

# Case Studies



# Case Study #1 Scenario 1

## Secondary Pest Problems - Why did they get out of control?

### Crop = Apple - Focus on spider mites

#### Situation:

- This is a large (100 acre) apple orchard with a modern high-density planting.
- Insect damage in cullage assessment for the last three years is show below.
- Total packout is high, 21 boxes per bin (84%).

	<i>Percent of Injury - Cullage Assessment</i>								
<i>Crop year</i>	<i>CM</i>	San Jose scale	LR	Campy *	Thrips	Sunburn	Bruises	Other non-insect	Total %
2009	1	0	5	1	5	15	32	41	100
2010	2	0	0	0	0	21	25	52	100
2011	0	0	1	0	0	23	27	49	100

\* Campy = *Campylomma*

#### Management Program - Monitoring:

The pest control program used in this orchard is outlined below. It has remained essentially the same for the **last three years**. Pheromones have been a part of the IPM program.

<i>Pest</i>	CM	Campy / thrips	LR	Mites	Aphids	Other pests
Methods used 2009-2011	1 trap with combo lure per 5 acres	Beat tray	None	Visually observe	Visually observe	Visually observe
Results	Ave. Moths/trap 2.3	Campy/tray =0.3 thrips/tray= 3	Did not monitor	Easy to see, brown leaves	Some on shoots, WAA present	none

## Management Program - Pest Control:

The pest control program used in this orchard is outlined below. It has remained essentially the same for the **last three years**.

Pest control program - products used	CM generation	Timing	Target(s)	\$ per acre <i>with appl.</i>	% area treated
Oil, Lorsban Application		Delayed dormant	Scale, mites, aphids	\$20 \$30 \$25	100%
Pheromone Application Delegate Application	1 <sup>st</sup> & 2 <sup>nd</sup>	Bloom	Codling moth, thrips	\$110 \$15 \$59 \$25	100%
Rimon Application	1 <sup>st</sup>	Petal Fall	Codling moth, leafrollers	\$55 \$25	100%
Delegate Application	1 <sup>st</sup>	1 <sup>st</sup> spray – <i>delayed egg hatch</i>	Codling moth	\$59 \$25	100%
Delegate Application	1 <sup>st</sup>	2 <sup>nd</sup> spray <i>14 day interval</i>	Codling moth	\$59 \$25	100%
Nexter Application		3 <sup>rd</sup> spray – late July	Spider mites	\$21 \$25	100%
			<b>Total</b>	<b>\$578</b>	

### Class Exercise I: Secondary Pest Problems

**GOAL:** Propose a new management program restoring biological control of spider mite while maintaining or increasing fruit quality (packout).

1. Identify the issues that are likely causing a problem with spider mites.

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2. Mark the pesticides in the pest control table above that are harmful to predatory mites (*Galendromus occidentalis*, Western predatory mite – WPM). Use the pesticide effect tables 1 & 2 (on pages 206-207) to help you make these decisions.
3. With the goal of keeping fruit quality high, at least from pest injury, similar to the past three years, what changes would you make in your monitoring and pest control program to enhance biological control of spider mites? Fill out the monitoring and pest control program tables out below. Use the pesticide effect tables 1 & 2 (on pages 206-207) to choose pesticides that are least harmful to natural enemies.

### Monitoring program changes

<b><i>Pest</i></b>	Codling moth	Campylomma /thrips	Leafroller	Mites	Aphids	Other pests
Method used (traps, visual, beat tray, other)						
Number (traps, samples, trees)						
Unit area sampled (acre, tree, etc.)						

### Propose changes in products that you would recommend for pest control.

Pest control program – products used	CM gen	Timing	Target(s)	% Area treated	Cost est.

4. In addition to the changes in monitoring and pest control practices outlined above, what other activities might you implement to reduce problems with secondary pests?

1. \_\_\_\_\_

2. \_\_\_\_\_

3. \_\_\_\_\_

4. \_\_\_\_\_

5. **Optional:** If you have time, compare the costs of your new pesticide program with the original pest control program. (Use the pesticide cost table on page 209.)

# Case Study #1 Scenario 2

## Secondary Pest Problems - Why did they get out of control?

### Crop = Apple - Focus on Leafroller

#### Situation:

- This is a large (100 acre) apple orchard with a modern high-density planting.
- Insect damage in cullage assessment for the last three years is show below.
- Total packout is high, 22 boxes per bin (84%).

<i>Crop year</i>	<i>Percent of Injury - Cullage Assessment</i>								Total %
	<i>CM</i>	San Jose scale	LR	Campy *	Thrips	Sunburn	Bruises	Other non-insect	
2009	3	0	0	1	0	20	22	54	100
2010	5	3	0	0	5	22	21	44	100
2011	0	0	0	0	0	34	27	39	100

\* Campy = *Campylomma*

#### Management Program - Monitoring:

The pest control program used in this orchard is outlined below. It has remained essentially the same for the **last three years**. Pheromones have been a part of the IPM program.

<i>Pest</i>	Codling moth	Campylomma/thrips	Leafroller	Mites	Aphids	Other pests
Methods used 2009-2011	1 trap with combo lure per 10 acres	Beat tray	None	None	Visually observe	Visually observe
Results	Moths/trap 3.5 max = 12	Campy/tray = 0.1 thrips/tray=7	Did not monitor	Did not monitor	few on shoots, no WAA present	none

### Management Program - Pest Control:

The pest control program used in this orchard is outlined below. It has remained essentially the same for the last three years.

Pest control program - products used	CM generation	Timing	Target(s)	\$ per acre with appl.	% area treated
Oil, Esteem Application		Delayed dormant	Scale, mites, aphids	\$20 \$48 \$25	100%
Carzol Application		Bloom	thrips	\$56 \$25	100%
Proclaim Application	1st	Petal Fall	leafroller	\$40 \$25	100%
Altacor Application	1st	1st spray <i>delayed egg hatch</i>	Codling moth	\$40 \$25	100%
Altacor Application	1st	2nd spray <i>14 day interval</i>	Codling moth	\$40 \$25	100%
Intrepid Application		3rd spray – early July	leafroller	\$30 \$25	100%
			<b>Total</b>	<b>\$424</b>	

### Proposed New Management Program:

**GOAL:** Propose adjustments in the pest control program that would enhance biological control of leafrollers while maintaining or increasing fruit quality (packout).

1. Identify the issues limit the biological control of leafrollers.

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2. Mark the pesticides in the pest control table above that could be harmful to leafroller parasitoids (*Colpoclypeus florus*). Use the pesticide effect tables 1 & 2 (on pages 206-207).
3. With the goal of keeping fruit quality high, at least from pest injury, what changes would you make in your monitoring and pest control program to enhance biological control of leafrollers? Fill out the monitoring and pest control program tables out below. Use the pesticide effect tables 1 & 2 (on pages 206-207) to choose pesticides and timings that would be least harmful to or avoid periods when natural enemies are most active.



### Monitoring program changes

<b><i>Pest</i></b>	<b>Codling moth</b>	<b>Campylomma/ thrips</b>	<b>Leafroller</b>	<b>Mites</b>	<b>Aphids</b>	<b>Other pests</b>
Method used (traps, visual, beat tray, other)						
Number (traps, samples, trees)						
Unit area sampled (acre, tree, etc.)						

### Propose changes in products that you would recommend for pest control.

<b>Pest control program – products used</b>	<b>CM gen</b>	<b>Timing</b>	<b>Target(s)</b>	<b>% Area treated</b>	<b>Cost est.</b>

4. In addition to the changes in monitoring and pest control practices outlined above, what other activities might you implement to reduce problems with secondary pests?

1. \_\_\_\_\_

2. \_\_\_\_\_

3. \_\_\_\_\_

4. \_\_\_\_\_

5. **Optional:** Compare the costs of your new pesticide program with the original pest control program. (Use the pesticide cost table on page 209.)

# Case Study #2 Scenario 1

## Designing BC Friendly IPM Programs

**Crop = Apple**

### Situation:

- You have taken over an apple orchard with the history outlined below.
- This is a moderate size (40 acre) apple orchard with a modern high-density planting.
- The variety is a mix of Gala (15 acres) and Fuji (25 acres).
- Insect damage in cullage assessment for the last three years is below.
- Total packout is modest, 19 boxes per bin.

Crop year	Percent of Injury - Cullage Assessment								Total %
	CM	San Jose scale	LR	Campy *	Thrips	Sunburn	Bruises	Other non-insect	
2009	5	0	1	1	5	15	32	41	100
2010	12	2	0	0	1	14	21	50	100
2011	20	15	0	0	0	7	13	45	100

### Management Program - Monitoring:

The pest control program used in this orchard is outlined below. It has remained essentially the same for the **last three years**. Pheromones have **not** been a part of the IPM program.

Pest	CM	Campylomma/thrips	LR	Mites	Aphids	Other pests
Methods used	1 trap with 1X lure per 10 acres	Beat tray	None	None	Visually observe	None
2009	Ave. Moths/trap 8	Campy/tray=0.3 thrips/tray=3	NA	NA	Present on shoots, WAA present	NA
2010	Ave. Moths/trap 12	Campy/tray=0.1 thrips/tray=7	NA	NA	Present on shoots, high WAA	NA
2011	Ave. Moths/trap 23	Campy/tray=0.0 thrips/tray=6	NA	NA	Present on shoots, high WAA	NA

- The cost of the monitoring program outline above is estimated to be **\$12 per acre**.
- When you design your new monitoring program below consider what if any would be the change in cost of monitoring and if this increase would be justified and how.

### Management Program - Pest Control

The pest control program used in this orchard is outlined below. It has remained essentially the same for the ***last three years.***

Pest control program - products applied	CM generation	Timing	Target(s)	\$ per acre with appl.	% area treated
Oil Lorsban Application		Delayed dormant	Scale, mites, aphids	\$20 \$30 \$25	100%
Carzol Application		Bloom	Campy*, thrips	\$57 \$25	100%
Esteem Application	1st	Petal Fall	Codling moth, leafrollers	\$48 \$25	100%
Assail+oil Application	1st	1st spray - egg hatch	Codling moth	\$60 \$25	100%
Assail+oil Application	1st	2nd spray 14 day interval	Codling moth	\$60 \$25	100%
Delegate Application	2nd	3rd spray – mid July	Codling moth	\$59 \$25	100%
Delegate + Provado+ Acramite Application	2nd	4th spray – early August	Codling moth, aphids, leafroller	\$59 \$15 \$38 \$25	100%
Diazinon Application		5th spray – late July	Spider mites	\$32 \$25	100%
			Total cost	\$ 610	

\* Campy = *Campylomma*

## ***Class Exercise II: Designing a BC Friendly Management Program***

**GOAL:** Design a BC friendly pest management program that over the next five years maintains or increases fruit quality.

**Resources:** As you design your BC friendly IPM program take advantages of the resources in your workbook. These would include:

- *Tables of pesticides effects on NEs (pages 206-207)*
- *Lists of NEs most common in apple and pear orchards (Day 1 presentations on NE ID)*
- *Information given in different presentations*

1. What are your key and secondary pests and their natural enemies? Make a list in the table below.

<b>Key pests:</b>	<b>Natural enemies:</b>
<b>Secondary pests:</b>	

2. Mark in your list above which of the natural enemies can likely be enhanced?

3. In the table below outline a monitoring program you would implement to enhance biological control and maintain or increase fruit quality.
4. Include the method use, when monitoring would occur, frequency of monitoring, and number of samples taken per area (traps placed or trees sampled).
  - What new tools/practices you have learned about would you employ to enhance biological control (e.g. natural enemy monitoring)?
  - When and how would you change your monitoring strategy between years?
  - **Optional:** compare the cost between your new and the old monitoring program.

### ***Proposed monitoring program***

<b><i>Pest</i></b>	Codling moth	Campy/thrips	Leaf-roller	Mites	Aphids	Other ( )	Other ( )
Method used (traps, visual, beat tray, other)							
Number (traps, samples, trees)							
Unit area sampled (acre, tree, etc.)							

5. In the two tables below outline a pest management program you would implement that enhances biological control and maintains or increases fruit quality.
  - Which pesticides would you change from the current program?
  - How would you change application timing to protect natural enemies and effectively control the pests?
  - How would your management program change from year 1 to year 5, assuming your control practices are effective?
  - Use the tables showing effects of pesticides on natural enemies to help you choose pesticides (pages 206-207) and the chart (page 208) for application timing.
  - **Optional:** if you have time calculate the cost of the new pest control program by using the table on pesticide costs (page 209).

*Propose products that you would recommend for pest control - year ONE.*

Pest control program – products used	CM gen	Timing	Target(s)	% Area treated	Cost est.

***Propose products that you would recommend for pest control - year FIVE.***

Pest control program – products used	CM gen	Timing	Target(s)	% Area treated	Cost est.

*In addition to the changes in monitoring and pest control practices outlined above, what other activities might you implement?*

1. \_\_\_\_\_
2. \_\_\_\_\_
3. \_\_\_\_\_
4. \_\_\_\_\_



# Case Study #2 Scenario 2

## Designing BC Friendly IPM Programs

**Crop = Pear**

### Situation:

- You have taken over an pear orchard with a history outlined below.
- This is a moderate size (30 acre) pear orchard with a standard planting.
- The variety is a mix of Bartlett (30%), and Anjou (70%).
- Insect damage in cullage assessment for the last three years is below.
- Total packout is modest, 18 boxes per bin.

Crop year	Percent of Injury - Cullage Assessment								Total %
	CM	San Jose scale	LR	Psylla russet	Mealybug	Pear russet	Limb rub	Other non-insect	
2009	3	0	0	10	1	20	22	44	100
2010	2	3	0	24	5	5	26	35	100
2011	4	1	0	15	0	25	23	32	100

### Management Program - Monitoring:

The pest control program used in this orchard is outlined below. It has remained essentially the same for the **last three years**. Pheromones have **not** been a part of the IPM program.

Pest	Codling moth	Pear psylla	Leafroller	Mites	Mealybug	Other pests
Method used	1 trap with 1X lure per 10 acres	Beat tray / leaf samples	None	None	Visually observe	Visually observe
2009	Moths/trap 2.4 max = 17	psylla/tray = 6 nymphs/leaf = 2.3	Did not monitor	Did not monitor	Low numbers present	None
2010	Moths/trap 1.9 max = 12	psylla/tray = 15 nymphs/leaf = 1.3	Did not monitor	Did not monitor	Low numbers present	None
2011	Moths/trap 3.2 max = 17	psylla/tray = 12 nymphs/leaf = 3.3	Did not monitor	Did not monitor	Low numbers present	None

- The cost of the monitoring program outline above is estimated to be **\$12 per acre**.
- When you design your new monitoring program below consider what if any would be the change in cost of monitoring and if this increase would be justified and how.

## Management Program - Pest Control

The pest control program used in this orchard is outlined below. It has remained essentially the same for the **last three years**.

Pest control program - products used	CM gen	Timing	Target(s)	\$ per acre with appl.	% area treated
Sulfur 80W +		Dormant	Pear psylla + pear rust mite	25	100%
Oil				20	
Application				20	
Oil +		Delayed dormant	Pear psylla	20	100%
Warrior II +				10	
Lorsban				30	
Application				20	
Mancozeb 75DF +		Cluster bud	Pear psylla + mites	35	100%
Nexter 75WP				78	
Application				20	
Ultor 1.25SC		Petal fall	Pear psylla	53	100%
Mancozeb 75DF				35	
Application				20	
Oil +		Post petal fall	Mites + pear psylla	5	100%
Agrimek 0.15EC +				87	
Ultor 1.25SC				53	
Application				20	
Delegate 25WG +	1st gen	1st cover codling moth spray	Pear psylla + codling moth	59	100%
oil				3	
Application				20	
Delegate 25WG +	1st gen	2nd cover codling moth spray	Pear psylla + codling moth	59	100%
oil				3	
Application				20	
Acramite		Summer	Spider mites + Pear psylla	58	100%
Clutch				50	
oil				3	
Application				20	
Sulfur 80W +		Post harvest	Pear psylla + pear rust mite	25	100%
oil				10	
Application				20	
			<b>Total cost</b>	901	

### Exercise: Designing a BC Friendly IPM Program

**GOAL:** Design a BC friendly pest management program that over the next five years maintains or increases fruit quality.

**Resources:** As you design your BC friendly IPM program take advantages of the resources in your workbook. These would include:

- *Tables of pesticides effects on NEs (pages 206-207)*
- *Lists of NEs most common in apple and pear orchards (Day 1 presentations on NE ID)*
- *Information given in different presentations*

1. What are your key and secondary pests and their natural enemies? Make a list in the table below.

Key pests:	Natural enemies:
Secondary pests:	

2. Mark in your list above which of the natural enemies can likely be enhanced?

3. In the table below outline a monitoring program you would implement to enhance biological control and maintain or increase fruit quality.
4. Include the method use, when monitoring would occur, frequency of monitoring, and number of samples taken per area (traps placed or trees sampled).
  - What new tools/practices you have learned about would you employ to enhance biological control (e.g. natural enemy monitoring)?
  - When and how would you change your monitoring strategy between years?
  - **Optional:** compare the cost between your new and the old monitoring program.

### **Proposed monitoring program**

<b>Pest</b>	Codling moth	Pear psylla	Leaf-roller	Mites	Aphids	Mealybug	Other ( )
Method used (traps, visual, beat tray, other)							
Number (traps, samples, trees)							
Unit area sampled (acre, tree, etc.)							

5. In the two tables below outline a pest management program you would implement that enhances biological control and maintains or increases fruit quality.
  - Which pesticides would you change from the current program?
  - How would you change application timing to protect natural enemies and effectively control the pests?
  - How would your management program change from year 1 to year 5, assuming your control practices are effective?
  - Use the tables showing effects of pesticides on natural enemies to help you choose pesticides (pages 206-207) and the chart (page 208) for application timing.
  - **Optional:** if you have time calculate the cost of the new pest control program by using the table on insecticide costs (page 209).

*Propose products that you would recommend for pest control - year ONE.*

Pest control program – products used	CM gen	Timing	Target(s)	% Area treated	Cost est.

***Propose products that you would recommend for pest control - year FIVE.***

Pest control program – products used	CM gen	Timing	Target(s)	% Area treated	Cost est.

*In addition to the changes in monitoring and pest control practices outlined above, what other activities might you implement?*

1. \_\_\_\_\_
2. \_\_\_\_\_
3. \_\_\_\_\_
4. \_\_\_\_\_

# Case Study #3 Scenario 1

## Dealing with Crisis and Restoring BC

### Resistance in the key pest

#### Situation:

- This is a moderate size (30 acre) apple orchard with a modern high-density planting.
- The variety is Fuji with crab pollinizers.
- Insect damage in cullage assessment for the last three years is below.
- Total packout has declined from 22 packs per bin to 17 packs per bin.
- The orchard has had increased problems controlling codling moth over the last three years.
- Bioassay of codling moth from this orchard shows a high degree of resistance to Altacor.
- You have been asked to manage the orchard with a history outlined below and to produce a crop without codling moth damage.

Crop year	Percent of Injury - Cullage Assessment								Total %
	CM	San Jose scale	LR	Campy *	Thrips	Sunburn	Bruises	Other non-insect	
2009	15	0	1	0	2	15	29	38	100
2010	36	2	0	0	1	8	15	38	100
2011	48	1	0	0	0	4	12	35	100

\* Campy = *Campylomma*

#### Management Program - Monitoring:

The pest monitoring program used in this orchard is outlined below. The methods have remained essentially the same for the **last three years**.

Pest	CM	Campylomma/thrips	LR	Mites	Aphids	Other pests
Methods used	1 trap per 5 acres with combo lure	Beat tray	None	Visually observe	Visually observe	None
2009	Ave. Moths/trap 5	Campy/tray=0.3 thrips/tray=3	NA	Low levels	Present on shoots	NA
2010	Ave. Moths/trap 22	Campy/tray=0.1 thrips/tray=7	NA	Low levels	Present on shoots	NA
2011	Ave. Moths/trap 44	Campy/tray=0.0 thrips/tray=2	NA	Moderate levels	Present on shoots, high WAA	NA

### Management Program - Pest Control

The pest control program used in 2011 in this orchard is outlined below. It has remained essentially the same for the ***last five years***.

Pest control program - products used	CM generation	Timing	Target(s)	\$ per acre with appl.	% area treated
Oil Application		Delayed dormant	Scale, mites	\$20 \$25	100%
Pheromone Application		Pink	Codling moth	\$50 \$15	100%
Carzol Application		Bloom	Campy*, thrips	\$57 \$25	100%
Altacor Application	1st	Petal Fall	Codling moth, leafrollers	\$48 \$25	100%
Altacor Application	1st	1st spray @ egg hatch	Codling moth	\$60 \$25	100%
Altacor Application	1st	2nd spray 17 day interval	Codling moth	\$60 \$25	100%
Intrepid + Provado Application	2nd	3rd spray – mid July	Codling moth	\$59 \$15 \$25	100%
Altacor + Acramite Application	2nd	4th spray – early August	Codling moth, leafroller	\$59 \$38 \$25	100%
Diazinon Application		5th spray – late July	Woolly apple aphid	\$32 \$25	100%
			<b>Total cost</b>	<b>\$ 654</b>	

\* Campy = *Campylomma*



### ***Class Exercise III - Dealing with Crisis and Restoring Biological Control***

#### **GOALS:**

- Manage a crisis with a key pest that has developed resistance to a pesticide.
- Consider option of how to restore BC into an IPM program.

#### **Scenario #1 - Dealing with CM resistance to Altacor**

- Your assignment is to bring CM back under control – reduce cullage to acceptable levels (2-4% of all culls), as inexpensively as possible in year one.
- Outline a pest control program you would implement to achieve the assigned task (use blank program below) for year one.

#### ***Propose products that you would recommend for pest control - year ONE.***

Pest control program – products used	CM gen	Timing	Target(s)	% Area treated	Cost est.

- What will be the impact of the program outlined above on biological control in the orchard?
- If the program you used in year one will disrupt biological control, what kind of a program will you implement in the following years to restore biological control in the orchard? Fill in the table below with your choice of products.
- How long do you think it will take to restore biological control to previous levels, that is, no need for application of controls for secondary pests?

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***Propose products that you would recommend for pest control - year TWO +.***

Pest control program – products used	CM gen	Timing	Target(s)	% Area treated	Cost est.

In addition to the changes in pest control practices outlined above, what other activities might you propose to change or implement?

- 1. \_\_\_\_\_
- 2. \_\_\_\_\_
- 3. \_\_\_\_\_
- 4. \_\_\_\_\_

What kinds of research solutions would be needed to deal with future problems such as this?

- 1. \_\_\_\_\_
- 2. \_\_\_\_\_
- 3. \_\_\_\_\_
- 4. \_\_\_\_\_



# Case Study #3 Scenario 2

## Dealing with Crisis and Restoring BC

### A new pest invades the region and your orchard

#### Situation:

- This is a large sized (100 acre) apple orchard with a modern high-density planting.
- The varieties are a mix of Gala (60%) and Fuji (40%) with crab pollinizers.
- Insect damage in cullage assessment for the last three years is below.
- Total packout has declined from 22 packs per bin to 15 packs per bin in the last year alone.
- Injury from **stink bugs** has dramatically increased in last two years.
- The injury from stink bug has been identified as coming from the *brown marmorated stink bug* (BMSB), a new invasive species (see fact sheet on this bug on page 210).

	Percent of Injury - Cullage Assessment								
Crop year	CM	San Jose scale	LR	Campy *	Thrips	Stink bugs	Bruises	Other non-insect	Total %
2009	4	1	1	1	2	0	32	59	100
2010	2	2	0	1	1	12	24	58	100
2011	1	0	0	0	0	67	9	23	100

\* Campy = Campylomma

#### Management Program - Monitoring:

The pest monitoring program used in this orchard is outlined below. The methods have remained essentially the same for the **last three years**.

Pest	CM	Campylomma/thrips	LR	Mites	Aphids	Other pests
Methods used	1 trap per 5 acres with combo lure	Beat tray	None	Visually observe	Visually observe	None
2009	Ave. Moths/trap 5	Campy/tray= 0.3 thrips/tray=3	NA	Low levels	Present on shoots	NA
2010	Ave. Moths/trap 3	Campy/tray= 0.1 thrips/tray=1	NA	Low levels	Present on shoots	NA
2011	Ave. Moths/trap 2	Campy/tray= 0.0 thrips/tray=2	NA	Moderate levels	Present on shoots, high WAA	NA

### **Management Program - Pest Control**

The pest control program used in 2011 in this orchard is outlined below. It has remained essentially the same for the **last five years**. There have been no applications for control of secondary pests over the last five years.

Pest control program – products used	CM gen	Timing	Target(s)	\$ per acre with appl.	% area treated
Oil Application		Delayed dormant	Scale, mites	\$20 \$25	100%
Pheromone Application		Bloom	Codling moth	\$100 \$15	100%
Intrepid Application	1st	Petal Fall	Codling moth, leafrollers	\$30 \$25	100%
Altacor Application	1st	1st spray delayed egg hatch	Codling moth	\$40 \$25	100%
Altacor Application	1st	2nd spray 17 day interval	Codling moth	\$40 \$25	100%
			<b>Total cost</b>	<b>\$345</b>	

### *Class Exercise III - Dealing with Crisis and Restoring Biological Control*

**GOAL:** Manage the crisis associated with the appearance of a new invasive pest, BMSB

#### **Scenario #2 - dealing with presence of a new invasive pest, BMSB**

- *In this scenario we are just asking you to address the questions below.*

What are the most likely pest control options for controlling BMSB?

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What will be the likely impact on biological control when implementing the above controls for BMSB?

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What barriers will exist to restoring biological control into an IPM program that must deal with this new pest?

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What information or tools for managing BMSB would be needed to help restore biological control to an orchard dealing with this new pest?

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