Summary of Research and Extension Programs at Cornell's Hudson Valley Laboratory for 2009 and 2010

Dave Rosenberger, Plant Pathologist
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Highland, NY
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Summary of Research and Extension Programs at Cornell's Hudson Valley Laboratory for 2009 and 2010

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This report summarizes the applied research and extension activities of the scientists at Cornell's Hudson Valley Laboratory (HVL) during 2009 and 2010. The report describes 34 applied research and extension projects that involved apples, pears, stone fruits, grapes, and sweet corn. Over the past two years, the research/extension scientists at HVL made a total of 172 presentations at various research and extension meetings. We also authored or co-authored five peer-reviewed articles, 7 research abstracts, 10 short contributions for books, 24 technical reports on pesticide trials, and 67 articles in extension newsletters or other extension publications. Forty-six additional citations for newsletter articles resulted from items being reprinted in other state and regional newsletters after they were initially published in Scaffolds Fruit Journal.

Our applied research and extension programs keep us busy during summer, and our time during winter is occupied by report writing, grant writing, and compiling presentations for meetings. Nevertheless, we always have time to answer questions from fruit growers, regardless of whether those questions arrive by phone, e-mail, or via extension educators or private consultants. We still make farm visits to assess complex problems, set up field trials on commercial farms, and try to keep abreast of developments in commercial orchards. We welcome requests for farm visits when unusual situations create new problems because seeing problems on-site often leads to new insights. We hope that you will not hesitate to call us if you have problems, complaints, new observations, or novel ideas for our program efforts. We extend a special thanks to those who have given us permission to conduct applied research on their farms.

The Hudson Valley Lab is a unique research/extension resource for the fruit industry of New York and surrounding states. As scientists, we know that any success that we achieve is largely due to the integrated support structure that we enjoy thanks to linkages with and support from the local fruit industry, private consultants, agrichemical companies, Cornell University in Ithaca, the N.Y. State Agricultural Experiment Station in Geneva, and Cornell’s extension educators.

We also benefit from the dedicated work of a highly skilled group of technicians and support staff. That group includes Donna Clark, administrative assistant, and Albert Woelfersheim, facility manager. Over the past two years, technical support has been provided for varying periods of time by Anne Rugh, Lindsay Sudol, Fritz Meyer, Frank Zeoli, Joe Whalen, Alex Olsen and Jordan Gianforte. Jeff Dimetro assisted Albert with orchard planting and maintenance for the past two summers. Mike Basedow (Cornell University) and Roberta Adams (Marist College) were student interns during summer of 2010. Other summer employees who assisted our research efforts were Sarah Dressel, Melissa Berger, and Henry Grimsland.
SUMMARY OF HORTICULTURE PROJECTS FOR 2009-10

Steve Hoying, Joe Whalen, and Mike Fargione

1. 2006 Gala/Fuji Apple Planting Systems Trial – Dressel Farms

This was the 5th season of a continuing project that develops and tests effective and profitable planting systems by establishing research and demonstration orchards with cooperating growers. These projects are planned for 10 years during which data and observations are made on the chosen training systems. During the project, data on yield, fruit size, fruit quality, pruning times, and other important factors are collected from which updated economic analyses among systems are made. This information is updated and provided to fruit growers regularly through in-field meetings, fruit schools, newsletters, and Fruit Quarterly articles. In addition, other events are held at these sites to give growers hands on experience with these systems and the opportunity to learn through “our mistakes!” This planting looks specifically at available Geneva rootstocks G.11, G.935, G.41, G.210 and compares them to our current standards M.9, B.9, M.26, and M.7. It also compares a high density Central Leader System to Vertical Axis and Tall Spindle. Table 1 shows how the various combinations fared in yield for the 4th and 5th leaf for Gala depending on tree density and rootstock. It also compares a finished tree with a spring-grafted tree for M.9 and B.9. These were planted in place of grafted trees, were 1 full year behind in yield, and suffered much greater mortality not reflected in the data.

Table 1. Calculated yield (bushel/acre) for the planting systems/rootstock combinations of Gala in the Dressel planting systems trial in 2009 and 2010.

<table>
<thead>
<tr>
<th>Planting System</th>
<th>Rootstock</th>
<th>Tree Density</th>
<th>Yield ’09</th>
<th>Yield ’10</th>
</tr>
</thead>
<tbody>
<tr>
<td>Tall Spindle</td>
<td>M.9-337 – Finished Tree</td>
<td>1320</td>
<td>1351</td>
<td>1602</td>
</tr>
<tr>
<td>Tall Spindle</td>
<td>M.9-337 – Graft</td>
<td>1320</td>
<td>200</td>
<td>1098</td>
</tr>
<tr>
<td>Tall Spindle</td>
<td>G.16</td>
<td>1320</td>
<td>1253</td>
<td>1562</td>
</tr>
<tr>
<td>Tall Spindle</td>
<td>G.11</td>
<td>1320</td>
<td>985</td>
<td>1160</td>
</tr>
<tr>
<td>Tall Spindle</td>
<td>B.9 – Finished Tree</td>
<td>1320</td>
<td>950</td>
<td>1108</td>
</tr>
<tr>
<td>Tall Spindle</td>
<td>B.9 – Graft</td>
<td>1320</td>
<td>230</td>
<td>1118</td>
</tr>
<tr>
<td>Tall Spindle</td>
<td>G.41</td>
<td>1320</td>
<td>254</td>
<td>1058</td>
</tr>
<tr>
<td>Vertical Axis</td>
<td>M.9-337</td>
<td>726</td>
<td>832</td>
<td>1115</td>
</tr>
<tr>
<td>Vertical Axis</td>
<td>G.16</td>
<td>726</td>
<td>878</td>
<td>882</td>
</tr>
<tr>
<td>Vertical Axis</td>
<td>G.11</td>
<td>726</td>
<td>652</td>
<td>703</td>
</tr>
<tr>
<td>Vertical Axis</td>
<td>B.9</td>
<td>726</td>
<td>740</td>
<td>1436</td>
</tr>
<tr>
<td>Vertical Axis</td>
<td>M.26</td>
<td>726</td>
<td>474</td>
<td>828</td>
</tr>
<tr>
<td>Vertical Axis</td>
<td>G.41</td>
<td>726</td>
<td>498</td>
<td>729</td>
</tr>
<tr>
<td>Vertical Axis</td>
<td>G.210</td>
<td>726</td>
<td>565</td>
<td>949</td>
</tr>
<tr>
<td>Vertical Axis</td>
<td>G.935</td>
<td>726</td>
<td>541</td>
<td>507</td>
</tr>
<tr>
<td>HD C Leader</td>
<td>G.210</td>
<td>340</td>
<td>372</td>
<td>1047</td>
</tr>
<tr>
<td>HD C Leader</td>
<td>G.30</td>
<td>340</td>
<td>475</td>
<td>628</td>
</tr>
<tr>
<td>HD C Leader</td>
<td>M.7</td>
<td>340</td>
<td>360</td>
<td>613</td>
</tr>
<tr>
<td>HD C Leader</td>
<td>M.26</td>
<td>340</td>
<td>371</td>
<td>789</td>
</tr>
<tr>
<td>HD C Leader</td>
<td>G.935</td>
<td>340</td>
<td>323</td>
<td>641</td>
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</table>

Table 2. Effect of rootstock alone on yield.

<table>
<thead>
<tr>
<th>Rootstock</th>
<th>Yield</th>
</tr>
</thead>
<tbody>
<tr>
<td>G.16</td>
<td>1305</td>
</tr>
<tr>
<td>M.9-337</td>
<td>1190</td>
</tr>
<tr>
<td>B.9</td>
<td>1058</td>
</tr>
<tr>
<td>G.11</td>
<td>875*</td>
</tr>
<tr>
<td>G.41</td>
<td>862*</td>
</tr>
</tbody>
</table>

* Over-cropped in the 2nd leaf resulting in poor growth and return bloom

Table 3. Effect of planting system alone on yield.

<table>
<thead>
<tr>
<th>Planting System</th>
<th>Yield</th>
</tr>
</thead>
<tbody>
<tr>
<td>Tall Spindle</td>
<td>1128</td>
</tr>
<tr>
<td>Vertical Axis</td>
<td>841</td>
</tr>
<tr>
<td>HD Central Leader</td>
<td>521</td>
</tr>
</tbody>
</table>
2. 2007 Red Delicious Planting Systems Trial – Chiaro Farms

This trial was established in Columbia County to test planting systems for Red Delicious. Although this variety is not as popular as in the past, there is still a substantial market for Red Delicious apples in the United States. The current “Buy Local” marketing interest may further create opportunities for this apple variety in the Hudson Valley. The main problem with producing Red Delicious is slow growth resulting in delayed mature yields and when not planted at the proper spacing, poor mature yields. This trial was initiated because of persistent requests from Hudson Valley growers to investigate the best way to produce this variety of apple. The trial was established in the spring of 2007 and has now reached its 4th leaf. Planting System/rootstock combinations are now bearing with some yield in the 3rd leaf and substantially more this past harvest season. The planting systems of interest combine more vigorous and productive rootstocks and much higher densities and include a Super Spindle (2178 T/A), Tall Spindle (1320 T/A), Triple Axis (908 T/A), and Vertical Axis (670 T/A). This planting looks specifically at available Geneva rootstocks G.11, G.935, G.41, G.210, G.30, and B.118 and compares them to our current standards M.9-P2, M.26, and M.7. After only the 4th growing season it is evident that some combinations are better than others!

3. Sweet Cherry Planting System/Rootstock Trial

We established an NC-140 sweet cherry trial in Walden in 2010 to look at new ways to grow and manage sweet cherries in the Hudson Valley. The trial includes four planting systems (Upright Fruiting Offshoot, Tall Spindle, Kim Green Bush, and Super Spindle), 3 rootstocks (Gi 3, Gi 5, Gi 6), and 2 varieties (Regina, Blackgold). The trial has 208 trees and is replicated by planting system and rootstock. This trial will conclude in 2021.

4. Rootstock Trials in the Hudson Valley – HVL, Crist Bros Orchards

a. 2007 Comparison of M.7, M.26, B.118, and G.30 Red Delicious at the Hudson Valley Lab

A small block of trees, cultivar ‘Super Chief Red Delicious’ was planted at the Hudson Valley Lab in 2007 to compare 4 rootstocks potentially suitable for weak growing varieties to encourage space filling and early yield. Trees were trained to a Vertical Axe system (7’ X 14’) single stake with high wire and bottom tier limbs spread with branch spreaders as needed. All trees have survived on the Bath gravelly silt loam soils.

Fig. 1 shows the relative vigor among the rootstocks after 4 seasons of growth. M.26 is the weakest among the 4 stocks and 53% of the size of M.7, 45% of G.30 and 36% the size of B118.

B.118 proved to be extremely precocious, yielding 506 bu/acre in the 3rd leaf. However, it was apparently over-cropped at this level and returned in 2010 with only 101 bu/acre. Still, B.118 outperformed every other rootstock with a total of 601 bu/acre after 4 seasons (Figure 2). When rootstocks were compared using cumulative yield efficiency (yield / trunk cross sectional area [TCA]), B.118 was still slightly better than G.30 despite being a larger tree and considerably better than the standard M.26 and M.7.

![Fig 1. Difference in vigor of Red Delicious among 4 rootstocks.](image1)

![Figure 2. 2009 and 2010 Red Delicious yields](image2)
This rootstock from the Russian Budagovsky series is roughly equivalent in size to M.111 but much more productive. It is winter hardy, well anchored and tolerant of a wide range of soils.

In this trial B.118 and M.26 were completely free of root suckers. G. 30 averaged just over 1 root sucker per tree.

![Fig 3. The average number of root suckers on Red Delicious in 2010 among 4 rootstocks](image)

**Fig 3.** The average number of root suckers on Red Delicious in 2010 among 4 rootstocks

![A B C D](image)

**Fig 4.** A) M.7 rootstock – note the smooth union and abundant root suckers. This has good potential for serious Roundup uptake. B) M.26 rootstock, note the burr knots and large rootstock compared to scion. This rootstock is very susceptible to dogwood and plum borer. C) G.30 rootstock. Note the smooth rootstock and union. D) B.118 rootstock – note the overgrowth of the scion. This is a full vigor precocious rootstock.

**b. Crist Bros Orchards** sponsors one of the many rootstock trials in NY. This trial features 54 different stocks from around the world all with Fuji Torres cv. as the test variety. Growth, mortality, yield, and fruit quality measures are collected annually. With previous data from other sites several candidates from this set of rootstocks were identified for introduction to the fruit industry and several more are under consideration. Rootstocks include G.214 in the dwarf category and G.969, G.890, and G.210 in the semi-dwarf category.

**Table 2. Selected dwarf rootstocks in Crist Bros Orchards Rootstock Trial. Fuji Torres cv. Planted 2005.**

<table>
<thead>
<tr>
<th>Vigor</th>
<th>Rootstock</th>
<th>Trunk Cross Sectional Area (TCA cm²)</th>
<th>Cumulative Yield (kg)</th>
<th>Avg. Fruit Size (g)</th>
<th>Rank Among Dwarf Rootstocks (Yield efficiency)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dwarf</td>
<td>M.27</td>
<td>7.4</td>
<td>8.2</td>
<td>183.2</td>
<td>21</td>
</tr>
<tr>
<td>Dwarf</td>
<td>G.11</td>
<td>11.2</td>
<td>17.6</td>
<td>198.7</td>
<td>15</td>
</tr>
<tr>
<td>Dwarf</td>
<td>M.9-337</td>
<td>11.7</td>
<td>18.4</td>
<td>202.7</td>
<td>16</td>
</tr>
<tr>
<td>Dwarf</td>
<td>G.214</td>
<td>16.2</td>
<td>31.3</td>
<td>184.4</td>
<td>5</td>
</tr>
<tr>
<td>Dwarf</td>
<td>M.26</td>
<td>16.6</td>
<td>19.7</td>
<td>212.9</td>
<td>22</td>
</tr>
<tr>
<td>Dwarf</td>
<td>G.935</td>
<td>21.0</td>
<td>39.7</td>
<td>189.2</td>
<td>4</td>
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</table>
Table 3. Selected semidwarf rootstocks in Crist Bros Orchards Rootstock Trial. Fuji Torres cv. Planted 2005

<table>
<thead>
<tr>
<th>Vigor</th>
<th>Rootstock</th>
<th>Trunk Cross Sectional Area (TCA cm²)</th>
<th>Cumulative Yield (kg)</th>
<th>Avg. Fruit Size (g)</th>
<th>Rank Among Semi Dwarf Rootstocks (Yield efficiency)</th>
</tr>
</thead>
<tbody>
<tr>
<td>SemiDwarf</td>
<td>G.969</td>
<td>19.4</td>
<td>43.0</td>
<td>175.0</td>
<td>1</td>
</tr>
<tr>
<td>SemiDwarf</td>
<td>MM.106</td>
<td>21.5</td>
<td>22.2</td>
<td>189.1</td>
<td>8</td>
</tr>
<tr>
<td>SemiDwarf</td>
<td>M.7</td>
<td>21.9</td>
<td>14.0</td>
<td>214.2</td>
<td>12</td>
</tr>
<tr>
<td>SemiDwarf</td>
<td>G.210</td>
<td>23.1</td>
<td>28.3</td>
<td>202.8</td>
<td>6</td>
</tr>
<tr>
<td>SemiDwarf</td>
<td>B.118</td>
<td>26.6</td>
<td>22.7</td>
<td>213.1</td>
<td>10</td>
</tr>
</tbody>
</table>

### c. NC-140 Doubrava Gala X Replant Trial

Twelve different rootstocks are being tested for their response to fumigation. The Doubrava trial was established in 2006 specifically to evaluate the effect of soil fumigation on the performance of M26, M.9Pajam2, G.41, M.7, G.11, G.210, CG.4210, G.30, B.9, G.935, and M9-337. Data on trunk area, # suckers, length of leader and shoot growth yield, fruit numbers and size were collected and yield efficiency calculated. There was no effect of fumigation on tree growth or cropping over the first 5 years indicating that this was not a strong replant site.

### d. NC-140 2010 Fuji Apple Rootstock Trial at the HVL

This trial was established in 2010 as part of the new 2-acre horticulture orchard planting at the lab. This planting examines more closely the Russian Budagovsky cultivar.

Table 4. NC-140 Rootstock planting at the HVL.

<table>
<thead>
<tr>
<th>Rootstocks Name</th>
<th>Mortality</th>
<th>Expected Tree Vigor (% of Seedling)</th>
<th>Initial TCA (cm²)</th>
<th>November TCA (cm²)</th>
<th>Change in TCA 2010 (cm²)</th>
</tr>
</thead>
<tbody>
<tr>
<td>B.9</td>
<td>0%</td>
<td>20</td>
<td>1.29</td>
<td>1.56</td>
<td>0.26</td>
</tr>
<tr>
<td>B.10 (Bud 62-396)</td>
<td>0%</td>
<td>40</td>
<td>1.69</td>
<td>2.08</td>
<td>0.39</td>
</tr>
<tr>
<td>B.64-194</td>
<td>0%</td>
<td>60</td>
<td>0.33</td>
<td>1.28</td>
<td>0.94</td>
</tr>
<tr>
<td>B.67-5-32</td>
<td>0%</td>
<td>40</td>
<td>1.3</td>
<td>1.77</td>
<td>0.47</td>
</tr>
<tr>
<td>B.70-6-8</td>
<td>0%</td>
<td>50</td>
<td>2.06</td>
<td>2.81</td>
<td>0.75</td>
</tr>
<tr>
<td>B.70-20-20</td>
<td>0%</td>
<td>60</td>
<td>2.88</td>
<td>3.70</td>
<td>0.81</td>
</tr>
<tr>
<td>B.70-20-21</td>
<td>0%</td>
<td>50</td>
<td>1.06</td>
<td>1.23</td>
<td>0.17</td>
</tr>
<tr>
<td>B.71-7-22</td>
<td>0%</td>
<td>40</td>
<td>0.83</td>
<td>0.97</td>
<td>0.14</td>
</tr>
<tr>
<td>B.7-3-150</td>
<td>0%</td>
<td>60</td>
<td>2.25</td>
<td>3.16</td>
<td>0.91</td>
</tr>
<tr>
<td>CG.2034</td>
<td>0%</td>
<td>20</td>
<td>1.94</td>
<td>1.96</td>
<td>0.03</td>
</tr>
<tr>
<td>CG.3001</td>
<td>0%</td>
<td>30</td>
<td>1.96</td>
<td>2.99</td>
<td>1.02</td>
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<tr>
<td>CG.4003</td>
<td>0%</td>
<td>40</td>
<td>1.34</td>
<td>2.17</td>
<td>0.82</td>
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<tr>
<td>CG.4004</td>
<td>0%</td>
<td>40</td>
<td>2.11</td>
<td>2.64</td>
<td>0.52</td>
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<tr>
<td>CG.4013</td>
<td>50%</td>
<td>50</td>
<td>1.37</td>
<td>1.29</td>
<td>0.08</td>
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<tr>
<td>CG.4214</td>
<td>0%</td>
<td>40</td>
<td>1.33</td>
<td>1.44</td>
<td>0.11</td>
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<tr>
<td>CG.4814</td>
<td>0%</td>
<td>50</td>
<td>2.07</td>
<td>2.44</td>
<td>0.37</td>
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<tr>
<td>CG.5222</td>
<td>0%</td>
<td>40</td>
<td>2.18</td>
<td>2.99</td>
<td>0.81</td>
</tr>
<tr>
<td>G.11</td>
<td>0%</td>
<td>30</td>
<td>1.51</td>
<td>2.42</td>
<td>0.91</td>
</tr>
<tr>
<td>CG.3041</td>
<td>38%</td>
<td>30</td>
<td>1.89</td>
<td>1.97</td>
<td>0.21</td>
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<tr>
<td>CG.3041 DB</td>
<td>0%</td>
<td>30</td>
<td>1.36</td>
<td>1.65</td>
<td>0.29</td>
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<tr>
<td>5935</td>
<td>0%</td>
<td>40</td>
<td>2.54</td>
<td>3.03</td>
<td>0.48</td>
</tr>
<tr>
<td>935</td>
<td>0%</td>
<td>40</td>
<td>2.00</td>
<td>2.60</td>
<td>0.60</td>
</tr>
<tr>
<td>G.202 Normal</td>
<td>33%</td>
<td>50</td>
<td>3.24</td>
<td>3.67</td>
<td>0.42</td>
</tr>
<tr>
<td>G.202 TC</td>
<td>0%</td>
<td>50</td>
<td>2.12</td>
<td>2.84</td>
<td>0.72</td>
</tr>
<tr>
<td>PiAu 51-11</td>
<td>0%</td>
<td>50</td>
<td>2.50</td>
<td>3.22</td>
<td>0.72</td>
</tr>
<tr>
<td>PiAu 9-90</td>
<td>29%</td>
<td>60</td>
<td>2.40</td>
<td>2.53</td>
<td>0.37</td>
</tr>
<tr>
<td>Supporter 3</td>
<td>0%</td>
<td>40</td>
<td>1.26</td>
<td>1.52</td>
<td>0.26</td>
</tr>
<tr>
<td>M.9T337</td>
<td>0%</td>
<td>30</td>
<td>1.73</td>
<td>2.27</td>
<td>0.55</td>
</tr>
<tr>
<td>M.9Pajam2</td>
<td>0%</td>
<td>40</td>
<td>2.16</td>
<td>2.53</td>
<td>0.38</td>
</tr>
<tr>
<td>M.26EMLA</td>
<td>0%</td>
<td>40</td>
<td>1.75</td>
<td>2.55</td>
<td>0.80</td>
</tr>
</tbody>
</table>
series of rootstocks and a number of new Geneva stocks. In addition, this trial is investigating the effect of tissue cultured versus stoolbed propagation techniques in the nursery on field performance among several of the rootstocks. As with all rootstock trials, this is scheduled for 10 years.

4. Apple Variety Testing

a. New Cornell Apple Selection Testing: Fifteen second test selections of Dr. Susan Brown’s apple varieties continue to be evaluated at the HVL. These were planted in 2007 and now are in their 4\textsuperscript{th} leaf. A large crop in 2009 resulted in a much smaller crop in 2010 with still enough fruit to make some evaluations. Lab personnel help testing by making comments about the new varieties when they are brought in for tasting. NY2 is in this planting and produced enough fruit for use in small-scale demonstrations and evaluations. We continue to make observations on these and other selections on 8 Hudson Valley farms with variety trials.

b. Early Fuji Strain Trials: Six early strains of Fuji are under test at the Hudson Valley lab. They were initially grafted onto existing trees in 2007 and are now in their 4\textsuperscript{th} leaf. A good crop in 2010 allowed for variety evaluation. The best of the selections we tested were Fuji cv. Jubilee and Fuji cv. Rising Sun for color, but none were exceptional in our planting. We do have Fuji cv. September Wonder in the planting systems trial described above that appears to be large and highly colored. Harvest dates for early Fuji are generally in mid September.

c. Horticultural Planting - Varieties – HVL: After 3 years of planning and preparation we were able to establish a new 2 acre planting at the Hudson Valley lab largely funded by the Apple Research and Development Program – your grower dollars at work! This is a multifaceted planting designed to be able to do many different horticultural projects. One of its uses will be to evaluate varieties and strains of interest in Hudson Valley conditions. We now have planted new strains of Fuji (Aztec, Red Striped, and Rising Sun), new strains of Honeycrisp (Bedford strains), Minieska, SnowSweet, NY1 and NY2. We do have one strain of McIntosh (Linda) and plan to expand with other strains as they become available.

<table>
<thead>
<tr>
<th>Variety</th>
<th>Strain</th>
<th>Map Code</th>
<th>Rootstock</th>
<th># trees</th>
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<tr>
<td>Empire</td>
<td>Royal</td>
<td>E</td>
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<tr>
<td>Fuji</td>
<td>Aztec</td>
<td>NC140</td>
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<td>RSF</td>
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<td>Fuji</td>
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<td>B.9</td>
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<td>Gala</td>
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<td>Golden Delicious</td>
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<td>Honeycrisp</td>
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<td>Honeycrisp</td>
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<td>HS-1</td>
<td>M9-337</td>
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<tr>
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<td>HS-423</td>
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<td>McIntosh</td>
<td>Linda</td>
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<td>Minieska</td>
<td>SweeTango</td>
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<td>M9-337</td>
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<td>NY1</td>
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<td>M9-337</td>
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<td>Red Delicious</td>
<td>Spur Red</td>
<td>RD</td>
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<td>SnowSweet</td>
<td></td>
<td>SS</td>
<td>B.9</td>
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</table>
5. Top-working Apples with Bark Grafting

We continue working with growers helping them use grafting-over techniques more effectively in their own situations. We conducted workshops in 2010 to help growers to learn these techniques and to obtain the materials necessary to be successful. A research trial is underway in the Fuji strain trial (See 4.b above) looking at the best methods for establishing and caring for grafted trees.

6. Growth Regulator Trials: Retain, NAA, and Harvista

The early season and frost events curtailed thinning trials this season but we were able to establish 2 preharvest drop trials at Dressel Farms. The objective was to determine the effect of Retain combined with NAA on preharvest drop of McIntosh apples in a hot year. This year surely qualified. The trial again showed the effectiveness of combining these materials in a stop drop program for McIntosh. The full rate of Retain alone, half rates applied 4 and 2 weeks before harvest and the half rate of Retain with 5 weekly applications of NAA were the best treatments this season.

Another trial looked at a sprayable formulation of SmartFresh called “Harvista” from Agrifresh. This trial compared different application dates on the stop drop effect and fruit quality issues of using this material on McIntosh. Blocks of trees were sprayed at weekly intervals starting 3 weeks before expected harvest and finishing 3 weeks after expected harvest. Fruit drop was quantified; fruit samples were taken and assessed for color, firmness, soluble solids, and ethylene generation. The best treatment was sprayed just days before harvest allowing for the best color development and drop control. This treatment held 70% of the apples on the trees for an additional 30 days.

Figure 6. Cumulative drop of McIntosh treated with Different rates and timings of Retain and NAA.
7. Establishment of a Horticultural Research Planting at the HVL

This three-year effort reached its culmination in 2010 with layout and planting of the block. This planting has a total of 22 rows of apple trees each approximately 270 feet long (see Table 5 for varieties and numbers of each). The block acreage is approximately 1.92 acres with 0.55 acres of border for equipment turning etc. Rows 3, 5, 7, 9, and 11 were planted to Aztec Fuji and are dedicated to an official NC-140 Rootstock trial (see Point 4d), spacing 1.8m X 4.2m (6ft X 14ft) 1323 trees/ha (535 trees/acre). These trees will be trained as a modified tall spindle with a single high wire and individual conduit stake trellis. The total land requirement is 0.2ha (0.5 acres). Rootstocks are from breeding programs from Russia (B. series), Germany (Supporter and Pi-Au series), and the US (CG and G Series) compared to industry standards (M. series) (Table 1). Data on tree mortality, growth, precocity and yield will be collected and analyzed and compared to similar trials established throughout the United States and Mexico.

The entire block was nutrient and pH mapped with soil samples collected across the block in grid fashion, and a replicated lime application made to measure the effect of pH change on tree growth. Three tree growth trials were started as soon as these trees were planted investigating

a. The Effect of Leader Selection on Growth: This trial was designed to test the effect of severity of bud removal on subsequent growth of newly planted trees. Roberta Adams, a student intern from Marist College, conducted the trials as part of a required biology internship for her degree. This trial on Red Delicious and SnowSweet varieties compares the effect of removing buds 6 inches below the leader, 12 inches below the leader and no bud removal to leader growth, scaffold growth, and increase in trunk cross sectional area.

b. The Effect of Fertilizers on Growth: This trial was designed to test the effect of fertilizer applications to the growth of trees in the planting year by comparing (1) no fertilizer at planting; (2) 113 grams 7 days after planting; (3) 113 grams 7 days after planting and 30 days after planting; (4) 226 grams 7 days after planting. Trunk cross-sectional area (TCA), leader growth, and shoot growth were measured.

c. The Effect of Flower Removal on Growth: This trial tested the effects of blossom and fruit removal on new tree growth. Treatments included (1) No blossom or fruit removal; (2) Removal of all blossoms; and (3) removal of fruit that had set 21 days after bloom. TCA, leader growth and shoot growth were measured.

The entire block is set up so that replicated studies can be performed on a number of varieties. Growth measurements will be made annually to track the effect of nutritional programs and growth regulator use. This resource will also be used in Extension demonstrations such as pruning or training demos and to try practices that cannot easily be done on grower cooperator farms or when trees need to be sacrificed. As this block matures the primary use will be to study the “Carbohydrate thinning model” and thinning programs for the Hudson Valley.

Figure 2. Average leader growth when 0 cm, 10cm, and 20 cm of competitive buds were removed immediately below the leader bud.
8. Asian Pear Planting HVL

Eight varieties of Asian pears and two standard pears were planted at the HVL for evaluation as part of an NC-140 project. We are using some of the training techniques used with sweet cherry to try to establish Vertical Axis type trees. Tipping and bud removal will be used to encourage vigor control. Thinning trials on these difficult to thin varieties will also be done.

9. Hudson Valley Temperature Sensor Project

This project continues to gather temperature data across the Hudson Valley thanks to funding by the Hudson Valley Wine and Grape Growers Association, which provided money to renew sensors. We now use a system using the US Mail and our cooperators to renew sensors when needed, making this project much more efficient by preventing the need to drive to each sensor location.

10. Grape Vine Trunk Protection

This project is looking at a device affectionately named “The Electric Blanket” which consists of a proprietary heating element that is fastened to the grapevine trunk designed to keep it warm during critically cold temperatures. The heating elements are covered by insulation to keep the heat in. It was tested at a Hudson Valley vineyard in 2010. Several limitations have been identified, including the need to be near an electric power source, the cost of materials, the time and labor required for installation and removal in the spring, the fact that it provides only trunk protection. The economics probably only pan out in severe situations with frequent winter freeze events.

11. Mulches for Winter Protection of Grape Vines

This is the third year of a project looking at winter mulches for protection of grape vines. We have directly compared municipal wood chips with straw, soil, and uncovered vines. Pruning weights, crop yield, and fruit quality data has been collected but not yet analyzed. Perhaps the largest impact so far has been on weed control. The wood chip mulch layered 6 inches deep has required little additional weed control the three years of application and those weeds that do germinate are easily removed mechanically compared to the other mulches. We have not had a test winter resulting in any vine mortality through 2010 and there is no difference among treatments in vine mortality. This project has been funded primarily through start up funding from the department and additional funds from a special project from Senator Larkin, which resulted in the establishment of the vineyard at the Hudson Valley Lab in Highland NY.

12. Grape Variety Evaluation and Suitability for the Hudson Valley

This project was also funded through the Larkin funds and establishment of the vineyard at the HVL. All varieties are harvested annually and yield and fruit quality assessed by variety. In 2010, 5 gallon test wines were made from some of the newer varieties by a local winemaker who volunteered for the project. There is particular interest in GM 318 and GM 322 (white German hybrids of Reisling).
HORTICULTURE EXTENSION PRESENTATIONS IN 2009-10

21-Jan-09  Nutrient Management to Satisfy Apple Tree Needs and Reduce the Cost  Lake Ontario Winter Fruit School, Albion, NY
28-Jan-09  Our Experiences with Peach Training Systems  Virginia/West Virginia Horticultural Societies Ann. Conference, Richmond, VA
29-Jan-09  Managing Orchard Nutrition for Fruit Quality and Yield  Virginia/West Virginia Horticultural Societies Ann. Conference, Richmond, VA
11-Feb-09  Managing Unruly Orchards  Empire State Fruit & Vegetable EXPO, Syracuse, NY
19-Feb-09  The First Five Years: Handling Apple Trees for Maximum Yield and Fruit Quality  Upper Hudson/Champlain Commercial Tree-Fruit School, Lake George, New York
24-Feb-09  Top-working with Bark Grafts  Hudson Valley Tree-Fruit School, Kingston, NY
25-Feb-09  Applied Horticulture/PGR Projects of Interest to Fruit Growers  Hudson Valley Tree-Fruit School, Kingston, NY
27-Feb-09  Introductions and Planned Activities for 2009  Hudson Valley Grape School, Kingston, NY
27-Feb-09  Grape Variety Selection for Farm and Wholesale Markets: Panel Discussion  Hudson Valley Grape School, Kingston, NY
5-Mar-09  Palmette and Other Pruning Methods for Improved Fruit Quality  Northeast Apple Society Annual Meeting, Stark, NH
5-Mar-09  Discussion of the Use of Harvista and Other Stop Drop Materials  Northeast Apple Society Annual Meeting, Stark, NH
5-Mar-09  Fruit Production in China  Northeast Apple Society Annual Meeting, Stark, NH
24-Mar-09  Managing Fruit Tree Nutrition to Satisfy Needs and Reduce Cost  In-depth Fruit School on Apple Mineral Nutrition, Ballston Spa, NY
24-Mar-09  Interpreting Soil and Leaf Analyses  In-depth Fruit School on Apple Mineral Nutrition, Ballston Spa, NY
25-Mar-09  Managing Fruit Tree Nutrition to Satisfy Needs and Reduce Cost  In-depth Fruit School on Apple Mineral Nutrition, Newark, NY
25-Mar-09  Interpreting Soil and Leaf Analyses  In-depth Fruit School on Apple Mineral Nutrition, Newark, NY
20-Oct-09  Wine Varieties and Sampling Fresh Grapes  CCE and HV Wine and Grape Meeting, Highland, NY
29-Oct-09  Rapid Prediction of Apple Thinning Results  Great Lakes Fruit Workers Annual Meeting, Fishkill, NY
30-Nov-09  Improved Chemical Thinning Efficacy, Return Boom & Pre-harvest Drop Control  Apple Research and Development Program Annual Meetings, Geneva, NY
30-Nov-09  Progress Establishing a Horticultural Research and Extension Planting at the HVL  Apple Research and Development Program Annual Meetings, Geneva, NY
30-Nov-09  Managing Ca/Mg Balance to Reduce Bitter Pit
           Apple Research and Development Program Annual Meetings, Geneva, NY

30-Nov-09  Orchard Management Systems for Improved Yield and Fruit Quality
           Apple Research and Development Program Annual Meetings, Geneva, NY

13-Jan-10  Foliar Nutrition Programs: Fact or Fiction
           Southeast Apple Growers Meeting, Raleigh, NC

13-Jan-10  Cultural Practices That Maximize Fruit Quality
           Southeast Apple Growers Meeting, Raleigh, NC

15-Jan-10  Managing Apple Tree Vigor with Pruning and Growth Regulators
           Long Island Agricultural Forum, Riverhead, NY

19-Jan-10  Managing Fruit Calcium-Magnesium Balance to Reduce the Occurrence of Bitter Pit
           Lake Ontario Fruit Program Tree-Fruit Schools, Albion, NY

20-Jan-10  Managing Fruit Calcium-Magnesium Balance to Reduce the Occurrence of Bitter Pit
           Lake Ontario Fruit Program Tree-Fruit Schools, Newark, NY

27-Jan-10  1- Producing Apple Trees on the Farm for the Farm
           NY Fruit and Vegetable Expo, Syracuse, NY
           2- New and Exciting Open Release Apple Varieties

2-Feb-10   1- Proven Cultural Practices for Apple Production
           2- Higher Density Training Systems for Peaches
           2010 Southwestern Illinois Commercial Tree Fruit Growers School, Mt. Vernon, IL

3-Feb-10   1- Proven Cultural Practices for Apple Production
           2- Higher Density Training Systems for Peaches
           2010 Southwestern Illinois Commercial Tree Fruit Growers School, Hardin, IL

23-Feb-10  Stone Fruit Planting Primer for the Hudson Valley
           Hudson Valley Extension Tree-Fruit School, Kingston, NY

24-Feb-10  McIntosh Stop Drop Research in the Hudson Valley
           Hudson Valley Extension Tree-Fruit School, Kingston, NY

27-Feb-10  1- Tree & Density Factors (Apple and Sweet Cherry)
           2- Apple Training Systems – Central Leader
           3- Apple Training Systems – Vertical Axe
           4- Enhancing Return Bloom with Summer NAA and Ethrel
           5- Tall Spindle Systems and Intensive Management
           International Fruit Tree Association Annual Meeting and In-depth Schools, Grand Rapids, MI

3-Mar-10   2- Apple Training Systems – Central Leader
           3- Apple Training Systems – Vertical Axe
           4- Enhancing Return Bloom with Summer NAA and Ethrel
           5- Tall Spindle Systems and Intensive Management

10-Mar-10  1- Enhancing Return Bloom with Summer NAA and Ethrel
           2- McIntosh Pre-harvest Drop Control in the Hudson Valley
           Northeast Plant Growth Regulators Meeting, Wilkes Barre, PA
           3- Thinning Timing
19-Mar-10  Handling Rootstock, Grafting and Budding
                Apple Tree Nursery Production In-depth School, Newark, NY

20-Mar-10  1- Site Selection for Establishing Vineyards
                Vineyard Establishment School, HVL, Highland, NY

Participation in Horticulture-Related Grant-Funded Projects in the Hudson Valley (Hoying)

2009

  ❖ Establishing a new apple planting for horticultural research and demonstration at the Hudson Valley Lab
  ❖ Delivering Timely Information on Vine Cold-Hardiness to NY Grape Growers.
  ❖ Coordination of NC-140 Trials
  ❖ Veraison to Harvest
  ❖ Determining Susceptibilities of New Cherry, Plum & Apricot Cultivars & Rootstocks to X-Disease Phytoplasma & Tomato Ringspot Virus
  ❖ Improved Chemical Thinning Efficacy for Better Fruit Size, Fruit Quality and Return Bloom
  ❖ Managing Fruit Calcium-Magnesium Balance to Reduce the Occurrence of Bitter Pit
  ❖ Orchard Management Systems for Improved Yield & Fruit Quality
  ❖ High Density Orchard systems and crop-load management for apple, peach, cherry and plum

2010

  ❖ Establishing a New Apple Planting for Horticultural Research & Demonstration at the Hudson Valley Lab.
  ❖ Veraison to Harvest Newsletter Production
  ❖ Delivering Timely Information on Vine Cold-Hardiness to NY Grape Growers
  ❖ Removal of Macro- and Micro- Nutrients by Fruit Harvest in Major New York Apple Cultivars and It’s Implications for Orchard Nutrient Management
  ❖ Competitive Orchard Systems and Improved Crop Load Management for Apple, Cherry, Pear and Peach
  ❖ Orchard Management Systems for Improved Yield & Fruit Quality
  ❖ Improved Chemical Thinning Efficacy, Return Bloom & Pre-Harvest Drop Control
  ❖ Determining Susceptibilities of New Cherry, Plum & Apricot Cultivars & Rootstocks to X-Disease Phytoplasma & Tomato Ringspot Virus
  ❖ Temperature Records for vineyard placement
  ❖ Timing Harvista Applications on McIntosh in the HV
  ❖ Combining Retain and NAA for Drop Control of McIntosh in the Hudson Valley
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<tr>
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<th>Title</th>
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<tr>
<td>13&amp;14-Jan-09</td>
<td>Pruning Instructions and Demonstrations</td>
<td>Apple Pruning &amp; Training School and Tour, Suffolk County, NY-8 farms</td>
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<td>18-Mar-09</td>
<td>Pruning Grape Vines</td>
<td>CCE and HV Wine and Grape Field Meeting, Glorie Farms, Marlboro, NY</td>
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<td>16-Apr-09</td>
<td>Review and Update of Herbicides for Grapes</td>
<td>CCE and HV Wine and Grape Field Meeting, Glorie Farms, Marlboro, NY</td>
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<td>15-May-09</td>
<td>Thinning Conditions and Recommendations</td>
<td>Hudson Valley Spring Fruit Thinning Meetings Germantown and Milton, NY</td>
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<td>15-Jul-09</td>
<td>Apple Planting Systems Including the NY Tall Spindle</td>
<td>Hudson Valley Summer Fruit Tour, Ulster County, NY</td>
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<td>Apple Thinning Trials and the Cornell Carbohydrate Thinning Model</td>
<td>Hudson Valley Summer Fruit Tour, Ulster County, NY</td>
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<td>15-Jul-09</td>
<td>Review of Apple Rootstocks</td>
<td>Hudson Valley Summer Fruit Tour, Ulster County, NY</td>
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<td>15-Jul-09</td>
<td>A Look Back at Top-worked Apple Trees from the Last Tour</td>
<td>Hudson Valley Summer Fruit Tour, Ulster County, NY</td>
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<td>15-Jul-09</td>
<td>Site Preparation Techniques for a New Orchard</td>
<td>Hudson Valley Summer Fruit Tour, Ulster County, NY</td>
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<td>18-19-Aug-09</td>
<td>The Results of Winter Pruning and Troubleshooting New Problems.</td>
<td>Long Island Summer Fruit Tour, Suffolk County, NY, Tour of 8 farms</td>
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<tr>
<td>11-Mar-10</td>
<td>1- Open Center, Perpendicular V, Tri-V, Quad V Training Systems</td>
<td>Long Island Peach Pruning Demonstration, Davis Orchards, Suffolk County, NY</td>
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<tr>
<td>11-Mar-10</td>
<td>2- Principles of Peach Pruning</td>
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<td>5-May-10</td>
<td>1- Organizing Your Thoughts for Thinning</td>
<td>CCE Petal Fall Thinning Meetings in Eastern NY, Marlboro, and Germantown, NY</td>
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<td>2- Review of Thinning Conditions for 2010</td>
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<tr>
<td>11-May-10</td>
<td>1- Organizing Your Thoughts for Thinning</td>
<td>CCE Petal Fall Thinning Meetings in Northern NY, Rexford and Burnt Hills, NY</td>
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<td>2- Review of Thinning Conditions for 2010</td>
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<td>13-May-10</td>
<td>1- Organizing Your Thoughts for Thinning</td>
<td>CCE Petal Fall Thinning Meetings in Western NY, Medina and Newark, NY</td>
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<td></td>
<td>2- Review of Thinning Conditions for 2010</td>
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<td>22-Dec-10</td>
<td>1- Central Leader Pruning</td>
<td>Hudson Valley Apple Pruning Demonstrations, Dressel Farms, New Paltz, NY</td>
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<td>2- Vertical Axis Pruning</td>
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### Other Horticulture-Related Educational and In-service Activity (Steve Hoving)

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<tr>
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<th>Event Description</th>
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<tr>
<td>10-Mar-09</td>
<td>Northeast Plant Growth Regulators Presentation Chairman and Co-Organizer</td>
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<tr>
<td>12&amp;13-Aug-09</td>
<td>Cornell Storage Workshop and Agri-fresh Crunch Clinic, Ithaca, NY</td>
<td>Attended for the latest information on 1-MCP</td>
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<tr>
<td>27-31-Oct-09</td>
<td>Great Lakes Fruit Workers Annual Meeting, Fishkill, NY</td>
<td>Rosenberger, Hoying, Jentsch, and Fargione organized and hosted this event, which brings together Research and Extension worker from the Northeast for annual summary of work.</td>
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<tr>
<td>2-3-Nov-09</td>
<td>NC140 Regional Rootstock Meeting, Chanhassen, MN</td>
<td>Attended and contributed to NY State Annual Report to NC-140</td>
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<tr>
<td>10-Nov-09</td>
<td>Cornell Recent Advances in Viticulture and Enology (CRAVE) Conference, Ithaca, NY</td>
<td>Attended in association with CCE Ag &amp; Food In-service.</td>
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<tr>
<td>27-Feb-10 to 3-Mar-10</td>
<td>International Fruit Tree Association, Grand Rapids, MI</td>
<td>Served on Technical Advisory Committee for conference Content for Art Mitchell High Density Symposium</td>
</tr>
<tr>
<td>7-10-Nov-10</td>
<td>Great Lakes Fruit Workers Group Meeting, Leamington, Ontario Canada</td>
<td>Attended and coauthored 2 growth regulator presentations with TL Robinson</td>
</tr>
<tr>
<td>2009 and 2010</td>
<td>Attended NENY and Hudson Valley Fruit Extension Advisory Committee meetings</td>
<td>Various Growers, Extension Specialists, County Ag Program Leaders and directors</td>
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<tr>
<td>2010</td>
<td>Worked to prepare an “Ideal” Staffing plan for eastern NY Fruit program.</td>
<td>Giles, Watkins, Association Directors, and Educators</td>
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<tr>
<td>2009 and 2010</td>
<td>Planned and executed Extension outreach activities with for HV grape activities</td>
<td>Steven McKay, Hudson Valley Wine and Grape Association, Peter Jentsch, various grower hosts</td>
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<tr>
<td>2009 and 2010</td>
<td>Supported HV Extension Tree Fruit outreach activities</td>
<td>Mike Fargione</td>
</tr>
<tr>
<td>2009</td>
<td>Helped purchase audience survey equipment for the HV fruit extension</td>
<td>Mike Fargione, Dave Rosenberger, Peter Jentsch</td>
</tr>
<tr>
<td>2010</td>
<td>Bought and installed RainWise weather station for HVL for inclusion in NEWA network</td>
<td>Fargione</td>
</tr>
<tr>
<td>2009 and 2010</td>
<td>Answered phone, email, personal requests for information and made farm visits when appropriate.</td>
<td>Considerable time has been spent assisting growers with the establishment of Tall Spindle apple planting systems throughout the Hudson Valley and helping make appropriate decisions for planting NY1 and 2.</td>
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SUMMARY OF ENTOMOLOGY PROJECTS FOR 2009-10
Peter Jentsch, Henry Grimsland, Alex Olsen, Mike Basedow, Joe Whalen

1. Establish and Develop a Brown Marmorated Stink Bug (BMSB) Regional Working Group to Study the Impact of this Invasive Species on Agriculture Throughout the Hudson Valley and Eastern Long Island.

(Potential funding: NY IPM Grant, ARDP grant, SCRI grant)

This insect, first reported in the late 1990’s in PA, has spread throughout the Mid-Atlantic States causing significant economic injury to tree fruit in 2009 and 2010. Infestations were observed throughout PA, MD, VA, WV, and NJ. It was first recorded in the Hudson Valley of NY in December of 2008. Over the past two years we have seen increasing numbers of this invasive insect as urban pests in the lower Hudson Valley. The purpose of this project is to develop a regional working group to coordinate research efforts and extension outreach by Cornell researchers and CCE educators. We intend to survey BMSB populations, develop standardized scouting, monitoring and damage assessment methodologies in tree fruit, vegetable, sweet corn, ornamental and urban environments, conduct laboratory and field studies to test insecticide efficacy while disseminating information to producers to manage populations and prevent agricultural losses throughout the Hudson Valley and Eastern Long Island.

- The nine-member HV working group (HVWG) includes CCE staff located in Rensselaer, Dutchess, Ulster, Orange and Suffolk counties in Eastern NY. We intend to develop resources to educate growers on the development of this newly emerging pest over the next 5 years. Members of the HVWG will work with regional producers to establish monitoring sites employing three different trapping methods to monitor populations of the BMSM. Trap data will be used to determine the insect density, onset of life stages, decline and end of presence in agricultural commodities in NY, making information available to producers via e-mail list serves and web based on-demand sites.

- Monitoring strategies to assess migration patterns of BMSB to Ag. commodities will employ sets of portable black light traps, Tedder's free standing and hanging traps placed in 12 commercial agricultural farm sites throughout the Hudson Valley and Long Island. Regional cooperators will detect and monitor BM and native stinkbug through the growing season. Traps containing methyl (E,E,Z)-2,4,6-decatrienoate impregnated lures will be placed along the agricultural border in commodity blocks to detect early migrating adults from non-agricultural sources. Recording the extent and severity of BMSB feeding in stone and pome fruit will employ weekly fruit damage assessment surveys, scored for % injury and severity as clean or injured, sliced to the
core to reveal corking injury. Assessments in vegetable, small fruit and corn during year 1 will be based on discoloration, % drop and yield, % botrytis injury, and % whole kernel. Trap, scouting thresholds and damage assessment protocols will be developed during the project.

- On December 5th, 2010, the group presented a commodity-specific technical Webinar presentation about BMSB biology, behavior, impact, identification, damage levels of fruit in the Mid-Atlantic States, possible control options, movement, monitoring/detection, and research for distribution. The audience was comprised of CCE extension staff, horticultural commodity group representatives, research entomologists, private consultants, NYS Dept of Ag. & Mkts inspectors, and growers and is made available on-demand at http://hudsonv.cce.cornell.edu/bmsb1.html.

- We have produced a regional map showing the location of confirmed BMSB populations found in urban residences that is also available on the Regional Hudson Valley Tree Fruit web site.

- We have produced an on-demand PowerPoint presentation for growers and Master Gardeners covering the impact of BMSB on tree fruit and vegetable with options for control located on the Regional Hudson Valley Tree Fruit web site. Over the coming season the group will develop commodity-specific fact sheets on BMSB biology, behavior, and damage to specific commodities, including references to similar species for comparison, photos of various life stages, and details on diagnostic features for scouts and farm managers.

- To assess the efficacy of insecticide controls against the BMSB over the next 5 years, the Hudson Valley Laboratory entomologist will apply treatments to four-tree plots, in a randomized complete block design using a tractor mounted airblast sprayer to 16 yr-old trees on M.26 rootstock, planted to a research spacing of 10' x 30'. Statistical analysis of treatments will be conducted to determine degrees of efficacy relative to grower standards and the untreated control to assist in development of management recommendations. CCE Working Group will provide on-demand information exchange for efficacy trial results through established web based resources in the region.

2. Validation of Predictive Insect Occurrence Modeling For Hudson Valley Pest Management Recommendations In Hudson Valley Apple Production.

Funding: NE-IPM Grant

The purpose of this project is to educate growers on insecticide modes of action for greater resistance management techniques, insecticide performance and proper application timing of new insecticide tools. We gather regional insect presence and temperature data from seven sites between Warwick and Saratoga and use this data in forecasting models to determine insect stages of development. We also employ this information to recommend timely application windows for each novel mode of action of the registered insecticides available to NY growers. By so doing we expect a decrease in commercial insect damage and an increase in the quality of production techniques when recommendations are applied to commercial tree fruit insect pest management programs.

- Establish pome fruit phenology and degree-day historical and present day summaries for use in insect degree-day based developmental modeling predictions of critical life stages for commercial insect pest management.
• Establish biofix dates for key insect pests for use in regional recommendations and NEWA web based predictive modeling programs using regional insect pheromone trapping.

• Use NEWA / NWS and NOAA weather data to collect temperature ranges at various Hudson Valley orchard locations to aid us in determining degree-day accumulations and forecasting weather conditions.

• Distribute to the grower community both insect occurrence predictions and recommendations on optimum timing windows for insecticide applications based on the mode of action of appropriate active ingredients.

• Post the insect occurrence from HV sites onto the Hudson Valley Regional Fruit Web Site: hudsonvf.cce.cornell.edu

• Weekly ‘Scouting Reports’ sent to cooperators / participants and regional producers via E-Mail list serve to CCE membership and posted on the Hudson Valley Regional Fruit Web Site.

3. Laboratory Studies to Determine the Susceptibility of Adult and Larval Populations of Codling Moth.

Partial funding through NE-IPM Partnership Grant in 2010

In this project we proposed to study the susceptibility of CM populations in laboratory studies using OMRI organic products. The principal goal is to establish a baseline of susceptibility of the F2 generation of the adult CM and F3 larvae to organic and newly developed synthetically produced insecticides.

In so doing we hope to establish the efficacy of these products to inform the producers of conventional and organic pome fruit of product efficacy.

• Rearing various life stages of CM to maintain laboratory colonies for which to test.

• Conducting adult and nymph bioassays to determine levels of efficacy of commercial and organic insecticides.

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February 2011
Page 17

Hudson Valley Research Laboratory
Department of Entomology
2010 Insect Pest Management Report

Highland, NY
As of 25th August

<table>
<thead>
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</tr>
<tr>
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<td>b</td>
</tr>
<tr>
<td>Bt SC</td>
<td>a</td>
</tr>
<tr>
<td>Thimet 75WP</td>
<td>c</td>
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<td>c</td>
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<tr>
<td>Protein</td>
<td>e</td>
</tr>
<tr>
<td>Protein</td>
<td>f</td>
</tr>
</tbody>
</table>

**Conclusion**

Given the level of resistance to thiamethoxam in the Hudson Valley, the rotation of insecticides is essential to reduce the risk of resistance development. To address this, a combination of conventional and organophosphate insecticides is recommended. This approach will help maintain the efficacy of these products in the long term, ensuring continued control of the Codling Moth population.
4. Resistance Management Strategies Using Organic Insect And Disease Control For Commercial Pear Production.

The purpose of this project is to determine the effectiveness of a stratified program employing Surround WP and 1% horticultural mineral oil (HMO) applications timed specifically for the control of foliar and fruit feeding insect pests. Our objectives are to determine the timing windows of these products for the optimal control of insects such as pear psylla and foliar / fruit Fabraea infections; determine the number of applications of HMO’s required based on pear psylla generations and infection periods; determine the environmental conditions for using HMO’s so as to optimize weather predictions and drying time to decrease risks related to application of oils; determine the economic factors that would improve profitability of using HMO’s; and determine the economic sustainability using these products in commercial production systems.

• Conducted 2010 Field evaluations of two organically approved treatments with comparisons to commercial standards (Seasonal applications of Surround WP & 1% Damoil or PureSpray oil).
• Conducted pear psylla nymph bioassays in the laboratory to determine degrees of toxicity of oil relative to droplet size.
• Collected field samples of pear psylla and Fabraea leaf spot in research plots to determine the efficacy of treatments in laboratory spore release studies.
• Continued to determine degrees of control using these products compared to conventional standards in commercial and experimental field trials using conventional application equipment timing.
• Developed on-demand video educational materials as resources for assisting tree fruit growers in implementing resistance management strategies using organically approved insecticides.


*Future funding through USDA in 2010*

This project employs odor-baited pesticide-treated spheres for direct control of AM in comparison with existing approaches to AM control based on calendar-driven sprays or applications based on trap-captures. Using pesticide-treated spheres had proved very effective in past evaluations with late season pesticide reductions observed. Trials were conducted in three Hudson Valley locations: Marlboro, Modena, and Altamont, NY.
6. Establishing Insecticide Effectiveness And Timing To Develop Protocols For N.Y. Apple Production Using Eco-Apple Marketing Parameters

Funding RAMP / Eco-Apple project awarded to Reissig

A project was conducted in New York as part of a multi-state marketing grant to evaluate ‘Eco-Apple’ insect and disease pest management strategies. We evaluated the use of effective and economically viable reduced-risk pest management programs in apples, using provisional action thresholds for specific major pests. Our primary objective was to determine the effectiveness of whole-farm approaches for managing the arthropod pests of apple relying on reduced-risk insecticides. Strategies to manage pests were employed by northeast growers using the Eco-Apple pest management protocols. Cooperator locations included several western and eastern NY orchards. Our contribution to the study focused on 4 sites including Burnt Hills, Altamont, Granville, and Marlboro NY. We observed commercial levels of control using reduced risk insecticides when they were employed as per timing and rate recommendations.


Competitive Hatch funding 2009-2013 with Dave Rosenberger

The objective of this project is to test three diverse pest management programs on varieties resistant to apple scab. Employing disease resistant cultivars using commercial, sustainable, and reduced-risk pest management protocols, this study will include evaluations of programs to determine the capacity of PRI cultivars to sustain reduced pesticide inputs. Ranking of these cultivars for susceptibility to insect and disease infestations, fruit size and yield, will help producers select apple varieties and employ practices that require fewer chemical inputs to achieve increased and sustainable economic viability.

In 2010, 1440 well feathered trees were planted on a 1 acre orchard block using 3’x10’ spacing supporting a four wire slender spindle high density planting system employed to optimize fruit load capacity through limb renewal and limb bending techniques. Varieties selected from the PRI breeding program include Crimson Crisp, Enterprise, Florina Querina, Goldrush, Nova Easygro, Pristine, Red Free, and Scarlet O’Hara. These will be compared to the standard varieties of Honeycrisp, Liberty and Novamac, the apple scab susceptible variety used as the commercial standard. Our purpose is to achieve maximum yield potential given tree and row spacing. Geneva 11 rootstock, resistant to fire blight, will provide attributes of precocious return bloom, and large fruit size. These attributes offer potentially high yielding and sustainable crop loads requiring fewer chemical inputs than conventional varieties given their levels of resistance to apple scab.

• We intend to promote this orchard as a model for the use of disease resistant cultivars using sustainable commercial and organic production methods so as to achieve high levels of yield, quality and profitability. Situated at Cornell University’s Hudson Valley Laboratory, the accessibility of this orchard as an educational tool will be available seasonally by extension educators and pome fruit producers. Extension outreach of sustainable pest management practices will be made available to Northeast apple stakeholders.

• Three management programs using conventional, sustainable and organic production methods will be employed to determine pesticide usage while comparing parameters of yield, fruit quality, tree development and overall economic profitability.

• Overlaid throughout the alternate ‘unmanaged drift rows’ we purpose to conduct ground cover management trials using removable agri-textiles to determine the viability of non-chemical weed management.
8. Industry Efficacy Screening Trials: Determining The Insecticidal And Miticidal Efficacy Of Newly Developed Experimental And Standard Commercial Insecticides For Use On Apple.

*Funding: Agrichemical Industry*

In these screening studies we test the efficacy of newly developed products to determine the efficacy of these chemistries on the insect complex on apple. Evaluations conducted throughout the season on tree, foliage, and fruit are made both in the field and through laboratory observations. By employing the use of mite-brushing machines and through the aid of dissecting scopes, arthropod populations are assessed on the leaf surface to determine the new chemistry impact on phytophagous and predatory mites. Local summer technicians are employed each year to assist the entomologist in the collection of data to evaluate these materials.


*Funding: Agrichemical Industry*

In these screening studies we test the efficacy of newly developed products to determine the efficacy of these chemistries on European pear varieties. Evaluations conducted throughout the season on tree, foliage, and fruit are made both in the field and through laboratory observations to determine the impact new chemistries have on the pear psylla and mite complex. Local summer technicians are employed each year to assist the entomologist in the collection of data to evaluate these materials.

- Determining the insecticidal and miticidal efficacy of experimental and commercially used N.Y. State registered insecticides for use on pear.

10. Industry Efficacy Trials: Determining The Insecticidal Efficacy Of Newly Developed Reduced Risk Experimental Insecticides And Standard Commercial Products For Use on Sweet Corn: New Paltz, Ulster County, NY.

*Funding in 2010 by DuPont*

In these screening studies we tested the efficacy of newly developed reduced-risk and conventional insecticide products in managing the lepidopteran complex on sweet corn for commercial use. A single technician is hired on a contract basis to prepare plots using experimental design, to monitor the Lepidoptera pest complex using adult flight and larva development observations to determine optimum application dates, and to conduct applications during the period of tassel development. A CO₂ research spraying system is used in making applications. Populations are assessed at harvest.
11. Hudson Valley Regional Grower Trials on Apple & Pear: Determining the efficacy of Surround WP and 1% HMO in conventional insect pest management programs, Modena, NY.

Funding: NESARE-Partnership grant

In 2010, early season pear tree fruit phenology was two to three weeks earlier than in the past thirty years. Petal fall occurred on the 28th of April on Bartlett. Pear psylla population density was moderate with 1st and 2nd generation causing significant damage to foliage on European varieties. However, the 3rd and 4th generation typically emerging in mid-late July through to first frost did not cause lingering levels that contributed to further damage or required additional control measures. Relatively dry conditions were conducive for long residual of OMRI materials requiring fewer applications than in ‘wet years’. We observed similar results of the commercial part of this trial to that of our small plot trials conducted at the Hudson Valley Laboratory in Highland, NY. Two early season applications of Surround WP at 50 lbs./A (1 pre-bloom, 1 at PF) followed by 3 mid-late season 1% oil applications were comparable in pear psylla management to the 3 grower applied conventional treatments. Two applications of AgriMek gave the best overall ovipositional deterrence. Air induction nozzles (AIN) generally provided comparable season long egg laying reductions compared to the commercial program and better overall results than hollow-cone nozzles in the OMRI program. Higher gallonage rates of application using either hollow-cone or air induction provided better results at reducing pear psylla nymph populations than lower application rates.


Funding: NESARE-Partnership grant

During the 2010 fruit growing season, in collaboration with USDA-ARS Appalachian Fruit Research Station (Tracy Leskey / Starker Wright) and Geneva Experiment Station (Harvey Reissig) we evaluated similar pest management programs on two uniquely different organic apple orchard systems in Modena, NY and Accord, NY.
The insect pest management programs employed Surround WP (50 lbs./A at TC, P, PF, 1C), Isomate twin ties for mating disruption of Oriental fruit moth (OFM): *Grapholitha molesta* (Busck) and Codling moth (CM): *Cydia pomonella* (Linnaeus), (applied at 1st pheromone trap catch at 200 ties/A), Cyd-X (4 oz/A @ 4 applications 10d intervals for each of 2 codling moth generations beginning at 1st hatch or 250DD₅₀), the use of Entrust and GF-120 combinations for Obliquebanded leafroller (OBLR): *Choristoneura rosaceana* (Harris) and Apple Maggot (AM): *Rhagoletis pomonella* (Walsh) in conjunction with baited red spheres (aptly named ‘Curve Balls’), a trap and kill alternative technology to control damage on apple, employed in pest control strategies. Apple tree fruit phenology was two to three weeks ahead of insect development leading to significantly lower injury levels from European apple sawfly (EAS): *Hoplocampa testudinea* (Klug) and plum curculio (PC): *Conotrachelus nenuphar* (Herbst).

In Milton, NY, significantly lower levels of insect damage was observed in season long management of disease resistant varieties on dwarfing M-9 rootstock using a high density slender spindle planting system. However, in Accord, NY, employing standard trees approximately 22-30’ high on a 25’ x 25’ spacing using similar rates and timings of the same pest management programs, demonstrated significantly higher levels of insect damage primarily from PC. Excellent control was achieved from fruit managed in the high-density block in Modena, with management providing over 85% clean fruit across the orchard. However, 86% fruit damage was observed in Accord. Differences in application coverage, spacing and insect density play important roles in observed differences in insect damage between farms.

<table>
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<tr>
<th>Location</th>
<th>Orchard: AM mgt.</th>
<th>Plum curc.</th>
<th>Tarnish plant bug</th>
<th>Stink bug complex</th>
<th>Internal lep OFM/CM</th>
<th>European apple sawfly</th>
<th>Apple maggot tunnel</th>
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Modena block received 4 trmts. of Surround WP at 50 lbs./A, 200 Isomate twin ties for CM & OFM mating disruption and Cyd-X @ 4.0 oz/A. Split block east received CB= ‘Curve Ball’ at 1 per tree; Split block west received Et = Entrust 80WP @ 4.0 oz/A and GF120 at 64 oz/A. Accord received 200 Isomate twin ties for CM & OFM mating disruption but did not receive Cyd-X applications.
ENTOMOLOGY EXTENSION PRESENTATIONS IN 2009-2010

Out-of-state Fruit Grower Meetings:

The Internal Lepidopteran Complex: N.E. Apple Resistance Management.
  July 15th, 2010; Massachusetts Pome Fruit Summer Tour, Belchertown, MA.

Commercial Orchard Study Comparing Organic Materials To Conventional Tools For Pear Psylla Management.
  Nov. 18th, 2010; 86th Cumberland Shenandoah Fruit Workers Meeting, Winchester, VA.

Technology Use in Fruit Extension.
  March 9, 2010 IPM Symposium. Entomological Society of America, Eastern Branch, Annapolis, MD.

Integrating alternative strategies to manage pear psylla, Cacopsylla pyricola (Foerster) and Fabraea leaf spot, Fabraea maculata, in northeast pear orchards.
  March 22nd, 2009; Eastern Branch Entomological Meeting Eastern Branch, Harrisburg, PA

Educational events within New York State:

  February 15, 2011  Hudson Valley Fruit School, Kingston, NY

Entomology 101: Managing the Insect Complex in NYS Tree Fruit Production
  February 2, 2011; Future Fruit Growers School, Hudson Valley Laboratory, Highland, NY

Shifting Management Strategies: The Challenge of Filling the Insecticide Void
  January 27, 2011 Empire State Fruit and Vegetable Expo, Oncenter, Syracuse, NY

Threat of the Brown Marmorated Stink Bug, Halyomorpha halys (Stål) to NY and New England on Tree Fruit, Small Fruit, Vegetable and Sweet Corn.
  December 5, 2010; Hudson Valley Laboratory, Highland, NY Via Webinar.

Threat of the Brown Marmorated Stink Bug, Halyomorpha halys (Stål) to NY and New England on Tree Fruit, Small Fruit, Vegetable and Sweet Corn, November 10, 2010;
  Hudson Valley Laboratory, Highland, NY Via Polycom.

Insect Pest IPM of Champlain Valley Pome Fruit: Early Season Management
  May 20th, 2010  Peru, NY

Insect Pest IPM of Hudson Valley Pome Fruit: Early Season Management
  May 6th, 2010  Milton, NY

Insect Pest IPM of Hudson Valley Pome Fruit: Early Season Management
  May 6th, 2009  Hudson, NY

Information Exchange; Syngenta Agrichemical New Product Release
  March 23, 2010  Dundee, NY

NEWA Workshop: Using the web to explore tree fruit insect pest management resources.
  March 22, 2010  Hudson Valley Laboratory, Highland, NY

Using the web to expand your tree fruit pest management resources.
  January 14, 2010  Long Island Agricultural Forum, Riverhead, NY

Developing Mite Management Strategies Using Reduced Risk Insecticides
  February 26, 2010  Lake Champlain Fruit School, Lake George, NY.

Grape Berry Moth Management in the Hudson Valley.
  February 26, 2010  Hudson Valley Berry School, Kingston, NY

  February 25, 2010  Hudson Valley Fruit School, Kingston, NY
Using Cellular and Digital Technology to do IPM
   January 26, 2010 Empire State Fruit and Vegetable Expo, Oncenter, Syracuse, NY

Codling Moth: Susceptibility Levels of CM to Azinphos-Methyl in New York Orchards.

Codling Moth: Susceptibility Levels of CM to Azinphos-Methyl in New York Orchards.
   October 25-28, 2009, Great Lakes Fruit Workers Meeting, Fishkill, NY.

Using Digital Technologies in Tree Fruit Extension.
   October 6, 2009, Entomology Department Faculty Seminar Series, Geneva, NY.

Managing Insecticide Use
   June 1, 2009   CCE Orange County Fruit & Vegetable Dinner Meeting, Middletown, NY

Insect Pest IPM of Champlain Valley Pome Fruit: Early Season Management
   May 20th, 2009   Peru, NY

Insect Pest IPM of Hudson Valley Pome Fruit: Early Season Management
   May 15th, 2009   Milton, NY

Insect Pest IPM of Hudson Valley Pome Fruit: Early Season Management
   May 15th, 2009   Hudson, NY

Grape Berry Moth Management in the Hudson Valley & Polycom video conference: Q & A with Wayne Wilcox.
   May 14, 2009, Hudson Valley Laboratory, Highland, NY

Grape Sprayer Demonstrations & Calibration Workshop
   April 16th, 2009   Glorie Farm, Marlboro, NY

Conference; Syngenta Agrichemical New Product Release
   February 11-12, 2009   Dundee, NY

Tree Fruit Insect Round-Up. Using Predictive Models for Insecticide Use in NY State; Insecticide Management
   for the Hudson Valley Lepidopteran Complex.
   February 25, 2009   Hudson Valley Fruit School, Kingston, NY

Abandoned Orchards Revisited: Managing Insecticide Resistance and Maintaining Insect Diversity.
   February 19, 2009   Lake Champlain Fruit School, Lake George, NY.
SUMMARY OF PLANT PATHOLOGY PROJECTS FOR 2009-2010
Dave Rosenberger, Fritz Meyer, Anne Rugh, and Lindsay (DeWitt) Sudol

The following projects are summarized in this report:

FIELD RESEARCH
1. New Approaches for Controlling Spread of Fire Blight During Summer
2. Using Phosphite Fungicides to Control Summer Diseases on Apples
3. Field Evaluations of New Fungicides for Apples
4. Importance of Botryosphaeria as a Postharvest Pathogen for Organic Apples, 2009
5. Integration of OMRI-Approved Fungicides and Cultural Controls for Managing Summer Diseases on Apples, 2010
6. Determining If and How Tomato Ringspot Virus and X-disease Impact New Stone Fruit Cultivars and Rootstocks
7. Effects of Glyphosate on Tree Health and Evaluation of Alternatives.

POSTHARVEST RESEARCH
8. Using Low-Volume Non-Recycling Drenches for Controlling Postharvest Diseases and Disorders of Apples
9. Effects of Glyphosate Exposure on Development of Internal Browning in Empire Apples During Storage.
10. Postharvest Fungicide Evaluations, 2009-10

1. New Approaches for Controlling Spread of Fire Blight During Summer

Funding source: NY Apple Research and Development Program (Joint project with Peter Jentsch).

Spread of fire blight during summer was investigated during three seasons using a meadow orchard of highly susceptible Lady Apple trees on MM.111 rootstocks. In our three-year effort to evaluate linkages between insect populations and spread of fire blight during summer, we found evidence supporting the role of insects in two of the three years. In 2008, repeated rain events favored spread of fire blight by wind-driven rain. Despite extensive development of shoot blight in our plots in 2008, no effect of insects was evident in either of two sequential trials completed that year. However, in both 2009 and 2010, there was a relatively low incidence of shoot blight in our plots and the plots with no insecticide treatment during June and July showed significantly more blight than the plots where insects were controlled throughout summer. Yellow sticky traps were maintained in each plot throughout summer to monitor populations of potato leafhoppers (PLH). After the initial influx of adult PLH, populations were lower in insecticide-treated plots than in plots that received no insecticides. In the 2010 trial, soil-applied Actigard suppressed PLH populations, but the incidence of fire blight strikes was too low to determine if Actigard could play a role in reducing shoot infections. Actigard is a host plant defense activator, and this is the first report suggesting that it has activity against leafhoppers in woody host plants.

From results of this three-year trial, we concluded that insects probably play a minor role in spread of fire blight during summer. Thus, it is unlikely that additional insecticide treatments would be cost-effective if they were applied solely to control spread of fire blight. Our results suggest that wind-blown rain is probably the key factor for disseminating fire blight in orchards where extensive spread of blight is noted during summer.
2. Using Phosphite Fungicides to Control Summer Diseases on Apples

*Funding source: Agrichemical companies*

Phosphite fungicides were applied to control sooty blotch and flyspeck (SBFS) in several field trials during the 2009 and 2010 growing seasons. Results confirmed that the combination of ProPhyt plus Captan controlled flyspeck significantly better than Captan alone and usually provided results comparable to those provided by a combination of Topsin M plus Captan. During the very wet summer of 2009, the combination of Captan 80W at 20 oz/100 gal plus ProPhyt 21.3 fl oz/100 gal applied six times during summer was significantly more effective for controlling SBFS than a similar combination with Captan at 10 oz/100 gal in three applications followed by Pristine in the last three applications. In 2010, we demonstrated that ProPhyt could also improve activity of Ziram against SBFS, although Ziram used alone was more effective than Captan used alone. While ProPhyt has proven useful for boosting the SBFS activity for Captan and Ziram, these combinations still have slightly less long-term residual activity than does Pristine.

3. Field Evaluations of New Fungicides for Apples

*Funding source: Agrichemical companies*

At the Hudson Valley Lab, we have optimized facilities, equipment and research orchards for efficient evaluation of pesticides. During 2009 and 2010, a total of 11 field trials were conducted to improve our understanding of disease control. These trials involved --

- 42 different products,
- 98 replicated treatments,
- 640 treatment sprays to replicated plots.

Trials included second-generation SI fungicides (e.g., Indar, Inspire Super), phosphite fungicides, and summer disease fungicides. These trials result in a total of 14 reports that have or will appear in Plant Disease Management Reports. Results from these trials are used to compile disease control strategies presented at winter fruit schools and in extension articles.
4. Importance of *Botryosphaeria* as a Postharvest Pathogen for Organic Apples, 2009

*Funding source: NY Dept. of Ag. and Markets funding for organic agriculture; Joint project with Dr. Kerik Cox at Geneva.*

Organic apple growers in New York State have experienced difficulty in controlling fungal diseases that appear on apples during summer. This project was initiated to evaluate various fungicide options for controlling black rot and white rot caused by *Botryosphaeria obtusa* and *B. dothidea*, respectively, flyspeck caused by *Schizothyrium pomi*, and sooty blotch caused by a species complex. Total losses to *Botryosphaeria* in the field and during storage exceeded 50% for some treatments and were limited to less than 20% only by the standard treatment (trt 9) and, for Cameo only, by liquid-lime sulfur (LLS) with copper added during July and August. The fact that the best OMRI-approved fungicides failed to control black rot illustrates the difficulties inherent in attempting to grow organic apples in a humid climate such as that which prevails in the Hudson Valley. The record-breaking rainfall in Highland in 2009 removed fungicide residues and the lengthy wetting periods favored development of black rot. Black rot is generally less severe as one travels north, so organic apple producers in the more northern areas of NY and New England may find it easier to control black rot with OMRI-approved fungicides. Results from this trial showed that *Botryosphaeria* can cause severe losses if fruit from eastern organic orchards are held in cold storage for extended periods after harvest. Including copper in some of the summer sprays helped to suppress damage from *Botryosphaeria*, but copper causes some phytotoxicity even when it is applied at low rates and even when the first application is delayed until after 1 July. Thus, none of the OMRI-approved fungicides provide a solution for controlling *Botryosphaeria* in organic apple production. Probably the best solution for controlling this disease will require selection of cultivars that, unlike Royal Court, do not retain a lot of fruitlet mummies through summer because the mummies become a source of black rot inoculum.

5. Integration of OMRI-Approved Fungicides, Sanitation, and Cultural Controls for Managing Summer Diseases on Apples, 2010

*Funding source: NY Dept. of Ag. and Markets funding for organic agriculture; Joint project with Dr. Kerik Cox at Geneva.*

Experiments were conducted to determine if organic apple growers could minimize losses to summer diseases on apples by using cultural management strategies and/or regular sprays of liquid lime sulfur (LLS). During 2010, a block containing the cultivars Royal Court and Cameo at the Hudson Valley Lab were treated using either cultural controls alone, treatment with LLS alone, or a combination of cultural controls and LLS treatments. Cultural controls included removal of fruitlet mummies that can harbor black rot inoculum and hand-thinning of fruit in June followed by light summer pruning to enhance rapid drying following rains and dews and to allow improved spray coverage. Apples were harvested at commercial maturity and evaluated for disease. Both LLS and cultural controls reduced disease incidence and severity of sooty blotch and flyspeck. LLS, cultural controls, and the combination of the two approaches were all consistently effective against black rot. However, conventional fungicide programs generally outperformed LLS against summer diseases in the Hudson Valley. This experiment verifies that LLS sprays can be used to control flyspeck and sooty blotch on organic apple farms, but neither LLS nor the cultural controls that we tested will control black rot on cultivars such as Royal Court that are highly susceptible to this disease.
6. Determining If and How Tomato Ringspot Virus and X-disease Impact New Stone Fruit Cultivars and Rootstocks

**Funding source:** Competitive Hatch Funds via NYSAES-Geneva; Joint project with Steve Hoying, Hudson Valley Lab, and Dr. Mark Fuchs, virologist, Geneva, NY.

Test orchards were established to evaluate susceptibility of various stone fruit germplasm (cultivars and rootstocks) to the X-disease phytoplasma and to tomato ringspot virus (ToRSV). Better information on the comparative susceptibility of new germplasm and on symptoms produced by these pathogens should help growers to avoid or manage the diseases more effectively.

The 690 cherry trees planted at the Hudson Valley Lab in Highland, NY, in 2009 included the following cultivars:

<table>
<thead>
<tr>
<th>Attika</th>
<th>Hedelfingen</th>
<th>Rainier</th>
<th>Sweetheart</th>
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<tbody>
<tr>
<td>Balaton</td>
<td>Hudson</td>
<td>Regina</td>
<td>Tieton</td>
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<tr>
<td>Black Gold</td>
<td>Kristen</td>
<td>Royalten</td>
<td>Ulster</td>
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<tr>
<td>Danube</td>
<td>Lapins</td>
<td>Sam</td>
<td>Van</td>
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<tr>
<td>Emperor Francis</td>
<td>Montmorency</td>
<td>Summit</td>
<td>White Gold</td>
</tr>
</tbody>
</table>

Eight of the 20 cultivars were only on Mazzard rootstocks. For the other 12 cultivars, the planting included trees of each cultivar propagated on at least three different rootstocks in addition to Mazzard. Other rootstocks included Gisela 5, Gisela 6, Gisela 12, Mahaleb, MxM14, and MxM60. Other stone fruit cultivars and rootstocks being tested include Redhaven peach, Hargrand apricot, and Orangered apricot, all on Cadaman, HBOK10, Istara, and Krymsk-1 rootstocks; Redhaven on Bailey and Controller-5 rootstocks; the plum cultivars Stanley, Early Golden, Long John, and President on Myrobalan rootstock; Stanley and Shiro plums on Cadaman, HBOK10, Istara, and Controller-5 rootstocks, and Shiro on Krymsk-1 rootstock. X-disease inoculations were made during July of 2009 and again in June of 2010 by using the T-budding technique to insert two bark patches from a naturally infected X-diseased chokecherry (*Prunus virginiana*) into the scion of each of the designated test tree. ToRSV inoculations were made in June of 2010 by placing two bark patches from a naturally infected 15-year-old Myrobalan rootstock into the rootstocks of test trees. Trees will be monitored annually and will be tested for X-disease via PCR and for ToRSV via ELISA in 2011 and 2012, but final results of inoculations may not be evident until the summer of 2013.

7. Effects of Glyphosate on Tree Health and Evaluation of Alternatives

**Funding sources pending:** USDA via Northeast IPM, NY Apple Research and Development Program

This research project will determine (i) if sublethal exposure to glyphosate herbicide is predisposing apple trees to canker diseases including the shoot blight phase of fire blight, (ii) if phosphate fungicides can make plants more susceptible to glyphosate damage, and (iii) if gramoxone, glufosinate, or removable landscape cloths are viable alternatives to glyphosate for apple orchards. In recent publications, glyphosate has been shown to enhance disease development in annual crops by interfering with host defense mechanisms, plant rhizosphere microorganisms, and mineral uptake and translocation within the exposed plants. Effects of sublethal glyphosate exposure on perennial crops remain largely unknown. We propose to expose Empire apple trees to simulated glyphosate drift and then challenge-inoculate trees with four fungal canker pathogens commonly encountered in apple orchards: *Botryosphaeria obtusa*, *Botryosphaeria dothidea*, *Nectria cinnabarin*osa, and *Schizophyllum commune*. Lady Apple trees will be similarly treated and challenge-inoculated with fire blight. Alternatives to glyphosate will be evaluated in a test orchard (planted in 2010) where glyphosate, gramoxone, glufosinate, black landscape cloth, and reflective landscape cloth will be compared in replicated plots containing Crimson Crisp, GoldRush, Enterprise, and Liberty apple trees. New methods will be developed to allow annual installation of reusable landscape cloths in May and their removal in August of each year, thereby avoiding problems that occur when landscape cloth is left in orchards over winter.
8. Using Low-Volume Non-Recycling Drenches for Controlling Postharvest Diseases and Disorders of Apples

Funding sources: NY Apple Research and Development Program, Syngenta Crop Protection

Continued use of recycling drenches for application of postharvest treatments on apples faces increasing scrutiny due to food safety concerns. We evaluated an alternative approach wherein fruit are treated with a non-recycling drench (NRD) of fungicide and diphenylamine (DPA) by spraying a small amount of the treatment solution across the tops of bins after harvest. In 2009, NRD treatments were compared with the same products applied in a traditional high-volume recycling drench (RD). Effectiveness of the two systems was compared by evaluating decay control in wounded Cortland fruit and by observing fruit for superficial scald after cold storage. Replicated treatments were applied to fruit in specially constructed minibins that were 15 inches square but equal in height to commercial harvest bins. In 2009, fruit treated with water via RD developed blue mold decay caused by Penicillium expansum at 69% of puncture wounds whereas water applied as via NRD resulted in decay at only 24% of puncture wounds. Fungicide/DPA mixtures applied via RD provided >99% control of decay whereas those same combinations applied via NRD provided only 86-92% control of decay. A fluorescent dye added to DPA and applied via NRD showed that only 40% of the fruit surface was contacted by NRD solutions. Where fungicides were applied via NRD, the incidence of decay was 3 to 5 times greater in fruit at the bottom of the bin than in fruit located near the tops of the bins. Although fungicide treatments applied via NRD were not as effective as RD treatments in this high-inoculum trial, the NRD treatments would presumably have provided acceptable decay control under commercial conditions where fruit would be exposed to lower levels of inoculum and where relatively few fruit have wounds. In treatments where diphenylamine (DPA) was applied via either NRD or RD to control superficial scald, the two different treatment methods were equally effective. Results suggest that DPA treatment via NRD is effective because the vapor action from DPA is sufficient for suppressing scald on portions of the fruit that receive incomplete coverage. Eliminating recycling drenches minimizes the redistribution of P. expansum spores and thus reduces the need for full coverage of fruit with postharvest fungicides. Using non-recycling drenches will be less expensive than alternative treatments while also eliminating the food safety concerns associated with recycling drenches. This work was repeated in fall of 2010, but results are not yet available.
9. Effects of Glyphosate Exposure on Development of Internal Browning in Empire Apples During Long-Term Storage

*Funding source: Agrichemical companies, USDA-CREES Multi-State Project NE-1036; Cooperative project with Dr. Chris Watkins, Ithaca, and Mario Miranda Sazo and Craig Kahlke, Lake Ontario Fruit Team.*

Internal browning is a physiological disorder that causes extensive but unpredictable losses when Empire apples are held in controlled-atmosphere storages for more than 6 or 8 months. An experiment was initiated in summer of 2009 to determine if glyphosate exposure (via drift or root suckers) might contribute to internal browning. Empire trees on three different farms in the Lake Ontario region were exposed to simulated glyphosate drift by spraying a low concentration of glyphosate directly onto one or several lower limbs of the trees during August. Fruit were harvested at normal maturity from both sprayed limbs and from the unsprayed upper parts of both exposed and control trees. Fruit were held in controlled atmosphere storage for 8 months and then evaluated for internal browning. Glyphosate treatments applied to trees increased the incidence and severity of both flesh browning and core browning when means for incidence and severity were compared across all three farms in statistical analyses that included apple samples from both upper and lower limbs on each tree. The percentage increase in browning incidence for glyphosate-treated compared to control fruit varied from 0 to more than 130%. When we analyzed only data for fruit harvested from the tops of trees (no direct exposure to glyphosate) glyphosate treatments caused significant increases in both the incidence and severity of flesh browning and in the incidence but not the severity of core browning. Treatments need to be repeated for several more years to verify results, but it appears that glyphosate treatment in the field can exacerbate internal browning during storage. This work was repeated in fall of 2010, but results are not yet available.

10. Postharvest Fungicide Evaluations, 2009-10

*Funding source: Agrichemical companies, USDA-CREES Multi-State Project NE-1036.*

Postharvest trials were conducted each year during harvest to assess the effectiveness of fungicides that can be applied after harvest to prevent apple fruit decays during long-term storage. Pyrimethanil (Penbotec) and fludioxonil (Scholar) are usually very effective for controlling both *Botrytis cinerea* and *Penicillium expansum.* However, in one trial, pyrimethanil failed to control *Botrytis cinerea* because the isolate recovered from a local vineyard was later found to be resistant to this fungicide, and pyrimethanil-resistance has been found in both of these postharvest pathogens in Washington State. Fludioxonil has consistently provided excellent control of both pathogens. Using Captan in combination with fludioxonil did not improve control of either *B. cinerea* or of *P. expansum.* However, fludioxonil used either alone or in combination with difenoconazole provided excellent control of both pathogens, and using the fludioxonil/difenoconazole combination should slow selection for resistance to fludioxonil in commercial packinghouses.
PLANT PATHOLOGY EXTENSION PRESENTATIONS IN 2009-10

In-State presentations at fruit grower meetings:

<table>
<thead>
<tr>
<th>Date</th>
<th>Title</th>
<th>Location</th>
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<tbody>
<tr>
<td>9-Jan-09</td>
<td>Controlling Bacterial Spot and Other Major Tree Fruit Diseases</td>
<td>28th Annual Long Island Agricultural Forum, Riverhead, Long Island, NY</td>
</tr>
<tr>
<td>11-Feb-09</td>
<td>Rethinking Fungicide Strategies for Apples in 2009</td>
<td>NY Fruit and Vegetable Expo, Syracuse, NY</td>
</tr>
<tr>
<td>19-Feb-09</td>
<td>Issues To Consider: New Fungicides, Shifting Prices, Fungicide Resistance in Scab Control</td>
<td>Upper Hudson/Champlain Commercial Tree Fruit School, Lake George, NY</td>
</tr>
<tr>
<td>24-Feb-09</td>
<td>Cornell Pest Management Research Update</td>
<td>Hudson Valley Commercial Fruit Growers' School, Kingston, NY</td>
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<tr>
<td>24-Feb-09</td>
<td>Tree Fruit Disease Roundup</td>
<td>Hudson Valley Commercial Fruit Growers' School, Kingston, NY</td>
</tr>
<tr>
<td>3-Mar-09</td>
<td>Recent Developments in Apple Scab &amp; Summer Disease Control</td>
<td>Agr.Assistance Grower Meeting, Lyons, NY</td>
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<tr>
<td>15-May-09</td>
<td>Ulster County Update on Fruit Disease Control</td>
<td>Fruit Grower Petal Fall Meeting, Milton NY</td>
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<tr>
<td>15-May-09</td>
<td>Columbia County Update on Fruit Disease Control</td>
<td>Fruit Grower Petal Fall Meeting, Hudson, NY</td>
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<tr>
<td>28-May-09</td>
<td>Champlain Valley Update on Disease Control for 2009</td>
<td>Fruit Grower Petal Fall Meeting, Peru, NY</td>
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<tr>
<td>11-Aug-09</td>
<td>Research Plots at the Hudson Valley Lab</td>
<td>Hudson Valley Fruit Growers Tour, New Paltz/Milton/Highland, NY</td>
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<tr>
<td>13-Aug-09</td>
<td>A Review of Sanitizers for Storage Rooms, Packing Lines, and Water Flumes</td>
<td>Apple Storage Workshop, Ithaca, NY</td>
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<tr>
<td>13-Aug-09</td>
<td>Disease Control for Honeycrisp</td>
<td>Apple Storage Workshop, Ithaca, NY</td>
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<tr>
<td>13-Aug-09</td>
<td>Fungicide Options for Controlling Postharvest Decays</td>
<td>Apple Storage Workshop, Ithaca, NY</td>
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<tr>
<td>30-Nov-09</td>
<td>Effects of Bactericide and Insecticide Sprays on Spread of Fire Blight During Summer</td>
<td>Apple Research &amp; Development Program Research Review, Geneva, NY</td>
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<tr>
<td>19-Jan-10</td>
<td>The Weak Links in the Scab Control Chain</td>
<td>Lake Ontario Winter Fruit School, Albion, NY</td>
</tr>
<tr>
<td>19-Jan-10</td>
<td>Do Potato Leafhoppers Affect the Spread of Shoot Blight During Summer?</td>
<td>Lake Ontario Winter Fruit School, Albion, NY</td>
</tr>
<tr>
<td>20-Jan-10</td>
<td>The Weak Links in the Scab Control Chain</td>
<td>Lake Ontario Winter Fruit School, Newark, NY</td>
</tr>
<tr>
<td>20-Jan-10</td>
<td>Do Potato Leafhoppers Affect the Spread of Shoot Blight During Summer?</td>
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<tr>
<td>23-Feb-10</td>
<td>Fruit Disease Roundup</td>
<td>Hudson Valley Commercial Fruit Growers School, Kingston, NY</td>
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<tr>
<td>24-Feb-10</td>
<td>Preparing for the Plague: Controlling Apple Scab in 2010</td>
<td>Hudson Valley Commercial Fruit Growers School, Kingston, NY</td>
</tr>
<tr>
<td>25-Feb-10</td>
<td>Dealing with Apple Scab When the Deck is Stacked Against You</td>
<td>Upper Hudson/Champlain Tree Fruit School, Lake George, NY</td>
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<tr>
<td>6-May-10</td>
<td>Ulster County Update on Fruit Disease Control</td>
<td>Fruit Grower Petal Fall Meeting, Milton NY</td>
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<tr>
<td>6-May-10</td>
<td>Columbia County Update on Fruit Disease Control</td>
<td>Fruit Grower Petal Fall Meeting, Hudson, NY</td>
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<tr>
<td>11-May-10</td>
<td>Champlain Valley Update on Disease Control for 2009</td>
<td>Fruit Grower Petal Fall Meeting, Saratoga Springs, NY</td>
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<tr>
<td>20-May-10</td>
<td>Champlain Valley Update on Disease Control for 2009</td>
<td>Fruit Grower Petal Fall Meeting, Peru, NY</td>
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<tr>
<td>29-Jul-10</td>
<td>Options for Applying Postharvest Treatments on Apples</td>
<td>Geneva Fruit Field Day, Geneva, NY</td>
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**Presentations for consultants, agribusiness, or tree fruit research/extension professionals:**

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<thead>
<tr>
<th>Date</th>
<th>Event</th>
<th>Location</th>
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<tbody>
<tr>
<td>4-Mar-09</td>
<td>Changing Public/Private Sector Roles in Agricultural Research and Extension</td>
<td>Northeast Crop Consultants Mtg, Canandaigua, NY</td>
</tr>
<tr>
<td>12-Mar-09</td>
<td>Results from Field Trials with Difenoconazole</td>
<td>Syngenta's 2009 Disease &amp; Insect Update Seminar</td>
</tr>
<tr>
<td>26-Jun-09</td>
<td>Results of Postharvest studies on apples</td>
<td>NE-1036 Meeting, Ithaca, NY</td>
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<tr>
<td>10-Sep-09</td>
<td>Result of Agrichemical Field trials in 2009</td>
<td>Annual Tour of Field Plots for the Agrichemical Industry, Hudson Valley Lab, Highland, NY</td>
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<tr>
<td>20-Oct-09</td>
<td>Summer Disease Control with Organic Fungicides</td>
<td>New England, NY, &amp; Canadian Fruit Worker Conference, Burlington, VT</td>
</tr>
<tr>
<td>27-Oct-09</td>
<td>Weak Links in Current Apple Disease Control Programs</td>
<td>Great Lakes Fruit Workers Meeting, Fishkill, NY</td>
</tr>
</tbody>
</table>
28-Oct-09  Unusual Observations and Disease Problems in 2009

30-Oct-09  Using Lime Sulfur to Control Sooty Blotch and Flyspeck in Organic Apple Production in Southeastern New York
            Ann. Mtg. Northeastern Division of the Am. Phytopathological Soc., Quebec City, Canada

18-Nov-09  Brief History of Flyspeck Model Development in the Hudson Valley
            Working Group on Summer Diseases of Apples, Winchester, VA

19-Nov-09  Strengths and Limitations of New Apple Fungicides
            Cumberland-Shenandoah Fruit Workers Conference, Winchester, VA

19-Nov-09  Evaluating New Stone Fruit Root Stocks and Cultivars for Susceptibility to X-Disease and Tomato Ringspot Virus
            Cumberland-Shenandoah Fruit Workers Conference, Winchester, VA

24-Mar-10  Results of 2009 field trials
            2010 Syngenta Disease & Insect Update Meeting, Dundee, NY

9-Sep-10  Result of Agrichemical Field trials in 2010
            Annual Tour of Field Plots for the Agrichemical Industry, Hudson Valley Lab, Highland, NY

19-Sep-10  Matching fungicides with apple pest management priorities
            New England, NY, & Canadian Fruit Worker Conference, Burlington, VT

20-Sep-10  Plans for evaluating scab-resistant apples at the Hudson Valley Lab
            New England, NY, & Canadian Fruit Worker Conference, Burlington, VT

27-Oct-10  Unusual Observations and Disease Problems in 2010

28-Oct-10  Non-target effects of glyphosate on apples.

9-Nov-10  Evaluating indirect effects of glyphosate on apples
            Great Lakes Fruit Workers Meeting, Leamington, ONT

18-Nov-10  Is glyphosate compromising apple tree health?
            Cumberland-Shenandoah Fruit Workers Conference, Winchester, VA

18-Nov-10  How will new fungicides fit into apple disease-control programs?
            Cumberland-Shenandoah Fruit Workers Conference, Winchester, VA

Invited presentations at out-of-state fruit grower or university meetings:

11-Jun-09  Treatment Options for Controlling Apple Storage Decays in 2009
            Apple Crunch Clinic Sponsored by AgroFresh, Grand Rapids, MI

5-Aug-09  New Fungicides for Controlling Apple Postharvest Diseases
            Syngenta Postharvest Meeting, Portland, OR

14-Nov-09  Managing risks for Apple Diseases
            Fruit Risk Mgmt Program, Boscawen, NH

14-Nov-09  Managing risks for Stone Fruit Diseases
            Fruit Risk Mgmt Program, Boscawen, NH

28-Jan-10  How Fungicide Resistance is Changing the Way We Control Apple Scab
            Virginia Horticultural Conference, Staunton, VA
<table>
<thead>
<tr>
<th>Date</th>
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<th>Event</th>
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<tbody>
<tr>
<td>28-Jan-10</td>
<td><em>Fungicide Programs for Summer Diseases and How They May Affect Storage Decays</em></td>
<td>Virginia Horticultural Conference, Staunton, VA</td>
</tr>
<tr>
<td>18-Feb-10</td>
<td><em>Fungicides for Summer Diseases on Apples and Factors That Reduce Their Effectiveness</em></td>
<td>Vermont Tree Fruit Growers’ Association 114th Annual Meeting Middlebury, VT</td>
</tr>
<tr>
<td>18-Feb-10</td>
<td><em>Early-Season Disease Management for Northeast Apples and Potential Impacts of New Fungicides</em></td>
<td>Vermont Tree Fruit Growers’ Association 114th Annual Meeting Middlebury, VT</td>
</tr>
<tr>
<td>8-Mar-10</td>
<td><em>How Are Research Trials Conducted to Determine Label Rates?</em></td>
<td>North Jersey Commercial Fruit Meeting</td>
</tr>
<tr>
<td>14-Jul-10</td>
<td><em>Tree Fruit Diseases - What's up Now?</em></td>
<td>Tree Fruit Twilight Meeting for Commercial Fruit Growers, Durham, NH</td>
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ACTIVITY REPORT FOR TREE FRUIT EXTENSION IN THE HUDSON VALLEY FOR 2010

Michael J. Fargione (mjf22@cornell.edu, 845-691-7117)
Cornell Cooperative Extension of Ulster County
Hudson Valley Regional Fruit Program

2010 EDUCATIONAL PROGRAMMING: OUTREACH ACTIVITIES

Grower Alert E-mail Messages – 124 messages were prepared and delivered to 165 commercial growers, extension and research staff in 4 northeast states. Messages were prepared with input from Cornell faculty including A. Agnello, S. Hoying, P. Jentsch, T. Robinson, D. Rosenberger and C. Watkins. During the growing season, these messages were delivered 2-6 times per week, and kept growers informed of pest management, horticulture, harvest, storage and other production issues at critical times to enhance their decision making capabilities. Messages often included web links to additional resources such as web sites, photographs, integrated pest management data, scouting summaries and video clips produced in collaboration with Cornell staff.

Information Requests - Significant effort was expended to respond to in-person, telephone and electronic information requests from individual growers, research and extension staff, elected officials, agency and non-profit staff, media contacts and the general public.

Farm Visits - More than 40 visits were conducted in the Hudson Valley. These visits, made alone or in conjunction with Cornell faculty, provided growers with hands-on training in pest scouting, insect and disease control practices and horticultural techniques.

Apple Harvest Maturity Evaluation Program – This research and extension program helped growers optimize the timing of apple and pear harvests to improve fruit quality and storability. In 2010, 318 fruit samples were collected from grower blocks within the Hudson Valley Regional Fruit Program area. Samples were evaluated in consultation with S. Hoying, P. Jentsch, D. Rosenberger and C. Watkins, and 8 reports on fruit maturity and optimal harvest timing were distributed via e-mail to 165 growers, extension staff and research faculty.

Training Program for New/Young Fruit Growers - Fargione facilitated the formation of the Hudson Valley chapter of the “Future NY Fruit Growers” and began a training program for them in collaboration with M. Miranda Saso and A. DeMarree (both of the Lake Ontario Fruit Program). This project is designed to “kick-start” educational training for the next generation of growers who will someday take over the management of NY’s fruit industries. Training meetings were held on January 15, April 9, July 21 and December 2. Presenters in 2010 included A. DeMarree, S. Hoying, T. Robinson, S. Brown, L. VanDeValk, (LEAD NY), K. Ellis (Penn State).

Hudson Valley Regional Fruit Program website – Fargione is webmaster of the site located at: http://hudsonvf.cce.cornell.edu/. It provides on-demand access to resources for commercial growers and others interested in Hudson Valley fruit production.

Risk Management Education Project for NEWA (Network for Environment and Weather Awareness http://newa.cornell.edu). Fargione previously worked with J. Carroll (IPM Program) to establish 4 local on-farm weather stations as part of the NEWA system. Stations provide the data needed to run predictive models of insect and disease activity for various crops including apples and pears. In 2010, efforts were undertaken to train growers in the use of this resource by citing site-specific daily products found there such as critical temperature records for frosts, wetting periods for disease initiation, and insect and disease predictive models.

Integrated Pest Management “Scouting and Predictive Models” Resource – Developed in 2009, this page on the Regional Fruit Program web site (http://hudsonvf.cce.cornell.edu/scoutingreport.html) was improved during 2010. This resource assisted growers in making insect pest management decisions. Data on insect presence or thresholds for treatment generated by P. Jentsch were updated onto the Regional Fruit Program web site to aid growers in determining if and when pesticide treatments are needed in specific local areas.

Audio-enhanced Power Point Presentations - In collaboration with P. Jentsch, S. Hoying, D. Rosenberger and T. Robinson, audio recordings of presentations were captured at our annual Fruit Growers’ Schools (or
produced independently. Work is currently underway to link these audio files to presenters’ Power Point slides and convert them to Flash movies. These are then being placed on our Regional Fruit Program website (http://hudsonvf.cce.cornell.edu/photogallery.html).

Improving Housing for Ulster County Farm Workers – Fargione served on the oversight committee for this grant-funded project that provided new trailers for low-income workers on 11 Ulster County farms during 2010.

2010 EDUCATIONAL PROGRAMMING: EVENTS:

Empire State Fruit & Vegetable Expo – Fargione organized and facilitated one session on Tree Fruit at this statewide meeting held January 26-27 in Syracuse, NY. There were approximately 100 growers in attendance who learn about tree fruit production issues.

Processing / Value Added Workshop – Fargione helped organize and facilitate a day-long workshop held February 5 by CCE Hudson Valley and the HV Agribusiness Development Corporation. The meeting was held at the Roosevelt Estate in Hyde Park, NY. Over 100 individuals attended the event and learned about adding value to their current and future agricultural products.

The Hudson Valley Commercial Fruit Growers’ School - This was a 4-day event held February 23-26 in Kingston, NY. The program included 46 topics presented by 32 speakers, and focused on tree fruit, berry and grape commodities. Fargione organized and facilitated the 2 days devoted to tree fruit production, and the 35-vendor trade show. McKay organized and facilitated the berry and grape sessions. During the 4-day event, 300 attendees learned about production, marketing, cultivar development and pest management strategies.

Farm Food Safety Practices and GAP (Good Agricultural Practice) Certification Trainings - Workshops were held at the Hudson Valley Lab (Highland, NY) on March 4-5 and December 8-9. These trainings provided growers with an understanding of GAP principles and helped them to write individual Farm Safety Plans. Trainings were held in collaboration with other local CCE staff, B. Bihn (Cornell GAPS program), R. Hadad (Cornell WNY Vegetable Team), C. Kahlke (Lake Ontario Fruit Team) and NYS Dept. Agriculture and Markets inspectors. Farm GAP workshops assisted 30 local fruit, vegetable, livestock and mushroom farmers to begin developing their own farm food safety plans. A Gap Certification Mock Audit was held at Gill Corn Farm (Hurley, NY) on June 23, and demonstrated the process by which inspectors conduct an actual audit. Two growers attending these trainings obtained USDA GAP certification during 2010.

Special Permit Training Sessions – Three trainings were held (March 16, Hudson NY; March 17, New Paltz, NY; April 14, Highland, NY) to help farm operators and farm workers comply with DEC requirements for on-site supervision of workers handling and making applications of restricted use pesticides. Trainings were held by Fargione and McKay in English & Spanish and helped 25 farm operations and 75 farm workers comply with DEC pesticide application requirements.

Using NEWA Weather Data for Pest Management – This collaborative workshop held March 25 at the Hudson Valley Lab (Highland, NY) by Fargione, P. Jentsch, D. Rosenberger and T. Rusinek help 15 fruit and vegetable growers and crop consultants effectively use the resources available on the Network for Environment and Weather Applications (NEWA) web site.

Wine Making and Winery Start-Up for Beginners – This workshop held April 20-21 at the Hudson Valley Lab (Highland, NY) helped 30 fruit growers and other interested individuals investigate how to produce wines for sale from their own fruit. Training covered the basics of grape and non-grape wine production for beginners. The meeting was conducted in collaboration with S. McKay, C. Gerling and A. Mansfield.

Petal Fall and Cropload Management Field Meetings – These annual field meetings were held on May 6 in Hudson, NY (Fix Bros. Orchard) and Milton, NY (Crist Bros. Orchard). Insect, disease, horticultural and cropload recommendations were provided to 75 attending growers at a critical point in the growing season by collaborators S. Hoying, P. Jentsch, T. Robinson and D. Rosenberger.

Cornell Fruit Field Days – Fargione participated in the July 29 Fruit Field Days at the New York State Agricultural Experiment Station (Geneva, NY), serving as a group guide.
Hudson Valley Harvest and Storage Workshop – This meeting was held August 18 at Cornell’s Hudson Valley Lab (Highland, NY) and provided information to growers about issues relating to the 2010 season’s late insect and disease management, harvest timing and conditions, and fruit storage issues. The meeting was held in collaboration with P. Jentsch, D. Rosenberger and C. Watkins.

Farm Tour for Local Officials - Co-organized with T. Rusinek (CCE Ulster; vegetables and ag issues) and A. Reith (CCE Orange/Ulster; livestock), this October 25 tour gave 15 local, state and federal officials and private ag-industry organizational staff a snapshot of Hudson Valley agriculture and some of the critical issues it faces. This year’s tour visited producers involved with direct marketing (Wallkill View Farms, New Paltz), grass-fed beef (Keirnan Farm, Gardiner), meat rabbits and ducks (John Fazio Farms, Modena), apple production and storage (Porpiglia Farms, Marlboro) and a winery/distillery (Stout Ridge Vineyards, Marlboro)

Crop Insurance Workshop – A meeting held November 17 at the Hudson Valley Lab (Highland, NY) as part of a series of workshops organized across NY in collaboration with NYS Department of Agriculture and Markets and the USDA Risk Management Agency. It targeted tree fruit and grape growers and provided timely information on new crop insurance products and insurance requirements to 18 growers and insurance sales representatives prior to the sign-up deadline.

Winter Pruning Demonstration was held for growers and farm workers on December 23 in Gardiner, NY (Dressel Farms). Collaborators S. Hoying and S. McKay taught central leader pruning techniques to 50 attendees (in English and Spanish languages).

RESEARCH PROJECTS

Apple Rootstock Demonstration Trials. Two field trial/demonstration plantings are being evaluated in collaboration with S. Hoying, T. Robinson and Hudson Valley grower cooperators. The planting at Crist Bros. Orchards (Milton, NY) investigates the field efficiency of Geneva apple rootstocks against other industry rootstock standards. The planting at Minard Farms (Clintondale, NY) is part of the NC140 rootstock trial and superimposes fumigation treatments to look at replant disease impacts. These trials have helped determine differences in rootstock suitability for NY orchards and have provided field sites for grower tours where rootstock impacts on tree growth and fruit production were visible.

Apple High-density Planting System Trials. Two field trial/demonstration plantings are being evaluated in collaboration with S. Hoying, T. Robinson and grower cooperators. The planting at Dressel Farms (New Paltz, NY) has provided data on orchard productivity and profitability of the Tall Spindle planting system compared with two other systems. In addition, the site has been the destination for several grower tours where management aspects of the Tall Spindle planting system were demonstrated. The planting at Yonder Farms (Hudson, NY) has provided orchard performance data for several planting systems for use with ‘Red Delicious’. The planting is providing valuable data to help growers’ select efficient systems for use with cultivar, and will be one site highlighted on the 2011 Hudson Valley Summer Fruit Tour.

Grower Evaluation of New Cornell-Geneva Apple Cultivars - Demonstration plantings of several apple selections from S. Brown’s Cornell breeding program were previously established in the Hudson Valley in collaboration with S. Brown, K. Maloney and S. Hoying. Grower cooperators on this project include Yonder Farms (Hudson, NY), Fix Bros Orchards (Hudson, NY), Mead Orchards (Tivoli, NY), W. G. Minard & Sons (Clintondale, NY), Stone Ridge Orchards (Stone Ridge, NY), Prospect Hill Orchard (Gardiner, NY), Crist Bros. Orchards (Milton, NY), and Ochs Orchards (Warwick, NY). Efforts in 2010 included evaluation of fruit maturity and quality, and collection of samples from the first 2 selections scheduled for release (“NY1” and “NY2”) for grower evaluations at harvest and after regular and controlled atmosphere storage. These efforts will help growers understand when to best harvest these selections for optimal profitability.

Web-based Extension Outreach on Apple Tree Irrigation Needs – Fargione collaborated with T. Robinson, A. Lakso and Art DeGaetano (NE Climate Center) to begin field evaluation of Lakso’s model to better track apple tree water needs. Fargione helped negotiate grower collaboration and financial inputs that made possible the installation of web based tree evapotranspiration estimates for sites across NY (http://squall.nrcc.cornell.edu/apple_et/apple_et.html) based on solar radiation and rainfall data gathered
automatically by the NEWA system (http://newa.cornell.edu/). In 2010, Fargione also worked with Lakso, Robinson and grower-cooperator D. Minard (Clintondale, NY) to evaluate the model for two Hudson Valley orchards. This project will eventually lead to a web-based resource that will calculate irrigation needs for individual grower orchards.

Harvista and Retain Use on ‘Honeycrisp’ apples. Fargione worked with C. Watkins and grower cooperator Crist Bros. Orchards (Gardiner, NY) to conduct a second season of field evaluations of the impacts of stop-drop materials on ‘Honeycrisp’ apples. The results from these trials will allow us to provide recommendations on how best to control fruit drop and color development for the highly-valuable ‘Honeycrisp’ cultivar.

Brown Marmorated Stink Bug (Halyomorpha halys) Monitoring. – Collaborative efforts are underway to investigate current and future distribution and depredations by the invasive Brown Marmarated Stink Bug in Eastern NY. This effort will be conducted in collaboration with P. Jentsch, T. Rusinek, Maire Ulrich (CCE Orange), Charles Bornt and Laura McDermott (both of the Capitol District Vegetable and Fruit Program). A web resource (http://hudsonvf.cce.cornell.edu/bmsb1.html) and preliminary distribution map were created late in 2010. Field monitoring and damage assessments are scheduled to begin in 2011. The project may become a part of a larger multi-state SCRI project depending on funding availability.
## Recent Presentations at Extension and Professional Meetings by Mike Fargione

<table>
<thead>
<tr>
<th>Date</th>
<th>Title</th>
<th>Location</th>
</tr>
</thead>
<tbody>
<tr>
<td>23-Feb-10</td>
<td>Grower Evaluation of HV Extension Programs</td>
<td>Hudson Valley Commercial Fruit Growers’ School, Kingston, NY</td>
</tr>
<tr>
<td>24-Feb-10</td>
<td>Turning Point – A New Tool for Extension Programs</td>
<td>Hudson Valley Commercial Fruit Growers’ School, Kingston, NY</td>
</tr>
<tr>
<td>24-Feb-10</td>
<td>Updated Resources for Tree Fruit IPM: - NEWA and the Apple IPM Websites</td>
<td>Hudson Valley Commercial Fruit Growers’ School, Kingston, NY</td>
</tr>
<tr>
<td>16-Mar-10</td>
<td>WPS Training for Workers and Handlers and Pesticide Training for the 2010 DEC Special Permit</td>
<td>Pesticide Special Permit Training for Farm Workers and Handlers, CCE Columbia County Office, Hudson, NY</td>
</tr>
<tr>
<td>17-Mar-10</td>
<td>WPS Training for Workers and Handlers and Pesticide Training for the 2010 DEC Special Permit</td>
<td>Pesticide Special Permit Training for Farm Workers and Handlers, NYS DEC Region 3 Headquarters, New Paltz, NY</td>
</tr>
<tr>
<td>19-Mar-10</td>
<td>Site Selection and Soil Preparation for an On-farm Nursery</td>
<td>Nursery Tree Production School, CCE Wayne County Office, Newark, NY</td>
</tr>
<tr>
<td>25-Mar-10</td>
<td>NEWA Website Information</td>
<td>Using NEWA Weather Data for Pest Management, Hudson Valley Lab, Highland, NY</td>
</tr>
<tr>
<td>14-Apr-10</td>
<td>WPS Training for Workers and Handlers and Pesticide Training for the 2010 DEC Special Permit</td>
<td>Pesticide Special Permit Training for Farm Workers and Handlers, Hudson Valley Lab, Highland, NY</td>
</tr>
<tr>
<td>24-Apr-10</td>
<td>Tree Fruit Basics</td>
<td>CCE Sullivan Co. Office, Liberty, NY</td>
</tr>
<tr>
<td>7-Aug-10</td>
<td>Bark Grafting Demonstration</td>
<td>Ulster County Fair, New Paltz, NY</td>
</tr>
<tr>
<td>18-Aug-10</td>
<td>Summary of 2010 Growing Season; Early Season Apple Maturity Evaluations and What to Expect from the 2010 Harvest Period</td>
<td>2010 Hudson Valley Apple Harvest and Storage Meeting, Hudson Valley Lab, Highland, NY</td>
</tr>
<tr>
<td>28-Oct-10</td>
<td>Tree Fruit Basics Workshop</td>
<td>Master Gardener Training for CCE Dutchess and Putnam Counties, Millbrook, NY</td>
</tr>
</tbody>
</table>
PUBLICATIONS

Authored or Co-Authored by Scientists at the Hudson Valley Lab

2009-2010

Refereed Journal Articles


Abstracts of Papers Presented at Scientific Meetings


Books contributions


University Publications


Extension Newsletter Articles:
Fargione, M. 2/2010. Adding value and safety to your agricultural products. Cornell County Extension Newsletters: The News (Columbia Co); Land and Living (Dutchess Co.), Ag Focus (Orange and Ulster Counties).
Fargione, M. 4/2010. Interpreting the new DEC burning regulations and how they impact disposal of farm wastes. Cornell County Extension Newsletters: The News (Columbia Co); Land and Living (Dutchess Co.), Ag Focus (Orange and Ulster Counties).
Fargione, M. 6/2010. Future New York fruit growers project seeks participants. Cornell County Extension Newsletters: The News (Columbia Co); Land and Living (Dutchess Co.), Ag Focus (Orange and Ulster Counties).
Fargione, M. 8/2010. Picking apples at their optimal maturity. Cornell County Extension Newsletters: The News (Columbia Co); Land and Living (Dutchess Co.), Ag Focus (Orange and Ulster Counties).
Fargione, M. 10/2010. Upcoming food safety and GAPs audit training available to NY produce growers. Cornell County Extension Newsletters: The News (Columbia Co); Land and Living (Dutchess Co.), Ag Focus (Orange and Ulster Counties).


Robinson, T.L., S.A. Hoying. 2009. Fine points to consider when making planting system decisions. Ohio Produce Growers and Marketers Association Today  Fall issue


Reprinted/excepted in:  


Reprinted in:


Reprinted in:


Reprinted in:


Reprinted in:


Reprinted/excepted in:
- Tree Fruit Recorded Message for August 3, 2010. E-mail messages for Hudson Valley fruit growers compiled by Mike Fargione.

Cross-referenced in:


Reprinted in:
- Ohio Fruit ICM News 13(4), 27 March 2009, S.R. Wright, ed. Online [link].

Adapted in:
- Vermont Apple IPM Alert, 7 April 2009. (L. P. Berkett, ed.).

Cross-referenced/cited in:


Reprinted/adapted in:
- Vermont Apple IPM Alert, 15 April 2009. (L. P. Berkett, ed.)

Cross-referenced/cited in:


Reprinted in:


Reprinted in:


Reprinted/adapted in:
- Ohio Fruit ICM News 13(10), 5 June 2009, (S.R. Wright, ed.). On-line [link].


Adapted in:


Reprinted in:
- Fruit Notes 9(14):6-8: Newsletter from CCE-Lake Ontario Fruit Extension Program.


Reprinted in:


Reprinted or abstracted in:
- Hudson Valley Grower Message 8-11-09, an e-mail list-serve produced by Mike Fargione, CCE Ulster County.


Reprinted in:
- Fruit Notes 9(17):2-4: Newsletter from CCE-Lake Ontario Fruit Extension Program.
Hudson Valley Grower Message 8-11-09, an e-mail list-serve produced by Mike Fargione, CCE Ulster County.


Extension publications other than newsletters:


Reports of field trials in Plant Disease Management Reports or Arthropod Management Tests:


Review of Major Repairs and Improvements on HVRL Properties
At the Hudson Valley Lab Over the Past 20 Years
Compiled by Albert Woelfersheim, Facility Manager
December 2010

All expenses were covered by HVRL, Inc. except that Cornell paid for items marked with an asterisk.

Oct. 2010  Removed all asbestos pipe insulation from crawl space and boiler room.
          Portion paid by HVRL ............................................................. $15,700
          Portion paid by NYSAES ......................................................... $10,000**
Jan. 2010: Replaced furnaces and air conditioner for front half of building. Installed Tiger
          loops on furnaces and boiler to eliminate problems with air in the fuel delivery
          system ........................................................................................ $17,585
Oct. 2009  Replaced boiler burner motor – price includes cleaning ........................................ $1,600
2009     Painted exterior of the lab building and the garage ...................................................... $6,000
Spr. 2009 Replaced old and stained suspended ceiling in the rear hallway ............................... $2,700
May 2009  Installed new air conditioning system for conference room: new compressor,
          refrigerant lines, new air handler, and new duct work ........................................ $5,450
2008     Painted lab building roof with aluminized roof coating ............................................. $1,960
Nov. 2008 Replaced single-pane glass/aluminum door in conference room with thermal pane
          glass/aluminum door ...................................................................... $1,200
Oct. 2008 Replaced circulator pump and burner transformer on boiler, and replaced lift pump
          – price includes cleaning boiler & furnaces ........................................ $3,040
May 2008  Installed Polycom video conference system in conference room ........................... $17,200**
Mar. 2008  Remodeled conference room .............................................................................. $6,500
Nov. 2007 Seal-coated parking lots and driveways, including driveway through orchard. This
          is the last time seal-coating was applied, but it had been done twice before on dates
          not in my records ........................................................................ $4,000
Jun. 2005 Replaced rooftop air conditioner that cools the rear labs ........................................ $5,970
2004     Installed drainage along both sides of the driveway to eliminate a clogged pipe and
          improve ground stability for extra parking ........................................ $6,950
Feb. 2003 Installed new fuel delivery lines for greenhouse furnaces, bypassing lift pump
          system ............................................................................................ Info not accessible**
Aug. 2002 Replaced exterior doors on shop .......................................................................... $730
Aug. 2002 Installed electric door openers on three double-bay garage doors to extend their
          likely lifetime and to reduce maintenance calls ........................................ $1,800
Jun. 2001 Replaced three double-wide single-pane glass/aluminum doors at either end of rear
          hallway and at the front door with thermal-pane glass/aluminum doors ................ $6,285
May 2001  Installed new heating system in conference room including installation of additional
          baseboard radiators, conversion of unused boiler zone to conference room zone .......... $1,700
<table>
<thead>
<tr>
<th>Year</th>
<th>Description</th>
<th>Cost</th>
</tr>
</thead>
<tbody>
<tr>
<td>2000</td>
<td>Replaced fume hood fan and ducts in Horticulture Lab</td>
<td>$2,050**</td>
</tr>
<tr>
<td>Feb. 2000</td>
<td>Installed electric door opener on one double-bay garage door that was regularly jumping the track when closed manually</td>
<td>$622</td>
</tr>
<tr>
<td>Jan. 2000</td>
<td>Installed Ethernet network in the lab building including wireless</td>
<td>$800**</td>
</tr>
<tr>
<td>1999</td>
<td>Installed sheet rock and repaired insulation on head house ceiling by the greenhouses</td>
<td>$980</td>
</tr>
<tr>
<td>Aug. 1999</td>
<td>Removed acid neutralization tank and contaminated soil. The tank had been disconnected from the drain system in 1994 when the septic tank was replaced. (with oversight by Cornell's Environmental Compliance Office)</td>
<td>Info not accessible**</td>
</tr>
<tr>
<td>Jul. 1999</td>
<td>Replaced gutters and downspouts on the rear of the lab building, and wrapped fascia with white aluminum</td>
<td>$1,277</td>
</tr>
<tr>
<td>Mar. 1999</td>
<td>Installed a water softener on the potable water system</td>
<td>$1,000</td>
</tr>
<tr>
<td>Jun. 1998</td>
<td>Installed fire and burglar alarm system, and began alarm monitoring by Rest Assured</td>
<td>$2,750</td>
</tr>
<tr>
<td>Apr. 1998</td>
<td>Replaced two greenhouse furnaces</td>
<td>$6,800**</td>
</tr>
<tr>
<td>Mar. 1998</td>
<td>Constructed wheelchair accessible rest room next to the back entrance as demanded by US government regulations associated with our mortgage</td>
<td>$5,500</td>
</tr>
<tr>
<td>Nov. 1997</td>
<td>Paved all parking lots and driveways, including driveway through orchard</td>
<td>$21,210</td>
</tr>
<tr>
<td>Oct. 1997</td>
<td>Installed used phone system in lab, shop, and pesticide building</td>
<td>est. $3,000**</td>
</tr>
<tr>
<td>Feb. 1997</td>
<td>Replaced water pressure tank for potable water system in lab building</td>
<td>Info not accessible</td>
</tr>
<tr>
<td>Aug. 1996</td>
<td>Constructed walk-in coolers between shop and garage. Construction was done by Albert with power connections and cooling systems installed by commercial vendors: HVRL portion</td>
<td>$6,700</td>
</tr>
<tr>
<td></td>
<td>Cornell portion</td>
<td>$10,830**</td>
</tr>
<tr>
<td>Nov. 1994</td>
<td>Replaced septic tank with 1,500 gallon concrete tank, and replaced waste lines from building</td>
<td>$2,750</td>
</tr>
<tr>
<td>Sep. 1992</td>
<td>Installed lift pump and fuel delivery system from new oil tank to 6 separate oil burner units (including greenhouse furnaces and hot water heater)</td>
<td>$2,875</td>
</tr>
<tr>
<td>1992</td>
<td>Removed three underground fuel storage tanks and replaced with one 1,000 gal above-ground tank.</td>
<td>$8,509</td>
</tr>
<tr>
<td>1991</td>
<td>Constructed new pesticide storage facility, and pesticide rinse water evaporation facility in Cornell's orchard</td>
<td>est. $275,000*</td>
</tr>
<tr>
<td>Jul. 1991</td>
<td>Drilled new well to obtain higher flow rate for Cornell's new pesticide storage facility, installed new submersible pump, and ran connections to the new building on top of the hill</td>
<td>est. $12,000*</td>
</tr>
<tr>
<td>Fall 1991</td>
<td>Replaced roofs on lab and garage buildings.</td>
<td>$15,287</td>
</tr>
</tbody>
</table>
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