



Transition of Insect Pest Management to New Pest Control Technology

Final Report
Agricultural Pilots Project
August 2009

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Executive Summary

- The Transition of Insect Pest Management to New Pest Control Technology project, also known more broadly as the Pest Management Transition Project (PMTP) was funded to deliver research-based information to the Washington apple industry and broader stakeholders, and to facilitate the tree fruit sector's transition from use of Guthion (an organophosphate pesticide) to alternative practices based on Integrated Pest Management (IPM).
- The PMTP established a set of benchmarks, all of which were met or exceeded.
- An Advisory Committee composed of a diverse group of 30 individuals representing agricultural, environmental, and farm worker interests was established, met 4 times, and provided valuable input that shaped the project.
- The PMTP included a strong, quantitative assessment component. Two comprehensive surveys, one of professional IPM consultants and another of apple growers, were conducted to establish baselines and enable robust evaluation of changes in IPM practices over time. Initial results indicate:
 - Nearly all consultants (97%) identified codling moth as the most important apple pest.
 - All consultants responding knew about the Guthion phase-out, but only 55% knew the last year the product could be used (2012).
 - Most consultants (75%) desired more training on use of OP alternatives and IPM practices.
 - Most growers (77%) used Guthion in 2008, but 48% of them had reduced its use over the previous three years
 - Most growers (56%) reported the amount of codling moth injury was about the same in 2008 as the previous three years.
 - Most growers (75%) indicated the cost of codling moth control had increased.
 - Nearly all growers (95%) knew about the Guthion phase-out but only 32% knew the last year the product could be used.
 - Most growers (57%) expressed a desire for more training on OP alternatives and IPM practices.
- Implementation Units (IUs) were a primary vehicle to deliver research-based knowledge and influence changed practices.
- The influence of IUs exceeded 40,000 acres in 2008 and 95,000 acres in 2009 and thus directly impacted more than half of the Washington apple acres.
- Team members engaged 60 environmental and farm worker organizations to explain project activities and develop sustained dialogue to improve overall project effectiveness.
- A significant number of Hispanic apple growers and their work force were involved in field day activities via Spanish translation. Much PMTP information is being made available in Spanish. Two IUs were composed exclusively or partially of Hispanic growers.
- Educational products and activities included:
 - IU handbooks (600 distributed throughout the industry)
 - Fourteen newsletters (print and electronic) on a variety of IPM topics delivered to 400

- people.
- Seven PMTP field days attended by over 220 people. In addition, the project participated in several other field days sponsored by other organizations.
 - Collaboration with WSU Extension to put on a two-day Pest Management school titled, *Growers and Mangers Working Together to Optimize Resources*. There were 183 participants at four locations, three of which were delivered via simulcast from the Wenatchee Confluence Technology Center.
 - Educational sessions at the Washington State Horticultural Association annual meetings in 2007 and 2008, attended by over 400 people.
 - Presentations at 37 winter meetings throughout the state.
 - Sponsorship of 2 health fairs and migrant and seasonal farm worker housing camps to engage residents on issues of pesticide safety.
 - Use of Turning Point educational software to assess learning and knowledge of participants at various meetings, schools and field days.
 - Dynamic, regularly-updated web site (<http://pmtip.wsu.edu/>), providing one-stop shopping for current and archived information regarding PMTP activities, IPM technologies, events, relevant links, etc.).
- The largest tangible impact of this project was that the Washington apple industry embraced our approach and made significant and measurable progress in its transition from reliance on organophosphate pesticides to robust IPM practices. This transition involves operations from small- to large-scale throughout the state's apple production districts and will enhance the health of farm workers and the environment as well as the economic health of the state's most valuable agricultural sector.

Project overview and accomplishments

Apple producers are under substantial pressure to maintain profitability in the face of escalating global competition, consumer expectations, and regulatory requirements. To remain globally competitive, agriculture must continually adopt new technologies to meet regulatory, market, and consumer demands. Significant regulatory concern over pesticides focuses on organophosphate insecticides (OPs). A regulatory action coupled with grower adoption of Integrated Pest Management (IPM) practices has resulted in a 59% reduction in OP use since 1995. However, a National Agricultural Statistics Service survey (NAAS 2006) reported that Washington apple growers applied 483,500 pounds of OPs in 2005. Two chemicals, azinphos-methyl (AZM = Guthion) and chlorpyrifos, comprise 80% of that total. Most Washington apple growers have based control of the key pest, the codling moth (CM), on AZM. The Environmental Protection Agency (EPA) has announced the phase-out of AZM by 2012. This regulatory action marks a new era for the apple industry, which must control CM while transitioning from AZM to new IPM-based strategies.

Reducing the use of OPs would reduce exposure risks to the environment and the work force. The EPA classifies many recently registered insecticides as reduced risk and OP alternatives. While these alternatives are safer, they are in many cases more costly, less efficacious, and used with different timing and application requirements than OPs they replace. In reality, transitioning from OPs will increase apple pest control costs and require significantly more sophisticated management. Fortunately, existing research-based knowledge on new technologies is available to help with the transition of IPM programs.

IPM is an ecologically based approach to managing pests in agriculture and urban environments. Washington's tree fruit industry is recognized internationally as a leader in tree fruit IPM. Research has developed new technologies (softer chemistries, more precise predictive models, improved spray delivery systems) and strategies for incorporating them into commercially relevant programs, and yet many tree fruit producers have not fully embraced new IPM practices. Some advocacy groups in Washington remain harshly critical of the tree fruit industry for what they perceive to be stubborn reliance on pest control practices that endanger both the environment and work force. Even the EPA's recent AZM decision has been attacked as an unacceptable delay, and a lawsuit has been brought against the EPA to ban chlorpyrifos. Finally, few Washington citizens are aware of the progress to date or of ongoing research that is leading to even safer and more sustainable IPM programs in the state's apple production.

Recognizing an opportunity to move proactively and transition to new technologies that would not only meet but surpass EPA regulations, apple industry leadership sought and received funding both through the State Legislature and also through the *Ag Pilots Program* for this project. Because the activities funded through each of these grants were so integrated, this final report includes activities and achievements made possible through both venues, with special emphasis on Ag Pilots-focused accomplishments. The combined project is referred to by the name of Pest Management Transition Project (PMTP). A complete report of the PMTP can be found on-line at http://pmtip.wsu.edu/downloads/PMTP_Final_Report.pdf. This online report outlines the administrative structure, advisory committee membership, and benchmarks and accomplishments of the PMTP, and focuses on educational efforts for the apple industry's transition from old to new IPM technologies. In contrast, this current Ag Pilots report does not seek to repeat or duplicate the final online PMTP report but rather to focus on the integration of

each project's components and on the overall accomplishments of the PMTP and Ag Pilots Projects.

The PMTP was designed to change practices, attitudes and perceptions of IPM while maintaining acceptable crop protection, sustaining grower profitability, reducing pesticide exposure risks of farm labor, and enhancing environmental health. And under this umbrella, the *specific goals of this Ag Pilots project were to:*

- 1) understand barriers to adoption of new IPM practices and develop educational and training strategies which encourage rapid and sustained adoption;
- 2) develop metrics to assess the impact that adopting new technologies has on (1) growers' economic viability and (2) the environment; and
- 3) understand perceptions of the environmental and farm labor sectors to more effectively develop education, communication and outreach programs that engage these groups.

Accomplishments pertaining to the first goal are discussed below in sections A (outreach and education) and B (assessment and documentation), while accomplishments pertaining to the third goal are discussed in section A item #1 (b and c). Metrics are still under development for the second goal, pertaining to economic impacts of technology adoption by growers. The Ag Pilot and PMTP staffs are working with a national group to adopt an IPM Evaluation Tool that can be used to assess these kinds of program changes. Project component timelines are discussed throughout the body of this report, and additional progress is discussed at the end alongside general reflections on the impact of this project on tree fruit profitability, sustainability, partnerships, successes, challenges, and next steps.

A. Outreach and Education

Outreach and education efforts of PMTP occurred in several different venues and were targeted to growers, pest management consultants, farm workers, and environmental group representatives. The primary grower-focused educational activities of PMTP were carried out through Implementation Unit (IU) meetings, distribution of pest management IU handbooks, field days focusing on IPM practices, sponsorship and organization of the WSU Fruit School on pest management, sessions at the WA State Horticultural Association annual meeting, winter grower meetings, and pesticide applicator recertification classes. PMTP also presented at a number of public meetings, field days, and health fairs, both within and outside of the fruit industry, to share the mission of PMTP and the efforts that Washington growers are taking to integrate new pest management strategies into their programs. PMTP newsletters, addressing seasonal IPM topics, were distributed via mail and email, the PMTP website was regularly updated, and articles about PMTP appeared in several news media. PMTP also met with individual farm worker and environmental group representatives to further exchange information, identify needs, and build relationships.

1. Target groups: There were three target groups for this project's outreach efforts:

- a. **Growers/pest management consultants:** The grower/consultant-focused educational efforts of PMTP were carried out through IU meetings. An IU was defined as a group of growers, managers, and crop consultants from the same general area who were willing to meet regularly for education, planning, and sharing experiences as

new IPM strategies were adopted. The IUs were patterned after the ‘education and information sharing’ model that was successful in previous ‘areawide’ projects that facilitated the adoption of pheromone technology (Codling Moth Areawide Management Project (CAMP) – 1995-1999).

- b. ***Farm workers:*** In 2008-09, meetings were held with over 30 individuals and organizations that work with farm workers in order to better understand the concerns and knowledge of the farm worker community on new insecticides, explain the work of PMTP, and establish key points of trust for outreach to farm worker communities. These meetings, and participation in several farm worker–oriented events and outreach activities, indicated a need for educational materials on the risks and benefits of new insecticides so that orchard supervisors and service providers could better communicate with workers on pesticide safety issues. The PMTP has been working with US EPA, WSDA and WISHA to develop posters and other materials with this type of information about new insecticides, and has been pilot testing poster designs with health clinic outreach workers and farm workers in order to finalize a clear and appropriate poster for improving farm worker knowledge of pesticides and pesticide safety. A draft of this poster was also displayed at two farm worker health fairs sponsored by PMTP in collaboration with Columbia Valley Community Health of Wenatchee, and is appended on the CD accompanying this report. If new funding is obtained, the PMTP will continue to work with groups that represent the farm worker community to assess needs for education as they arise. A list of farm worker groups that PMTP met with is found in Table 1 at the end of this report (pgs. 21-23).
 - c. ***Environmental and sustainable agriculture groups:*** In 2008-09, meetings were held with over 30 individuals and organizations working in the areas of environmental conservation and sustainable/bio-agriculture. These meetings were designed to establish points of contact with groups, explain the work of PMTP, and begin an exchange of ideas on the impacts and implications of the pesticide transition for environmental and agricultural goals. These meetings, and participation in broader environmental group committee meetings, indicated that many groups supported PMTP and were interested in varying levels of collaboration. PMTP has since incorporated groups’ thoughts, feedback, and questions into projects such as the 2009 grower survey, and will continue to work with these groups to identify areas of common interest, such as comparing pesticide use data from ongoing PMTP surveys with water quality data from nearby Watershed Planning Units and Department of Ecology studies, in order to better understand the environmental impacts of the pesticide transition over time. A list of the environmental conservation groups that PMTP met with is found in Table 1 at the end of this report (pgs. 21-23).
2. **Educational venues:** There were three educational venues for this project – implementation units, presentations, and field days:
- a. ***Implementation Units (IUs)*** – Grower/consultant Implementation Units were formed in one of three ways:

- i. Warehouse centered groups – growers, managers, warehouse, and ag-chem fieldmen associated with a particular warehouse.
- ii. Regional groups – targeted individuals in a given geographical area that were invited by the regional coordinators to attend IU meetings.
- iii. Walk-ins – people that signed up via the web or at a winter meeting.

Geographic distribution of the IUs is shown in Fig. 1 (08) and Fig. 2 (09). Most of the IUs met in March, April, and May for the purpose of planning pest management strategies and then again in August (pre harvest) and November (post harvest) to assess pest management programs and PMTP educational efforts. The meetings were held in locations that were convenient for the local group (warehouse lunchrooms, warehouse boardrooms, fire stations, diners, and churches). The IU handbook (described below) was used to guide discussions at IU meetings, but participation by those in attendance was actively encouraged, which made each IU meeting unique. Jay Brunner, WSU entomologist and Tree Fruit Research and Extension Center (WSU-TFREC) director, attended many of the IU meetings to discuss current WSU research and how to practically apply research-based knowledge. Dr. Elizabeth Beers, WSU entomologist focusing on secondary pests, also attended several of the IU meetings to help address issues of secondary pests, which have been an obstacle in implementing new pesticides that are replacing AZM for codling moth control. Nick Stephens, private consultant and PMTP regional coordinator, attended IU meetings to share practical experiences of implementing new IPM practices. Nadine Lehrer, PMTP assessment specialist, attended IU meetings to help assess the needs and perceptions of the groups and to help with translation with groups that included Spanish-speaking participants.

The first year's (2008) experience with the Implementation Units indicated that warehouse centered groups were likely the most sustainable – attendance was most consistent and participants were more involved in discussions. In most cases, a warehouse manager was responsible for encouraging attendance and discussion. The composition of the warehouse centered groups varied, but in general fell into one of three categories: (1) warehouse growers; (2) warehouse field staff; or (3) warehouse field staff, growers, and agricultural chemical fieldmen that work with the warehouse. Most of the IUs from 2008 continued into 2009; however, some were refocused around a warehouse and others were combined or relocated for the purpose of increasing attendance and participation. Also, to help encourage attendance, PMTP worked with the Washington State Department of Agriculture (WSDA) to provide pesticide applicator recertification credits to those who attended PMTP IU meetings in 2009.

Though the number of IUs and IU participants decreased slightly in 2009, the number of acres represented by the IU participants increased from 43,000 to 95,000. This was due, in part, to a more focused approach to organizing the IUs around a warehouse and also increased participation by consultants (private, warehouse, and agricultural chemical distribution), who often represented decisions made on multiple acres. Some of the warehouse consultants indicated that they did not make pest

management decisions; however, the warehouse seems to have increasing influence on pest management decisions because of consumer demand and export issues. Though the warehouse field staff was not always responsible for writing pest management recommendations, their influence on the decision making process made them a good target group for PMTP. If funding is obtained to continue PMTP, warehouse groups will be a larger focus of future education efforts. The IUs in 2009 also included one Spanish language group. Nadine Lehrer, PMTP assessment specialist, helped with translation and organization of the Spanish language education efforts.

At the end of 2008, IU participants were asked to complete a brief survey, via TurningPoint (see pgs. 8, 11-12, and 14 for more information on TurningPoint) or online, to assess their perceptions of the IU meetings and the PMTP educational efforts. Overall, 102 (53%) of the IU participants responded to the survey and most indicated a high level of satisfaction with the IU meetings and the educational materials and programs provided by PMTP. More than 80% of the IU participants indicated that PMTP had influenced their pest management decisions and 90% indicated that they would like to participate in an IU again in 2009. Most (80%) indicated that they would like to attend a PMTP field day in 2009 and 97% indicated that they would like to continue to receive the PMTP newsletter. The complete survey and results are appended on the CD accompanying this report.

Figure 1. Implementation Unit Geographical Distribution (2008)



Figure 2. Implementation Unit Geographical Distribution (2009)



b. Presentations

- i. *Grower meetings and pesticide recertification classes*** – Winter ‘grower’ meetings, sponsored by WSU extension, warehouses/packinghouses, and agricultural chemical distribution companies, are a standard means for disseminating information to the Washington State apple industry. PMTP participated in 19 industry meetings in the winter of 2007-08 and 18 meetings in 2008-09. The focus of PMTP presentations at these meetings was conveying research-based knowledge on new IPM technologies and implementation, explaining how PMTP could help with the transition of pest management programs, and encouraging industry involvement in PMTP through participation in an Implementation Unit (IU).

In addition, the new assessment tool, TurningPoint (see p.11-12 and 14), was used to gather information and stimulate discussion at several winter meetings. The TurningPoint technology allows an audience to interact with and provide anonymous feedback to a presenter through the use of ResponseCards (“clickers”) (Fig. 3). PMTP presentations using TurningPoint were made at seven Spanish-language and one English-language seminar – including three large tree fruit industry meetings, and five separate pesticide applicator recertification classes.

The use of the TurningPoint system expanded these presentations from outreach and education to incorporate data collection as well. Sessions measured pesticide applicators’ knowledge of the Guthion phase-out and alternative methods of pest management, and helped expand PMTP outreach to specialized farm workers. Just under 1000 participants were surveyed (note, however, that there was some overlap between session participants so unique participants probably numbered more realistically around 7-800). The TurningPoint surveys from recertification classes are appended on the CD accompanying this report.

- ii. *Health fairs*** – PMTP partnered with Columbia Valley Community Health clinic of Wenatchee to host two health fairs at migrant farm worker housing camps in:

- Monitor, WA on June 26, 2009;
- Malaga, WA on June 27, 2009.

Health fairs lasted 2-3 hours and included booths from area health clinics with information on medical services and preventative health care, food, music, and a special focus on pesticides and the transition to new insecticides. This pesticide focus was achieved specifically through the development and playing of an interactive pesticide safety jeopardy board game with prizes. The ‘pesticide jeopardy’ questions are appended on the CD accompanying this report.

Approximately 450 people attended these health fairs, helping extend outreach on pesticide safety to migrant and seasonal farm workers.

- iii. *Public meetings*** – PMTP presented at the following public meetings:

- WSDA meeting, Yakima – January 9, 2008;

- Ruckelshaus Center meeting, Pullman – February 29, 2008;
- Presentation to visiting Chilean tree fruit representatives – August 27, 2008;
- “A Taste of Washington State University” WSU Week in Seattle – August 28, 2008;
- Water Quality Technical Subcommittee of Wenatchee Watershed Planning Unit – October 1, 2008;
- Audubon Society, Wenatchee Chapter – October 30, 2008;
- Ag Pilots Project Oversight Committee meeting – June 18, 2009;
- PMTP Advisory Committee Meetings: November 7, 2007; February 28, 2008; October 23, 2008; March 4, 2009.

iv. ***Other meetings*** – PMTP also presented at the following meetings:

- Pesticide Incident Reporting and Tracking (PIRT) panel – July 17, 2008;
- Opportunities Industrialization Center (OIC) “Partnerships that Work” Conference (booth and presentation) – August 6, 2008;
- Ag Forestry Leadership Program – Agriculture seminar presentation on pesticide issues – September 10, 2008;
- WSU Entomology graduate student seminar – November 7, 2008;
- Washington Growers Clearinghouse board meeting – November 20, 2008;
- Friends of Farms and Forests board meeting – December 4, 2008;
- Western Migrant Stream Forum (poster presentation), January 26, 2009;
- Northwest Regional Rural Health Conference – March 20, 2009;
- Washington Association of Community and Migrant Health Clinics health outreach workers (promotores) meeting (poster presentation) – April 21, 2009;
- Cinco de Mayo Omak Latino Health Fair (poster booth) – May 10, 2009;
- National Farmworker Health Conference – May 12, 2009;
- Pesticide Incident Reporting and Tracking (PIRT) panel – May 21, 2009.

v. ***Industry field tours*** – PMTP participated in two field tours in summer/fall 2008:

- Washington Environment Protection Agency Pest Management tour (sponsored by Washington Commission on Pesticide Registration) – July 22, 2008;
- New Paths - Health and Safety in Agriculture Western Agriculture Conference (sponsored by UW-PNASH) – November 12, 2008.

The handout that was provided to field tour participants is appended on the CD accompanying this report.

vi. ***WA Horticultural Association Annual Meetings***

2007 – The PMTP was introduced to the Washington apple industry at the 103rd annual meeting of the Washington State Horticultural Association held in Wenatchee on December 3, 2007. The PMTP session featured the following presentations:

- *History of apple IPM Transition Program funding, structure and goals*, Jim McFerson;

- *New insecticides that will help with the transition of apple IPM programs*, Mike Doerr;
- *Making the complex simpler: IPM Decision Aid System*, Vince Jones;
- *Reaching beyond traditional clientele with the IPM Transition message*, Karen Lewis;
- *Environmental Quality Incentives Program (EQIP)*, Nana Simone;
- *How to get involved in the apple IPM Transition Project* - Jay Brunner; and,
- *Challenges facing the IPM Transition Program* - Jay Brunner.

Approximately two hundred people attended the two-hour PMTP session.

2008 – The PMTP hosted a session at the 104th annual meeting of the Washington State Horticultural Association (WSHA) in Yakima, WA on December 2, 2008. The session, entitled *AZM (Guthion) Phase Out: How to be Successful in a Changing Environment*, was managed by Jay Brunner and featured the following presentations:

- *Delegate and Altacor: New Products to Fit AZM Phase-Out Programs*, Mike Doerr;
- *Minimizing Negative Impacts of New Products*, Betsy Beers;
- *Dealing With Change – Grower/Consultant Panel*, Nick Stephens;
- *Economics of Managing a Crisis Pest Situation*, Karen Lewis;
- *Extending Knowledge to New Audiences*, Nadine Lehrer;
- *PMTP: What Was Learned and Where We Are Going*, Keith Granger.

Approximately two hundred people attended the two-hour PMTP session.

In addition to the PMTP session:

- Nadine Lehrer presented at the Spanish language session of the WSHA meeting on December 2 with 400 attendees – *Pest Management Transition Program (PMTP) / Proyecto de Transición en Manejo de Plagas (PMTP) – Responding to Changing Pesticide Regulations and Improving Health and Safety / Respondiendo a Cambios en las Regulaciones de Pesticidas y Mejorando la Salud y la Seguridad*; and,
- Wendy Jones presented a PMTP poster at the WSHA poster session on December 2 – *Pest Management Transition Project: Helping Growers and Managers Update their IPM Strategies*. A copy of the WSHA poster is appended on the CD accompanying this report.

vii. WSU Pest Management Fruit School – The PMTP sponsored the 2008 WSU Fruit School on Pest Management entitled *Growers and Managers Working Together to Optimize Resources*. The two-day workshop on pest management was held on December 10-11 at the Wenatchee Confluence Technology Center. The event was also simulcast to the Yakima Valley Community College, Yakima WA; UI Extension Caldwell Complex, Caldwell ID; and the Agri-plex Annex, Okanogan WA. In total, there were 183 registered participants. The PMTP worked with WSU Extension and the Tree Fruit Research Commission to plan and host the event. The WSU Fruit School is a series of intensive workshops

involving industry, research, and extension experts. The Fruit School targeted fruit producers, orchard managers, crop consultants and field staff. The goals of this fruit school were to empower growers/managers to work with crop consultants in monitoring orchards, and to encourage crop consultants to trust and use farm-based information to help make IPM decisions.

More information about the Fruit School and video recordings of the Fruit School presentations can be found on the PMTP web site:

<http://pmtп.wsu.edu/fruitschool.html>. A complete and detailed agenda is appended on the CD accompanying this report. In addition, TurningPoint technology was used to survey participants and conduct pre- and post- learning assessments of Fruit School material. Results from the TurningPoint assessment are also appended on the CD accompanying this report.

c. Field Days

2008 – PMTP conducted three field days in 2008 at locations in Quincy, Prosser, and Brewster. The field days were planned in cooperation with the WSU Tree Fruit Extension Team, were open to the public, and were attended by approximately 120 people. Each event lasted approximately two hours and addressed four topics pertaining to implementing new IPM technologies: Codling moth and leafroller control strategies, Secondary pest issues, Implementing the Decision Aid System (DAS), and Horticultural practices and sprayer technologies to improve pest management.

2009 – PMTP conducted four field days in 2009 at locations in Quincy, Prosser, Brewster, and Wapato. In response to feedback from the 2008 field days, the 2009 field days were made more “hands-on” through the incorporation of audience activities and the rotation of small groups of participants through each of three stations. Each of the four field days lasted approximately two hours and included three stations: Monitoring, Sprayer Calibration, and BioControl. The field days were planned in cooperation with WSU Tree Fruit Extension Team, were open to the public, and were attended by approximately 100 people. Handouts provided at the field days are appended on the CD accompanying this report.

At each of the 2009 field day events, Dr. Brunner used the TurningPoint Audience Response system as a teaching aid during the monitoring station. Participants used a handheld device (Fig. 3) to answer a short series of questions about monitoring in the orchard while Dr. Brunner used a handheld receiver (Fig. 5) to monitor answers to the questions as the group worked through the series. In this way, Dr. Brunner was able to expand on areas that needed more explanation and spend less time on areas where the group had a solid level of understanding. Asking the group why they answered the way they did stimulated discussion and interaction and encouraged participants to share their opinions and experiences. The complete TurningPoint report from the four field days is appended on the CD accompanying this report.

Figure 3. The TurningPoint ResponseCard allows the audience to interact with presentations.



Figure 4. The TurningPoint USB receiver captures audience response in real-time.



Figure 5. The TurningPoint ResponseCard AnyWhere provides portability to the system and can be used without laptop or projector.



Figure 6. The TurningPoint polling software provides the option for real-time charts and graphics of audience response.



3. Educational materials

- a. Implementation Unit Handbook* – The IU Handbook (which is appended on the CD accompanying this report and is available on the PMTP web site, <http://pmtп.wsu.edu/handbook.html>) was well received by the industry – over 600

- printed handbooks were distributed in 2008-09. The handbook provides a general overview of many subjects that are important to implementing integrated pest management strategies in apple systems. The handbook does not prescribe programs, but instead presents basic principles useful in implementing new products and practices as pest management programs transition from OP based programs to new technologies.
- b. ***PMTP newsletters*** – PMTP newsletters were distributed, via mail and email, during the growing seasons of 2008 and 2009. Each newsletter was sent to approximately 400 people and addressed topics that were important to integrated pest management at specific times during the growing season. PMTP newsletters will continue through the 2009 growing season. Current and archived editions of the PMTP newsletter are available on the PMTP web site, <http://pmp.wsu.edu/newsletters.html>, and are appended on the CD accompanying this report.
 - c. ***Public articles and interviews*** – The Good Fruit Grower reported on PMTP field days in its August (08) issue (vol. 59: no. 13) – *Pesticide transition piques interest*. PMTP also authored four articles for the Good Fruit Grower: November (08) issue (vol. 59: no. 16) – *WSU pest management fruit school*; March (09) issue (vol. 60 no. 5) – *Learning new tactics*; June (09) issue (vol. 60: no. 11) – *Learn new practices: PMTP field days*; June (09) issue (vol. 60: no. 11) – *PMTP surveys consultants*. In addition, Nadine Lehrer worked with Informe Hispano, a Wenatchee based Spanish language newspaper, to create an article featuring PMTP, *Uso y desuso de pesticidas*, which was published on August 28 (08). Nadine also provided information about PMTP in a radio interview on the Spanish language Radio La Nueva in Wenatchee on September 12 (08). The Grower magazine also prepared an article on the Pest Management Transition Project to be published in July (09). Finally, PMTP authored an article – *New tricks for an old pest* – posted on the Initiative for Rural Innovation and Stewardship (IRIS environmental/rural development nonprofit group)’s “success stories” webpage (<http://www.irisncw.org/Success-Stories/New-Tricks-Old-Pest.html>). Copies of written articles are appended on the CD accompanying this report.
 - d. ***PMTP Web Site*** – The PMTP web site (Fig. 7, <http://pmp.wsu.edu>) provides background information about PMTP, meeting minutes and information, educational products (including newsletters, handbook, and field day handouts), information about the Implementation Units and how to get involved, reference tools (including speed sprayer use information, adult codling moth ID, and information on maximum residue levels (MRLs) of new products), information about the EQIP program and how to qualify, bilingual web forms for public comment and input, and a form to sign up for an IU or to receive newsletters. In addition, the website contains information relevant to assessment and documentation of PMTP (Fig. 8) – including milestones, progress reports, and the results of surveys that have been conducted over the course of the project.

Figure 7. PMTP website (<http://pmp.wsu.edu>).



Figure 8. PMTP website – Assessment & Documentation: Survey Results (http://pmp.wsu.edu/survey_IUres2.html).



4. Outreach tools

- a. **TurningPoint Technology** – PMTP used the TurningPoint audience response system (<http://www.turningpointtechnologies.com/>) as both a teaching tool and survey instrument. The TurningPoint system interfaces with Microsoft PowerPoint and allows the audience to participate in presentations by submitting responses to interactive questions using a ResponseCard (Fig. 3). The TurningPoint system consists of three parts: (1) polling software (Fig. 6), which allows interactive questions to be inserted into a PowerPoint presentation; (2) a small handheld response device (Fig. 5), which allows the audience to respond to questions posed by the presenter; and (3) a response receiver (Fig. 4). The polling software charts and graphs responses in real-time, which proved to be an excellent platform for initiating discussion and was used at PMTP field days, fruit school, and IU meetings to stimulate dialogue within the group and facilitate sharing of ideas and experiences. The polling software also records data and provides reports of the feedback that is received from the audience, which worked well for capturing survey data and was used to survey IU participants at the end of 2008 – to assess their perceptions of PMTP efforts, and at a number of grower and farm worker pesticide recertification meetings – to collect information about the level of understanding of these groups regarding the AZM phase-out and the new options for pest control that are available.
- b. **Wireless Interpretation Equipment** – The 2009 field day modules were made accessible in Spanish through the use of wireless interpretation equipment. This equipment, borrowed from Heifer International and the WSU Small Farms program,

consisted of one microphone pack and sixteen headsets. By tuning all pieces to the same frequency, Spanish-speaking participants could hear all presentations in real time interpreted from English by Nadine Lehrer. Through the use of this technology, about 6 Spanish-speaking growers in Wapato and 10 Spanish-speaking orchard IPM students in Quincy could understand and participate seamlessly in the field days. If funding is obtained to continue PMTP, increased access to PMTP events and materials will be a growing goal for outreach to Spanish-speakers in the tree fruit industry.

- c. ***Pessl Sprayer Calibration Instrument*** – The Pessl Sprayer Calibration Instrument was demonstrated at each of the PMTP field days to address the importance of thorough spray coverage and demonstrate the benefits of proper sprayer calibration and targeting the spray appropriately to the canopy of the orchard being sprayed. In addition, PMTP worked with Gwen Hoheisel, WSU Extension, to calibrate 16 grower sprayers during the time the Pessl instrument was in Washington. The most common findings when calibrating grower equipment were (1) clogged nozzles and (2) poor calibration of the vertical distribution relative to the canopy being sprayed. In most cases, nozzle maintenance was performed to bring the sprayer back in line with specifications and adjustments to the boom of the sprayer were completed that resulted in better targeting of the spray to the crop, which will result in less over-tree and under-tree drift. The Pessl Sprayer Calibration Instrument was brought to Washington with funding provided by the Pest Management Transition Project, WSU Extension, Washington Association of Wine Grape Growers, CropLife America, Friends of Farms and Forests, and the Coalition for Urban/Rural Environmental Stewardship.

B. Assessment and Documentation

Primary assessment and documentation efforts in 2008 were conducted through surveys of tree fruit industry consultants and growers, and related assessments of early IPM adoption:

1. *Consultant survey*

A survey of tree fruit industry consultants was mailed in July 2008. The survey measured levels of insecticide use, IPM practice adoption, and consultant opinions on and perceptions of the transition to alternative pest management systems during the 2007 growing season. The survey response rate was 57% (40 out of 70 eligible participants, 73 mailed out).

Consultants surveyed made pest management recommendations on an average of 1,950 acres of apples, about 10% of which was managed organically and 5% which was in transition to organic certification. Consultants also provided recommendations on an average of 415 acres of cherries, 370 acres of pears, and smaller acreages of apricots, grapes, peaches, nectarines, prunes, and plums. Ninety-five percent (95%) of respondents were male, and 75% were between 30 and 49 years of age. Two-thirds had parents who farmed during their childhood, and two-thirds had a four-year college degree.

Results indicated that consultants considered codling moth the pest of highest concern in 2007, and this concern corresponded with extensive recommendations of Guthion/AZM applications. However, consultants were also all aware that Guthion/AZM was being phased out, and one-third to just over one-half were aware of the various details (timing, amounts allowed) of the phase-out.

In addition, consultants reported a level of confidence that resulted in common recommendations of many alternative methods of pest control – new reduced-risk, OP alternative insecticides and also IPM practices such as monitoring, pheromone traps, and degree-day models. They reported relying on other consultants, the WSU Decision Aid System, WSU researchers, and conferences or workshops as their best sources of information on pest control. Seventy-five percent (75%) indicated an interest in more training on how to use or recommend alternatives for Guthion to manage pests.

In summary, while consultants were concerned that both the costs and control of codling moth would become more difficult and riskier after the Guthion phase-out, they agreed that WSU research had developed good information on alternatives to Guthion and that they had been able to use these alternatives in their codling moth control programs. These results indicate that the PMTP is having impact by providing training and resources to help the apple industry adopt acceptable alternative technologies. A copy of the consultant survey is appended on the CD accompanying this report along with a more complete summary of the survey results. A second and expanded consultant survey will be developed and distributed in the fall of 2009 to cover the 2009 growing season (if access to continued funding is obtained for PMTP).

2. *Grower survey:*

Based on results from the consultant survey and feedback from 2008 meetings, an additional survey was mailed to a sample of 2000 Washington State apple growers in February 2009 to assess growers' uses and perceptions of insecticides and IPM practices during the 2008 growing season. The response rate to this survey was 27% of eligible participants, and the data are currently being processed and analyzed. Thus, the data presented here are preliminary analyses and may still be subject to change.

Preliminary findings indicated that growers owned or managed a mean of 194 acres of apples. Most growers (77%) used Guthion in 2008, and 48% reported having decreased their use of OP insecticides in general from the previous three years. Most growers (67%) also used pheromone mating disruption in 2008 (60% said they felt confident in their use of the technique), and 44% had increased their use of OP alternative insecticides overall (but felt generally somewhat less confident in their use of these materials). Many growers were also using various IPM practices for codling moth control, including monitoring (78%), trapping (65%), degree-day models (59%), and insecticide resistance management (42%).

As for the impacts of these changing practices on codling moth control, 56% of growers reported that the amount of codling moth damage they found in 2008 was about the same as the previous three years, and 75% indicated that the cost of codling moth control had

gone up. Accordingly, high costs surfaced as the biggest barrier to adoption of OP alternative insecticides among respondents. With regards to the phase out of Guthion, 95% of respondents knew about the phase out, and 32% knew the last year that Guthion could be used. Most growers (60%) said they were in the process of reducing their Guthion use, while 17% had already stopped using Guthion (1.3% had never used Guthion). Finally, 57% of growers said that they would be interested in more training on how to use OP alternative insecticides and IPM practices.

Thus, preliminary survey results indicated that growers are aware of the Guthion phase out and are taking steps to reduce their use of Guthion and other OP insecticides, while increasing their use of alternative insecticides and IPM practices. However, most still have room for improvement in completely eliminating their use of Guthion and developing greater knowledge of and confidence with alternative methods of codling moth pest management. The PMTP plans to complete its analysis of these data by fall 2009, so as to compare results with the 2007 consultant survey and also use results to improve the PMTP and the transition to increased IPM use. A copy of the grower survey is appended on the CD accompanying this report and final survey results will be available in fall 2009.

These first consultant and grower surveys will also be used as baseline data for future comparisons with upcoming practices/perceptions surveys for the 2009 (for consultants) and, if PMTP funding is continued, the 2010 (for growers) growing seasons.

3. *Additional IPM adoption assessments*

Efforts to measure the on-the-ground adoption of IPM practices have been high on the PMTP agenda. Initial feedback from 2008 Implementation Unit members indicated that, despite challenges to adapting to a new system of pest control, growers and consultants had good success using IPM and alternative insecticides to control codling moth and leafroller in apple.

PMTP has been following up on such initial assessments using 1) the results from Implementation Unit evaluations, 2) data on baseline pesticide use and perceptions from grower and consultant surveys and from the WSU Fruit School TurningPoint sessions, and 3) data on farm worker pesticide knowledge gathered with the TurningPoint audience response system during Spanish language winter meeting presentations. Together, these sources of data have begun to give a picture of how much knowledge growers and specialized workers have concerning the Guthion phase out and IPM alternatives, how they are approaching the challenge of changing their pest management practices, and how useful the Implementation Unit programs have been in helping growers adopt alternative pest management strategies.

This early assessment of IPM adoption looks promising. Growers, consultants, and specialized farm workers are quite aware of the Guthion phase-out, and have significant experience with the newer chemistries and IPM strategies. In addition, IU members and others have responded very positively to PMTP outreach in 2007-09. Adding more detailed grower survey data will help give a fuller sense of how IPM adoption is

progressing, and together, these data will serve as a base for follow-up surveys and future case study analyses of IPM adoption, and will also provide insight on how to guide future IU meetings and broader outreach efforts so as to facilitate and support the use of IPM throughout the tree fruit industry.

C. Policy work: Environmental Quality Incentives Program (EQIP)

The 2002 Farm Bill created the Environmental Quality Incentives Program (EQIP) to address natural resource concerns in all land use sectors, including specialty crops. EQIP is administered by the USDA Natural Resources Conservation Service (NRCS). In 2008, over \$500,000 in pest management assistance was obligated by NRCS in contracts with tree fruit growers and this level of funding was expected to increase in 2009. Prior to 2008, some Washington tree fruit growers obtained EQIP contracts, but the focus was on irrigation system improvements with pest management assistance as an additional, but not primary, focus. For future contracts, NRCS will consider assistance to growers who wish to make the transition away from AZM and other organophosphate insecticides to mating disruption and new chemistries. This new focus for NRCS will be a means for some growers to afford the expense of adopting new IPM strategies and goes hand-in-hand with the educational efforts of the PMTP. PMTP Regional Coordinator Naná Simone spearheaded the tree fruit industry access to EQIP assistance by:

- Working with NRCS on the state and local level (in 3 NRCS geographic areas) to create a suite of appropriate pest management practices to facilitate the transition from organophosphate insecticides, a ranking system for applicants, and documentation procedures for producers who obtain contracts.
- Informing the tree fruit industry about EQIP through industry newsletters, magazine articles, websites, workshops and individual consultations.
- Following up with those who obtained contracts to assist them with pest management planning and documentation.

The PMTP worked with the EQIP program by encouraging those receiving contracts through EQIP to participate in PMTP by joining an IU. The education and sharing of information that is accessible through PMTP IUs has helped EQIP growers gain a better understanding of new IPM technologies that are available and has also helped them identify strategies for implementing these technologies. This type of education and information sharing has and will continue to better facilitate the successful transition away from organophosphates to new IPM technologies.

General findings

A. Profitability

In order for growers to successfully adopt new IPM strategies and OP-alternative insecticides, these new tools must be cost-effective. Preliminary indications suggest that tools are expensive, but there seem to be a number of early adopters using them in financially sustainable ways. More detailed perceptions of costs on the part of growers will be available once grower survey results are completely analyzed. However, a solid economic analysis of

the new pest management tools was not conducted as part of the Ag Pilots project due to lack of funding for a part-time economist. Nevertheless, this is work that project staff hopes to complete in the future through collaboration with Dr. Karina Gallardo, a newly hired WSU Agricultural Economist housed at WSU-TFREC. In addition, other WSU economists are working to model the macro-level financial impacts of the Guthion phase-out on the state's economy. Project staff looks forward to working with this group to further delve into the economic sustainability issues inherent in the transition to new pest management tools.

B. Sustainability

IPM contributes to agricultural sustainability in that it enhances environmental, social, and economic balance in pest management. Research indicates that use of IPM strategies and OP-alternative insecticides contributes to an improved environmental footprint in tree fruit production and gains for human health, especially for farm workers. However, transitioning to these new pest management tools implies increased costs, especially up front. Part of this project's current efforts and future goals is therefore to document the long term costs savings of using IPM (in terms of reduced pest pressure, improved conservation of natural predators, etc.) that can balance the increased costs of OP-alternative insecticides, in order to add to the assessment of IPM's economic sustainability. In addition, project staff is looking to more quantitatively document the environmental and social sustainability of new IPM practices using a sustainability assessment tool called the IPM Pesticide Evaluation Tool (see www.ipminstitute.org/pmoet for more details).

C. Partnerships

This Ag Pilots project helped strengthen relationships between WSU-TFREC and tree fruit industry representatives, growers, and pest management consultants. It also helped WSU-TFREC build new relationships with farm worker advocacy groups and service providers (health/legal clinic staff, etc.) as well as environmental and sustainable agriculture organizations. Many of these partnerships are described in the body of this report. In addition, a listing of the farm worker and environmental groups that PMTP met with during the Ag Pilots project is found in Table 1 at the end of this report (pgs. 21-23), and a listing of advisory committee members (which include many of the project's industry partners) is found in Table 2 on p.23. While many of the project's newer relationships still have room to grow and strengthen, the Ag Pilots project provided a very important opportunity to establish them and begin an exchange of ideas and information.

D. Project successes

Project successes included new and improved partnerships with stakeholders, high recommendations of IPM and new insecticides among consultants, buy-in to the pest management transition process from the tree fruit industry, high satisfaction with Implementation Units among participants, strong knowledge base about pesticides among pesticide applicators & supervisors, development and adoption of new materials for educational programs (IU handbook, newsletters, Turning Technologies system, Wireless Interpretation equipment), and ongoing outreach and collaboration with farm worker and environmental groups.

E. Project challenges

Project challenges included adequately strengthening partnerships with farm labor and especially environmental stakeholders. While such partnerships now exist, representing a major step forward, they are still in need of bolstering. This is particularly true in relationships with environmental organizations, where many groups expressed support for this project but lacked the time to participate in relevant collaborations. A second challenge included developing adequate Spanish language materials, especially written materials to extend outreach to Spanish-speaking growers and farm workers. While project staff was able to communicate orally with Spanish-speaking audiences, their ability to provide translated written materials was more limited due to lack of time. This is an area where project staff hope to improve in the coming months and years, provided more funding is secured. A third challenge was expanding outreach impacts beyond the early participants in Implementation Units; in other words, expanding IUs to include new growers and consultants and also designing outreach efforts for growers and consultants not able/willing to invest the time in IU meetings. This too is a future goal of this project. A final challenge was encountered in assessing real changes over time. While baseline surveys have provided good information on pest management practices from 2008-09, this project will need further funding in order to conduct future surveys to compare against this baseline, in order to more robustly assess pest management changes over time.

F. Project futures

This project has grown to include a much broader range of stakeholders that it had previously, and also to cover many more acres of tree fruit orchards than initially expected. Project leadership sought renewed legislative funding for the 2009-11 biennium, but due to economic shortfalls, this funding was not secured. Currently project leadership is applying for additional funds to continue this work, including:

- Possible funds from EPA (American Farmland Trust & EPA monitoring funds)
- WSDA specialty crop block grant – this project has passed the pre-proposal phase and is in the full proposal stage, and
- Dovetailing with a specialty crop research initiative based at WSU-TFREC and focused on enhancing biocontrol (through IPM practices and guided use of OP-alternative insecticides)

The goal is to have this project last through the complete phase out of Guthion in 2012, in order to better support the tree fruit industry's transition to new pest management tools and more adequately address health and safety issues for and with farm workers and environmental groups.

G. Synopses of result and data

Synopses of data, results, and impacts of this project on agricultural, environmental, and community sustainability and relationships are included in the body of this report and also in the materials appended on the CD accompanying this report.

Summary

The Ag Pilots Project funding that was accorded to the Transition of Insect Pest Management to New Pest Control Technology Project for the 2007-09 has made a crucial contribution to the viability and sustainability of tree fruit production as well as growers, consultants, farm workers,

and concerned citizens in Washington State. As a result of this funding, the broader Pest Management Transition Project has extended research-based knowledge on IPM strategies and alternative insecticides to a large and growing number of apple growers, pest management consultants, farm workers, environmental groups, and the public. With a multi-pronged approach combining workshops, meetings, web and print materials, presentations, survey assessments and evaluations, PMTP is facilitating the tree fruit industry’s transition from an organophosphate-based pest management system to one that blends environmental, social, and economic sustainability into an integrated pest management approach to tree fruit production. While many challenges remain to the full adoption of IPM within the tree fruit industry, much has been accomplished through the PMTP’s efforts thus far. It is the hope of PMTP staff and supporters that further funding will be obtained to continue this work, through to the complete phase-out of Guthion/AZM, to ensure industry adoption of IPM practices and broader stakeholder participation for a more sustainable tree fruit sector in Washington State.

Table 1. Meetings held (in person or by phone) with environmental and farm labor groups

Meetings with *environmental/sustainable agriculture groups* and related individuals

Name	Organization
Beth Anderson	Earth Ministry
Preston Andrews	WSU Horticulture program
Blair Anundson	WA Public Interest Research Group
Paul Benz	Lutheran Public Policy
Bob Bugert	Chelan-Douglas Land Trust
David Burger & Larry Nussbaum	Stewardship Partners
Lynne Carpenter-Boggs	WSU Bio-Ag program
Colleen Donovan	Heifer Project International
Lee Faulconer	WA State Department of Agriculture
Richard Frye	WA State Department of Ecology
David Granatstein	WSU Organics program
Michael Grenetz & Kathy Pryor	Washington Toxics Coalition
Kat Hall	Lands Council
Sandy Halstead	US Environmental Protection Agency – Region 10
Karen Lewotsky	Food Alliance
Mo McBrown	Washington Environmental Council
Rob McDaniel & Kara Whitman	Ruckelshaus Center
Julie Morgan	Upper Columbia Salmon Recovery Board
Justin Mount	USDA Natural Resources Conservation Service
Joshua Osborne-Klein	Earthjustice Legal Defense Fund
Marcy Ostrom	WSU Small Farms program
Mark Oswood	Audubon Society
Rachael Pecore	Columbia River Keeper

Mike Rickel & Sarah Rudbeck	Cascadia Conservation District
Mary Jo Sanborn	Chelan County Natural Resources
Ron Shultz	Office of Farmland Preservation
Amy Solomon	Bullitt Foundation
Don Stuart	American Farmland Trust
Mace Vaughan	Xerces Society
Nancy Warner	Institute for Rural Innovation and Stewardship (IRIS)
Additional group-wide meetings	IRIS Habitat Farming Committee
Additional group-wide meetings	Stemilt-Squilchuck Watershed Planning Unit

Meetings with *farm worker groups* and related individuals

Name	Organization
Sandra Aguilar & Mario Villanueva	Catholic Charities, Yakima Diocese
Patricia Arnold	WA Community, Trade, and Economic Development
Ofelio Borges , Flor Servin, & Jaime Ramon	WSDA Farm worker education
Manuel Castillo	T & T Orchards
Martin Cervantes, Velia Lewis, & Mireya Leyva	Opportunities Industrialization Center (OIC) of WA, Yakima
Carol Dansereau	Farm worker Pesticide Project
Shelley Davis	Farm Worker Justice, D.C.
Cherie Eichholz & Steve Gilbert	WA Physicians for Social Responsibility
Malaquias Flores	WSU Small Farms program
Harry Huntley	Morgan Orchards
Leo Garcia & Francisco Sarmiento	Wenatchee Valley College, Hispanic Orchard Employee Education Program
Jose Garcia Pabon	WSU Tri-Cities
Alejandra Gonzalez	EPIC/Migrant Head Start
Rich Fenske, Matt Kiefer, Helen Murphy, Coby Jansen, Rad, Jen Krenz	UW Pacific Northwest Agricultural Health and Safety
Carol McCormick & Laurie Riegert	Columbia Valley Community Health
Rosalinda Mendoza	Farm Worker Housing Trust
Louisa Mora & Oralia Zacarias	OIC Farm Worker Investment Program, Wenatchee
Pat Matteson	CA Dept of Pesticide Regulation
Teresa Niedda	Farm worker Health & Safety Institute
Juvenal Perales	Radio KDNA
Patrick Pleas	Northwest Justice Project
Joan Qazi	Wenatchee Valley College
Margaret Reeves	Pesticide Action Network (CA)

Nana Simone	Pest Management Transition Project
Jose Zambrano	Informe Hispano
Additional group-wide meetings	Washington Association of Community and Migrant Health Clinics
Additional group-wide meetings	Washington State Department of Agriculture Pesticide Training Stakeholder meetings
Additional group-wide meetings	WSU Extension Working with Latinos workshops
Additional group-wide meetings	Wenatchee Valley College Hispanic Orchard Education IPM Technician classes
Additional group-wide meetings	Columbia Valley Community Health Manson Health Fair & Migrant Camp visits
Additional group-wide meetings	Northwest Justice Project Migrant Camp visits

Table 2. Advisory Committee members

Name	Organization	Name	Organization
Jim Cowin	Yakima POM Club	Ofelio Borges	WSDA
Orlin Knutson	Alamo Organic	Nick Stephens	Columbia IPM
Byron McDougall	McDougall & Sons	Frank Alvarez	Dovex
Steve Zediker	WA Hort. Assoc.	Edilberto Garcia	Sagemoor Farms
Kevin Knight	Growers Clearinghouse	Jose Ramirez	Stein Manzana
Keith Mathews	Yakima Valley Growers & Shippers	Alberto Roman	Larson Fruit
Charlie Pomianek	Wenatchee Valley Traffic	Ellen Gray	WA Sustainable Food & Farming
Rich Fenske	UW Occupational Health	Lisa Pelly	WA Rivers Conservancy
Leo Garcia	Wenatchee Valley College	Travis Schoenwald	Gebbers Farms
Gwen-Alyn Hoheisel	WSU Extension	Sandy Halstead	EPA Region 10
Dave Gleason	Yakima POM Club	Cynthia Lopez	WSDH
Doug Walsh	WSU IPM Coordinator	Mike Willett	Northwest Hort. Council
Lee Gale	NCW Fieldmen	Aaron Avila	GS Long Co.
Greg Pickel	Wilbur-Ellis Co.	Dennis Nicholson	Nicholson's Orchards
Helen Murphy	UW - PNASH	Mary Jo Ybarra-Vega	Quincy Community Health Center