Apple Pest Management Transition Project

Final Report
June 2009
Executive Summary

- The Pest Management Transition Project (PMTP) was funded (07-09 biennium) to deliver research-based information to the Washington apple industry, thus facilitating the transition from organophosphate insecticides to alternative IPM practices.
- PMTP established a set of benchmarks, all of which were met or exceeded.
- An Advisory Committee (30 individuals) comprised of a diverse group of individuals was established, met 4 times, and provided valuable input that shaped the project.
- Surveys, a professional IPM consultant survey and a grower survey, were conducted to establish baselines, which will be used to evaluate changes in IPM practices over time. Survey results included:
  - Consultants (97.5%) identified codling moth as the most important pest of apple.
  - All consultant respondents knew about the Guthion phase-out but only 55% knew the last year the product could be used.
  - Ninety-five percent of grower respondents knew about the Guthion phase-out but only 32% knew the last year the product could be used.
  - Seventy-five percent of consultants indicated a desire for more training on the use of OP alternatives and IPM practices.
  - Fifty-seven percent of growers indicated a desire for more training on the use of OP alternatives and IPM practices.
  - Most growers (77%) used Guthion in 2008, but 48% of them had reduced their use over the previous three years. Fifty six percent reported that the amount of codling moth injury was about the same as it had been during the previous three years.
  - Most growers (75%) indicated that the cost of codling moth control had increased.
- 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, the latter representing more than half of the Washington apple acres.
- PMTP educational products and activities included:
  - Implementation Unit handbooks (600 distributed throughout the industry)
  - Fourteen newsletters (print and electronic) on a variety of IPM topics sent 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 Managers 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 explaining how to transition to new IPM technologies and how to become involved in the project.
  - Use of Turning Point technology to assess learning and knowledge of participants.
at various meetings, schools and field days.
  o The PMTP web site (http://pmtp.wsu.edu/), serving as the best single source for up to date and archived information on how to transition IPM programs by taking advantage of new technologies.

- PMTP made small but significant changes in moving most grower IPM programs away from reliance on organophosphate insecticides. It was also responsible for completely transforming some large operations to new IPM technologies.
- PMTP interfaced with 60 farm worker or environmental organizations to explain changes being made in IPM programs that impacted or interested them.
- PMTP delivered several field day activities via Spanish translation and interacted with two IUs that were comprised exclusively or partially of Hispanic growers.
History of PMTP

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 ($550,000 for 07-09 biennium) through the State Legislature for the Pest Management Transition Project (PMTP). These funds were allocated through the Washington State Department of Agriculture (WSDA) with specific reporting requirements set forth in an agreement between the WSDA and the Washington Tree Fruit Research Commission (WTFRC), the industry vehicle to receive funds from the WSDA to execute the project. The WTFRC provided a grant to the WSU Tree Fruit Research and Extension Center to meet the objectives of the PMTP.

The PMTP will 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.
Overview of PMTP Benchmarks and Accomplishments
PMTP recognizes barriers to the adoption of new pest control technologies in IPM. PMTP has addressed these barriers through a comprehensive program of education, training, and assessment.

Table 1. Summary of benchmarks and accomplishments

<table>
<thead>
<tr>
<th>Activity Milestones</th>
<th>Time-line</th>
<th>Accomplishments</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Form Executive Committee:</strong></td>
<td>Summer 2007</td>
<td>The PMTP Executive Committee was formed in the summer of 2007 (see Executive Committee below).</td>
</tr>
<tr>
<td><strong>Form Advisory Committee:</strong></td>
<td>Summer 2007</td>
<td>The PMTP Advisory Committee was formed in the fall of 2007 (see Advisory Committee below).</td>
</tr>
<tr>
<td><strong>Establish baseline:</strong> Conduct surveys of IPM practices used by growers and assess perceptions of farm labor and environmental communities about IPM technologies.</td>
<td>Winter of 2007 and spring of 2008.</td>
<td>An ‘apple consultant survey’ was completed in 2008 (see Documentation and Assessment below). An ‘apple grower survey’ was completed in 2009 (see Documentation and Assessment below). Meetings were held with farm labor and environmental groups to assess perceptions and needs (see Broader Outreach Efforts below).</td>
</tr>
<tr>
<td><strong>IPM Adoption working group:</strong></td>
<td>Winter of 2007 and continuing to add new participants as adoption increases.</td>
<td>A group of early IPM adopters was assembled in January of 2008 to identify barriers to adoption of new IPM technologies and develop strategies for working with Implementation Units to increase adoption. Most of the Implementation Units included 1-2 participants that could be classified as early adopters. These participants were able to share their experience using new technologies with others in the group during the IU meetings.</td>
</tr>
</tbody>
</table>
Table 1. Summary of benchmarks and accomplishments (continued)

<table>
<thead>
<tr>
<th>Activity Milestones</th>
<th>Time-line</th>
<th>Accomplishments</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Education efforts:</strong> Conduct intensive, focused educational workshops on tools and methods to implement OP transition pest management programs.</td>
<td>Winters of 2007, 2008, and 2009 and continuing in off-season as needed.</td>
<td>Educational efforts were conducted through Implementation Unit (IU) meetings, Field Days, and Workshops (see <em>Outreach and Education</em> below).</td>
</tr>
<tr>
<td><strong>Education products:</strong> Develop educational materials (manuals, web-based products, etc.) that support the implementation of OP transition programs for all Washington fruit crops.</td>
<td>Initial efforts in winter of 2007-08 with revisions, updates, and new information added as they become available in the next two years.</td>
<td>Over 600 IU handbooks were distributed (see <em>Implementation Unit handbook</em> below). Fourteen PMTP newsletters were distributed (see <em>Newsletters</em> below). The PMTP web page is the most up to date source for PMTP information (see <em>Web Page</em> below).</td>
</tr>
<tr>
<td><strong>Implementation:</strong> Carry out an action plan for the pest management transition program.</td>
<td>Establish IUs - winter 2007-08. Expand IUs in second season.</td>
<td>Fourteen IUs, representing 43,000 Washington apple acres, met regularly in 2008 for education, planning, and sharing experiences as new IPM strategies were adopted. IUs were reorganized in 2009 resulting in 11 IUs, representing 95,000 Washington apple acres (see <em>Implementation Units</em> below).</td>
</tr>
<tr>
<td><strong>Assessment:</strong> Document change in practices using TEAM economic assessments, environmental indices, and surveys of farm labor and environmental partners about changes in the apple IPM system.</td>
<td>2008 production season and subsequently until transition goals are achieved.</td>
<td>Surveys and meetings conducted in 2008 served to establish baseline partnerships and measures from which to assess future change in IPM practices and perceptions among stakeholder groups (see <em>Documentation and Assessment</em> below).</td>
</tr>
<tr>
<td><strong>Reporting</strong></td>
<td>Report at the end of each production season. Final report at project end.</td>
<td>Two interim reports were submitted to WSDA (June 08, January 08). A final report was submitted in June 2009.</td>
</tr>
</tbody>
</table>
**Executive Committee** – The PMTP Executive Committee (EC) oversees project personnel, budgets, goals, and objectives. Current members of the PMTP EC are listed below.

**Dr. Jay Brunner**, WSU Tree Fruit Research & Extension Center, 1100 N. Western Ave., Wenatchee, WA 98801; Office: 509-663-8181 x238; Email: jfb@wsu.edu

**Bruce Grim**, Executive Director, Washington State Horticultural Association, P. O. Box 136, Wenatchee, WA 98807-0136; Office: 509-665-9641; E-mail: bruce@wahort.org

**Dr. Jim McFerson**, Manager, Wash. Tree Fruit Research Commission, 1719 Springwater Ave., Wenatchee, WA 98801; Office: 509-665-8271 x1; Email: mcferson@treefruitresearch.com

**Dr. Marcy Ostrom**, Director, WSU Small Farms Program, CAHNRS, 1100 N Western Ave., Wenatchee, WA 98801; Office: 509-663-8181 x263; Email: mrostrom@wsu.edu

**Karen Lewis**, Washington State University Extension, P.O. Box 37-Courthouse, Ephrata, WA 98823; Office: 509-754-2011 ext 411; Email: kmlewis@wsu.edu

**Advisory Committee (Table 2)** – The Advisory Committee (AC) provides a vital broad base of perceptions, experiences, and knowledge to improve the effectiveness of the PMTP from planning stages through the life of the project. The AC is a credible, representative source of concerns, ideas, and input serving to help shape and reshape the project. PMTP AC membership is listed below.
### Table 2. Advisory Committee members

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

**Advisory Committee meetings** – Two meetings of the PMTP AC were scheduled each year, spring and fall. All advisory committee meetings were open to the public. Meetings were held in November 2007, February 2008, October 2008, and March 2009. Minutes of the AC meetings can be found on the PMTP web site (http://pmtp.wsu.edu/agd_min.html) and are appended on the CD accompanying this report.

**PMTP staff**

- **Keith Granger**, PMTP Manager. Directs education and outreach activities, oversees implementation efforts, and works with the assessment specialist on assessment and documentation.

- **Nadine Lehrer**, Assessment Specialist. Works to assess and document changes in IPM practices and spearheads education and communication efforts involving environmental groups, farm workers, and policy makers.

- **Wendy Jones**, Web and Communication Specialist. Develops and maintains the PMTP web site, develops web-based educational products, and organizes communication efforts for the PMTP.

- **Nick Stephens**, Regional Coordinator. Helps to establish Implementation Units and facilitate meetings and field days.
Outreach and Education
Outreach and education efforts of PMTP occurred in several different venues. The primary 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. Finally, in a broader outreach effort, PMTP met with farm worker and environmental group representatives to exchange information, identify needs, and build relationships.

TurningPoint Technology – PMTP used the TurningPoint audience response system (http://www.turningtechnologies.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. 3), 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 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.
<table>
<thead>
<tr>
<th><strong>Figure 3.</strong> The TurningPoint ResponseCard allows the audience to interact with presentations.</th>
<th><strong>Figure 4.</strong> The TurningPoint USB receiver captures audience response in real-time.</th>
</tr>
</thead>
<tbody>
<tr>
<td><img src="image3.png" alt="Image 3" /></td>
<td><img src="image4.png" alt="Image 4" /></td>
</tr>
<tr>
<td><strong>Figure 5.</strong> The TurningPoint ResponseCard AnyWhere provides portability to the system and can be used without laptop or projector.</td>
<td><strong>Figure 6.</strong> The TurningPoint polling software provides the option for real-time charts and graphics of audience response.</td>
</tr>
<tr>
<td><img src="image5.png" alt="Image 5" /></td>
<td><img src="image6.png" alt="Image 6" /></td>
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</tbody>
</table>
Implementation Units (IUs) – The primary 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).

The Implementation Units were formed in one of three ways:

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

Geographic distribution of the IUs is shown in Fig. 7 (08) and Fig. 8 (09) and specific statistics of the IUs and participants are included in Table 3 and 4 (08) and 5 and 6 (09) below. 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 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-language 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 were 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 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.
Table 3. PMTP Implementation Unit Statistics (2008)

<table>
<thead>
<tr>
<th>Implementation Unit (IU)</th>
<th>Number of IU Meetings</th>
<th>Number Acres (Apple) Represented</th>
<th>Number of Participants</th>
</tr>
</thead>
<tbody>
<tr>
<td>Okanogan County 1</td>
<td>5</td>
<td>508</td>
<td>27</td>
</tr>
<tr>
<td>Okanogan County 2</td>
<td>5</td>
<td>12614</td>
<td>15</td>
</tr>
<tr>
<td>Chelan County 1</td>
<td>3</td>
<td>815</td>
<td>12</td>
</tr>
<tr>
<td>Chelan County 2</td>
<td>4</td>
<td>493</td>
<td>12</td>
</tr>
<tr>
<td>Chelan County 3</td>
<td>5</td>
<td>1965</td>
<td>13</td>
</tr>
<tr>
<td>Chelan County 4</td>
<td>5</td>
<td>4590</td>
<td>11</td>
</tr>
<tr>
<td>Grant County 1</td>
<td>6</td>
<td>2322</td>
<td>19</td>
</tr>
<tr>
<td>Grant County 2</td>
<td>4</td>
<td>2270</td>
<td>8</td>
</tr>
<tr>
<td>Grant County 3</td>
<td>5</td>
<td>6905</td>
<td>15</td>
</tr>
<tr>
<td>Yakima County 1</td>
<td>4</td>
<td>3000</td>
<td>8</td>
</tr>
<tr>
<td>Yakima County 2</td>
<td>6</td>
<td>3100</td>
<td>6</td>
</tr>
<tr>
<td>Yakima County 3</td>
<td>4</td>
<td>2043</td>
<td>20</td>
</tr>
<tr>
<td>Yakima County 4</td>
<td>4</td>
<td>70</td>
<td>8</td>
</tr>
<tr>
<td>Benton County 1</td>
<td>4</td>
<td>1943</td>
<td>18</td>
</tr>
<tr>
<td>Totals</td>
<td>64</td>
<td>42,638</td>
<td>192</td>
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</tbody>
</table>

Table 4. IU Summary Statistics (2008)

<table>
<thead>
<tr>
<th>Consultant</th>
<th>Grower/Manager</th>
<th>Use CM Mating Disruption</th>
<th>Use Guthion</th>
</tr>
</thead>
<tbody>
<tr>
<td>24%</td>
<td>56%*</td>
<td>87%</td>
<td>73%</td>
</tr>
</tbody>
</table>

*20% answered ‘other’ or did not respond.
Table 5. PMTP Implementation Units (2009)

<table>
<thead>
<tr>
<th>Implementation Unit (IU)</th>
<th>Number of IU Meetings</th>
<th>Number Acres (Apple) Represented</th>
<th>Number of Participants</th>
</tr>
</thead>
<tbody>
<tr>
<td>Okanogan County 1</td>
<td>3</td>
<td>4422</td>
<td>14</td>
</tr>
<tr>
<td>Okanogan County 2</td>
<td>3</td>
<td>25912</td>
<td>12</td>
</tr>
<tr>
<td>Okanogan County 3</td>
<td>3</td>
<td>12521</td>
<td>15</td>
</tr>
<tr>
<td>Chelan County 1</td>
<td>3</td>
<td>4500</td>
<td>9</td>
</tr>
<tr>
<td>Chelan County 2</td>
<td>3</td>
<td>9250</td>
<td>11</td>
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<tr>
<td>Grant County 1</td>
<td>3</td>
<td>2422</td>
<td>15</td>
</tr>
<tr>
<td>Grant County 2</td>
<td>3</td>
<td>8715</td>
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<tr>
<td>Grant County 3</td>
<td>3</td>
<td>8295</td>
<td>9</td>
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<tr>
<td>Yakima County 1</td>
<td>3</td>
<td>398</td>
<td>13</td>
</tr>
<tr>
<td>Yakima County 2</td>
<td>3</td>
<td>8100</td>
<td>14</td>
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<tr>
<td>Yakima County 3</td>
<td>1</td>
<td>10000</td>
<td>9</td>
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<tr>
<td><strong>Totals</strong></td>
<td><strong>31</strong></td>
<td><strong>94,535</strong></td>
<td><strong>136</strong></td>
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</tbody>
</table>

Table 6. IU Summary Statistics (2009)

<table>
<thead>
<tr>
<th>Consultant</th>
<th>Grower/Manager</th>
<th>Use CM Mating Disruption</th>
<th>Use Guthion</th>
<th>PMTP in 2008</th>
</tr>
</thead>
<tbody>
<tr>
<td>35%</td>
<td>56%*</td>
<td>70%</td>
<td>42%</td>
<td>64%</td>
</tr>
</tbody>
</table>

*9% answered ‘other’ or did not respond.
Implementation Unit Handbook – The IU Handbook (which is appended on the CD accompanying this report and is available on the PMTP web site, http://pmtp.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 principals useful in implementing new products and practices as pest management programs transition from OP based programs to new technologies. The handbook is divided into ten sections, each of which is briefly described below.

1. PMTP Overview – The PMTP overview includes an IU sign-up form, a list of contact information for the PMTP EC members and staff, an overview of the EPA phase-out schedule for azinphos-methyl, and the purpose and objectives of PMTP.

2. Mating Disruption – Mating disruption is presented as the foundation of an apple pest management program. This section explains the value of using mating disruption, provides information about the various mating disruption dispenser types that are available commercially, and identifies the best use practices for these dispensers based on research knowledge.

3. Using OP Replacements – There are many new insecticides that have been registered as OP replacements. This section presents an overview of the new insecticide options that are available for control of CM and LR in apple, best use information based on research conducted at the WSU TFREC, and several programmatic approaches for controlling CM and LR without the use of organophosphates.

4. Resistance Management – Resistance management is an important concept to consider as new insecticides are introduced into pest management programs. This section defines the concept of resistance management, explains the importance of implementing a sound resistance management plan, and provides information on how to plan pest management programs that incorporate a resistance management strategy.

5. Monitoring – A good monitoring program should be multifaceted and make best use of degree day models to identify insect phenology (when the pest is present), trapping technologies to identify population densities and distribution (how many are present), and visual inspections to identify hotspots and give confidence in the other facets of the program. The monitoring section provides an overview of the different aspects of a robust monitoring system and provides basic information about the different monitoring tools available.

6. Secondary Pests/Biological Control – Secondary pests have become an important issue as new insecticides are introduced into our orchard systems. This section provides an overview of current secondary pest issues and some things to consider, relevant to secondary pests and biological control, when planning a pest management program.

7. Clean-up Programs – This section gives two examples (organic and conventional) of pest management programs that were struggling, but were able to reestablish control by implementing some of the IPM practices presented in the handbook.

8. Cultural Practices – Thoroughness of spray coverage is very important when using new insecticides that must be consumed by feeding larvae or come into direct contact with
the egg to be effective. This section provides basic information on calibrating an airblast sprayer.

9. **Web Resources** – The WSU TFREC has many web resources that provide information about the orchard pest complex and materials used for control. The Decision Aid System (DAS) is one example. The DAS uses weather data from Ag Weather Net (AWN) to run insect and disease models. This section provides an overview of using the DAS.

10. **Appendices** – This section contains two previously published papers, which tie together the IPM principals presented in the handbook.

**Field Days (2008)** – PMTP conducted three field days in 2008 (Figs. 9-16): Tuesday, June 10th, Morgan Orchards, Quincy; Wednesday, June 11th, Oasis Farms, Prosser; and Thursday, June 12th, Crane & Crane Orchards, Brewster. The field day events 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.

- Codling moth and leafroller control strategies – Using a multi-tactic approach to disrupt the insect life cycle in as many places as possible is the best chance for successful control of key apple pests, such as the codling moth. Use of mating disruption, ovicides, and larvicides to control codling moth was discussed.
- Secondary pest issues – Secondary pests have become problematic in some transition scenarios. Control of secondary pests with new pesticides and avoiding flare-ups of secondary pests with product choice was discussed.
- Implementing the Decision Aid System (DAS) – The Decision Aid System (DAS) is a web-based program that integrates weather data, insect and disease models, management recommendations, and pesticide recommendation databases. Use of the DAS to plan and implement pest management strategies was discussed.
- Sprayer Technology – Thorough spray coverage is essential to successful pest management with new products that are being implemented to replace OPs. New sprayer technologies can help to better direct spray to the target. Taking the time to properly calibrate existing airblast technologies to match the canopy being sprayed can also improve coverage. Different application scenarios and sprayer coverage were demonstrated.

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.

**Field Days (2009)** – PMTP conducted four field days in 2009: Wednesday, May 28, C&M Orchards and Oasis Farms, Prosser; Wednesday, June 3, Gebbers Farms, Brewster; Wednesday, June 10, Double S Orchard, Quincy; and Thursday, June 12, Marquez Farms, 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.
• Monitoring – A monitoring plan for pests that utilizes degree-day models, trapping, and visual inspections can improve the efficiency of pesticide use by optimizing application timing and identifying specific areas that need, or do not need, pest controls. Tactics and approaches for building a monitoring plan were discussed at this station, which was taught by Dr. Jay Brunner from the WSU Tree Fruit Research Center in Wenatchee.

• Sprayer Calibration – Efficient pesticide applications improve economic efficiency and reduce offsite movement of pesticides. The Pessl Calibrating Unit is a high tech instrument used to assist orchard growers in improving pesticide application efficiency. The Pessl calibration instrument was demonstrated at this station, which was taught by Gwen Hoheisel and Karen Lewis from WSU Cooperative Extension.

• Biocontrol – Among the objectives of the Enhancing Western Orchard Biological Control (EWOBC) project are: evaluating the effects of pesticides on key natural enemies (NEs), characterizing the seasonal biology of key NEs, and evaluating methods for monitoring NE presence and abundance over time. Biocontrol and EWOBC progress were discussed at this station, which was taught by EWOBC project affiliates, Drs. Shawn Steffan, Elizabeth Beers, and Tom Unruh.

TurningPoint – Dr. Brunner used the TurningPoint Audience Response system as a teaching aid during the monitoring station at each of the field day events. Participants used a handheld device (Fig. 3) to answer a short series of questions relative to 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.

Pessl Sprayer Calibration Instrument – 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. The Pessl instrument consists of two parts:

1. **Nozzle output calibration** – The Pessl calibrating instrument has hoses that are attached to sprayer nozzles, which confines any nozzle output to the test system. When the sprayer is turned on, the spray discharged by the individual nozzles is carried through the hoses to collection tubes (one for each nozzle) where sensors measure the nozzle output in gallons per minute and transmit the data to a computer. An initial test of nozzle output is conducted to assess what needs to be done during the calibration to improve the output efficiency and the uniformity of output on the left and right sides of the boom. Based on the output measurements, strainers and nozzles that are clogged or damaged can be identified and repaired or replaced. After completing any necessary maintenance work on the nozzles, the Pessl instrument is used to measure the “after” calibration nozzle output and uniformity of output across the boom and any further adjustments and repairs can be made.
2. *Vertical Distribution Calibration* – The Pessl unit also conducts an analysis of the vertical distribution of spray during a calibration session. The instrument consists of a 4-foot wide by 15-foot tall screen with spray collectors to catch the nozzle discharge. The spray emitted from the sprayer onto the stand is collected in beakers with sensors that measure the amount of spray applied at each height above the ground. The sensors transmit the measurement to the computer, which creates a graph of the vertical distribution of spray and overlays that graph on an image of a tree canopy shape specific to the grower’s crop. The two sides of the boom are tested separately, and the computer program combines the data from both sides on the graph. After making necessary adjustments to better focus the spray to the target canopy, calibration can be reassessed. For more information visit: http://www.curesworks.org/spray/aboutCalibrate.asp.

The Pessl 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.

*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.

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.
Figure 9. Keith Granger (PMTP Manager) explained how to get involved with a PMTP Implementation Unit at PMTP field days (2008).

Figure 10. Dr. Jay Brunner (WSU) helped field day participants sign-up to join a PMTP Implementation Unit (2008).

Figure 11. Nick Stephens (PMTP Regional Coordinator) talked about his experiences using new IPM technologies at PMTP field days (2008).

Figure 12. Travis Schoenwald (PMTP AC) talked about his experiences using new insecticides and application strategies PMTP field days (2008).

Figure 13. Dr. Betsy Beers (WSU) presented current research relevant to secondary pest issues at PMTP field days (2008).

Figure 14. Dr. Vince Jones (WSU) talked about implementing the Decision Aid System (DAS) at PMTP field days (2008).
Figure 15. Tim Smith (WSU Extension) shared information about using phenology models to predict biological events PMTP field days (2008).

Figure 16. Tom Auvil (WTFRC) and Karen Lewis (WSU Extension) talked with field day participants about the importance of spray coverage (2008).

Figure 17. Dr. Brunner used the TurningPoint audience response system to interact with growers at PMTP field days (2009).

Figure 18. Participants answered a series of questions using a handheld TurningPoint device (left) while Dr. Brunner monitored results using a handheld receiver (right) to help guide discussion and learning (2009).

Figure 19. Dr. Shawn Steffan (WSU TFREC) helped field day participants identify natural enemies from collections that he brought to share (2009).

Figure 20. Nadine Lehrer (PMTP) translated from English to Spanish using wireless translation equipment at PMTP field days (2009).
Figure 21. The Pessl calibration unit was used to assess vertical distribution on a tower sprayer (left) and airblast sprayer (right) at PMTP field days (2009).

Figure 22. Spray emitted from the sprayer is collected in beakers with sensors that measure the amount of spray applied at each height above the ground (2009).

Figure 23. Below, the Pessl instrument is attached to an airblast sprayer for the purpose of calibrating nozzle output (2009).

Figure 24. Gwen Hoheisel (WSU Extension) explained the results of nozzle output calibration using the Pessl instrument at PMTP field days (2009).

Figure 25. Gwen Hoheisel explained how to make adjustments to improve deposition within the orchard canopy and reduce over-tree drift.

Figure 26. Dr. Jay Brunner (WSU) taught apple growers how to identify leafroller feeding sites (left) and discussed methods for sampling and monitoring (right) (2009).
WSU Pest Management Fruit School: Growers and Advisors Working Together to Optimize Resources – 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. The Fruit School featured four sessions:

Session 1: The Fundamentals
- Introduction, Jay Brunner
- Fundamentals of a well designed IPM system, Mike Doerr
- Fundamentals of sampling, Jay Brunner
- Economic example, Norman Suverly

Session 2: Achieving and improving control
- Introduction, Keith Granger
- Models and WSU Decision Aid System, Jay Brunner/Vince Jones
- Integrating new insecticides into an IPM plan, Keith Granger
- Integrating new fungicides into a pest management program, Chang-Lin Xiao
- Improving deposition and reducing drift, Andrew Landers
- Developing a site specific monitoring plan, Astrid Goplen
- Panel Discussion: Experience of good pest control, Keith Granger
- Economic Example, Norman Suverly

Session 3: Marketing and regulations
- Introduction, Tim Smith
- Regulatory issues affecting pest management, Mike Willett
- Panel Discussion: The practices of managing markets and pests, Mike Willett
- Public demand for sustainability in tree fruit production, Nadine Lehrer and Karina Gallardo

Session 4: Building capacity for a better pest management program
- Introduction, Tom Auvil
- Panel Discussion: The business management of pest management, Tom Auvil
- Improving the quality of your investment: Staff, Karen Lewis
- Improving the quality of your investment: Sprayer Technology, Andrew Landers
- EQIP, Justin Mount
- Economic Example, Norman Suverly

More information about the Fruit School and video recordings of the Fruit School presentations can be found on the PMTP web site: http://pmtp.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.
WA Horticultural Association Annual Meeting (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.

WA State Horticultural Association Annual Meeting (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 – 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.

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, 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. 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.

**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.

**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;

**Industry field tours** – PMTP participated in two field tours in the summer/fall of 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.

**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.

**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. Newsletter topics and dates of publication are listed below (Table 7).

**Table 7. PMTP newsletters**

<table>
<thead>
<tr>
<th>Newsletter</th>
<th>Date</th>
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<tbody>
<tr>
<td>PMTP Introduction and Overview</td>
<td>03/15/08</td>
</tr>
<tr>
<td>Airblast Sprayer Calibration</td>
<td>04/01/08</td>
</tr>
<tr>
<td>Codling Moth Mating Disruption</td>
<td>04/15/08</td>
</tr>
<tr>
<td>Petal Fall Codling Moth and Leafroller Control Strategies</td>
<td>05/01/08</td>
</tr>
<tr>
<td>PMTP Field Days</td>
<td>06/01/08</td>
</tr>
<tr>
<td>Environmental Quality Incentives Program (EQIP)</td>
<td>06/15/08</td>
</tr>
<tr>
<td>Monitoring Codling Moth</td>
<td>08/01/08</td>
</tr>
<tr>
<td>Stink Bugs – a late season pest of concern</td>
<td>08/15/08</td>
</tr>
<tr>
<td>Exporting Apples to Taiwan</td>
<td>09/01/08</td>
</tr>
<tr>
<td>WSU Pest Management Fruit School</td>
<td>11/01/08</td>
</tr>
<tr>
<td>Sprayer Technology</td>
<td>04/15/09</td>
</tr>
<tr>
<td>Orchard Pest Management: Thrips and Campylomma</td>
<td>05/01/09</td>
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<tr>
<td>PMTP Field Days</td>
<td>05/15/09</td>
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<tr>
<td>Monitoring Codling Moth</td>
<td>06/15/09</td>
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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://pmtp.wsu.edu/newsletters.html, and are appended on the CD accompanying this report.

**PMTP Web Site** – The PMTP web site (Fig. 27, http://pmtp.wsu.edu) provides background information about the 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. The website also has quick links to a calendar of upcoming events and more links and information about topics important to transitioning pest management programs. In addition, the website contains information relevant to assessment and documentation of PMTP (Fig. 28) – including milestones, progress reports, and the results of surveys that have been conducted over the course of the project.

**Figure 27.** PMTP website (http://pmtp.wsu.edu).

**Figure 28.** PMTP website – Assessment & Documentation: Survey Results (http://pmtp.wsu.edu/survey_IUres2.html).

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**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 was invited to author an article – *Collaboration in tree fruit* – to be posted during summer (09) on the Initiative for Rural Innovation and Stewardship (IRIS environmental/rural development nonprofit group)’s “success stories” webpage. Copies of written articles are appended on the CD accompanying this report.

**Broader Outreach Efforts**

Primary contact and outreach to broader stakeholders in 2008-09 was conducted through meetings with farm worker groups to establish partnerships and assess outreach needs, and meetings with environmental and sustainable agriculture groups to exchange ideas and establish working relationships.
1. **Farm worker perceptions and needs assessment:** 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 the 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. 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 the PMTP met with is appended on the CD accompanying this report.

2. **Environmental and sustainable agriculture sector perceptions assessment:** 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 the PMTP and were interested in varying levels of collaboration. The 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 the PMTP met with is appended on the CD accompanying this report.

**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:

**Baseline surveys**

*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 – both 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 based on access to continued funding of PMTP.

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.

**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. The 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 picture of IPM adoption assessment looks promising. 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 grower survey data to this picture in late 2009 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.
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 is 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:

1. 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.
2. Informing the tree fruit industry about EQIP through industry newsletters, magazine articles, websites, workshops and individual consultations.
3. 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.

Summary
The State Legislative funding that was accorded to the Pest Management Transition Project for the 2007-09 biennium, as administered by WSDA, has made a crucial contribution to the viability and sustainability of the tree fruit industry in Washington State. As a result of this funding, PMTP 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 for a more sustainable tree fruit sector in Washington State.
Financial Summary
Table 8 summarizes the expenditures of PMTP through the 09 biennium. The high costs in goods and services are the results of the cost of surveys and fuel costs that were originally budgeted in travel but show up on goods and services.

Table 8. Summary financial report for PMTP

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* The balance shown includes approximately $20,000 in encumbrances that were paid but had not shown up on the final financial reporting system.