipm.osu.edu/element/tomato.htm

Wheat

ipm.osu.edu/element/wheat.htm

Appendix G: Articles about this project

IPM and NRCS Programs Build a Shared Vision for Growers and the Environment

CSREES's [Northeastern IPM Center](#) and the Natural Resources Conservation Service (NRCS) are training growers in practices that will minimize environmental impacts while improving crop yield and pest control. At the same time, IPM and NRCS professionals are learning about each other's work and how to reap benefits from the strengths of both USDA-funded groups.

Integrated pest management (IPM) programs promote the use of effective, economical pest management practices that reduce risks to the environment and human health. NRCS offers financial incentives to growers whose farming practices reduce nonpoint source pollution to protect water, air, and soil quality. In many cases, conservation and IPM practices overlap, so growers have an opportunity to benefit economically from using practices that protect the environment while managing pests.

With funding from a 2006 USDA Extension-IPM grant, the Northeastern IPM Center brought four states together to design a series of on-farm workshops. Land-grant-based IPM specialists, private consultants, state employees, growers, and NRCS staff are becoming partners in cross-educating themselves about these related, but still very distinct, USDA programs.

In June 2007, 65 growers, consultants, Extension specialists, and NRCS employees from four northeastern states attended an on-farm workshop organized by the Maine Department of Agriculture, University of Maine Cooperative Extension, and NRCS. The event, hosted by two farms in Lincoln County, Maine, included presentations on ecological weed control, plant nutrition and crop health, host plant resistance, no-till and cover crop systems, and soil quality assessment tools.

At County Fair Farm, owner Andy Williamson demonstrated his approach to minimizing soil disturbance and erosion by preparing crop fields using a zone till cart that makes 4-inch-wide seed beds, followed by a planter that plants directly into the zone tillage rows. At Spear Farm, owner Bob Spear talked about using row covers for his corn and greenhouses for his tomatoes so these crops can be ready for market early in the season.

In a post-workshop evaluation, attendees reported an increase in their knowledge of both conservation and IPM practices, as well as greater awareness of resources such as extension scouting programs and NRCS cost-share programs. Participants came away from the workshop with plans to increase their use of weed mapping, crop disease forecasting, insect traps, synthetic row covers, greenhouses, crop rotation, disease resistant varieties, and pest scouting.

Similar on-farm workshops were held in Massachusetts during summer 2007, augmented with support from other agencies. A June 19 workshop at the Warner Farm in Sunderland, Massachusetts, drew about 35 participants, with a morning session tailored for NRCS staff (who rated a hands-on scouting exercise as "extremely helpful") and an evening session targeted toward growers, who focused on topics such as resistance management.

Additional programs are being developed in Connecticut and Maryland that will include one-on-one mentoring. The Northeastern IPM Center has also worked with several states to develop [web-based information resources](#) that will help growers earn greater financial assistance from NRCS for using IPM practices.



Andy Williamson of County Fair Farm in Jefferson, Maine, explains his approach to integrated pest management and soil conservation.

Article about Building Bridges project in the Center's *IPM Insights* newsletter, October 2008.

Incentives could boost IPM adoption

Workshops help NRCS to help growers

Since 2007, nearly 400 northeastern growers and Natural Resources Conservation Service (NRCS) staff have attended on-farm workshops aimed at improving growers' ability to earn financial incentives for managing pests in ways that protect the environment. IPM specialists, NRCS personnel, and growers have become partners in educating each other through hands-on training in Maine, Massachusetts, Pennsylvania, Maryland, and Delaware, with support from the Northeastern IPM Center's Vegetable Working Group and a CSREES grant entitled "Building Bridges between IPM and NRCS."

Through its Environmental Quality Incentives Program (EQIP), NRCS offers financial help to growers whose farming practices protect water, air, and soil quality. Growers may now qualify for these incentives if they use IPM tactics like crop rotation, pest scouting, trap crops, and other effective, economical pest management practices that minimize environmental risks.

Farmers who attended a workshop in Maine last July appreciated the interactive, informal nature of the event, and a majority reported that they would apply for EQIP funds as a result of what they had learned.

"We need more of these types of programs for small growers to pass the knowledge around," explained one grower. Workshop leaders hope to offer more training like this in the future, focusing on various crops.

The farm is the classroom

Because NRCS staff work with growers who seek incentives, they play a crucial role in explaining the connections between conservation and integrated pest management. Until recently, NRCS and IPM programs seldom interacted, leaving many unaware that growers might simultaneously benefit from the strengths of both these USDA-funded groups.

"Those NRCS folks who have attended the workshops now see Extension IPM specialists as an important resource," says Ruth Hazard, who



Agricultural consultant Luke McConnell (McConnell Agronomics) teaches NRCS professionals from Maryland and Delaware to sample for pests and then make management decisions using real-life scenarios. Photo by C. Koplinka-Loehr

has led workshops in Massachusetts. "These staff members represent the future of NRCS."

"Every occasion like this builds on my knowledge base," said an NRCS staff member from Massachusetts. Another participant reported gaining "an improved ability to discuss IPM with growers as well as greater confidence in tackling pest management plans."

One IPM tour took NRCS professionals to vegetable and grain farms in Delaware and Maryland, where they learned pest sampling techniques, control options, and decision-making for vegetables and tree fruits. While the programs include handouts such as fact sheets and pest identification guides, participants are most enthusiastic about the hands-on, practical aspects of the workshops.

The Northeastern IPM Center has also worked with several states to develop web-based information that will help growers earn financial assistance from NRCS for using IPM practices (NortheastIPM.org/nrcs.cfm).

2009 IPM SYMPOSIUM

The Sixth International IPM Symposium, "Transcending Boundaries," will be held March 24-26, 2009, in Portland, Oregon. See details at www.ipmcenters.org/ipmsymposium09/.

The Northeastern IPM Center, a sponsor of the event, will work with partners to offer a session called "Implementing IPM in Affordable Housing through Strategic Partnerships," with case studies that will include

- the Healthy Pest Free Housing Initiative, a Boston-based initiative with an eight-year history,
- Penn State's Philadelphia Schools and Community IPM Partnership, which has created inroads in IPM education for urban communities,
- the new, national IPM training curriculum (see cover story) developed under the Center's leadership.

Presenters at this session will discuss strategies, lessons learned, and results achieved in each program, and will provide suggestions for adapting their model to other settings.