Case Study Solutions

Case Study #1 Scenario 1

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

Crop = Apple - Focus on spider mites
Proposed New Management Program:

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.

Over spraying for control of codling moth based on cullage levels in packout and on monitoring results.
Use of insecticides that are highly toxic to predatory mites.

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 to help you make these decisions.

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

Delegate has a large impact on predatory mites.
Rimon has more subtle secondary but negative effects on predatory mite reproduction.
The combination of Delegate and Rimon would increase the risk of spider mite problems.

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 to choose pesticides that are least harmful to natural enemies.

Below are possible monitoring activities that could have used to assess the level of different pests.

Some kind of monitoring program for pests and NE is foundational to a good IPM program.

Monitoring program changes

Pest	Codling moth	Campylomma/ thrips	Leafroller	Mites	Aphids	Other pests
Method used (traps, visual, beat tray, other)	***Combo lures***	***Beat tray***	***Visual 2-minute sample***	***Visual exam of leaves***	***Visual exam of shoots***	
Number (traps, samples, trees)	***One delta trap***	***3 beats 25 trees***	***30 trees***	***5 leaves 10 trees***	***20 trees***	
Unit area sampled (acre, tree, etc.)	***2.5 acres***	***20 acres***	***20 acres***	***20 acres***	***20 acres***	

See program suggestions on next page.

Retain use of Lorsban as it provides some suppression of Campylomma.

Use Intrepid at petal fall to set up delayed spray for CM.

Delay first spray of Altacor - monitoring results will determine the need and what areas should be treated.

Plan 2nd generation CM sprays based on a survey of 1st generation damage.

If fruit injury is very low then good options would be to use CM virus at peak hatch of second generation OR a targeted treatment of Calypso where there is most pressure.

$200 saved in program can be put towards monitoring or additional soft products and applications.

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

Pest control program - products used	CM gen	Timing	Target(s)	$ per acre ***with appl.***	% area treated
Oil, Lorsban Application		Delayed dormant	Scale, mites, aphids	$20 $30 $25	100%
Pheromone Application	1st & 2nd	Bloom	Codling moth	$110 $15	100%
Intrepid Application	1st	Petal Fall *275 CMDD*	Codling moth, leafrollers	$30 $25	100%
Altacor Application	1st	1st spray – *525 CMDD*	Codling moth	$40 $25	***100% all area need treating?***
CM virus OR ***Calypso*** where needed Application		3rd spray – late July (use model for timing)	Codling moth	$30 OR $54 $25	***Area to treat? 20 to 100%***
			Total	***$375 versus $578***	

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

Collect shoots from orchards with stable biological control of spider mites to introduce populations of predatory mites. This should be done early in the spring to allow for establishment and buildup of the predatory mites.

5. ***Optional***: If you have time, compare the costs of your new pesticide program with the original pest control program. ***See program cost comparisons above.***

Case Study #1 Scenario 2

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

Crop = Apple - Focus on Leafroller

	Percent of injury – Cullage assessment								
Crop year	*CM*	San Jose scale	LR	Campy *	Thrips	Sunburn	Bruises	Other non-insect	Total %
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

Pest	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	Camp/tray = 0.1 thrips/tray=7	Did not monitor	Did not monitor	few on shoots, no WAA present	none

Monitoring of codling moth with too few traps.

Low captures suggest a low CM population, which is supported by packout data.

No Campylomma pressure and very low thrips pressure.

No leafroller damage and low scale infestation.

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 *delayed egg hatch*	Codling moth	$40 $25	100%
Altacor Application	1st	2nd spray *14 day interval*	Codling moth	$40 $25	100%
Intrepid Application		3rd spray – early July	leafroller	$30 $25	100%
			Total	***$424***	

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).

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

   Carzol is used for thrips control and not justified by monitoring results. Carzol is likely toxic to parasitoids of LR.

   Proclaim is highly effective against LR. Proclaim at petal fall will eliminate all or most leafrollers so no opportunity for LR parasitoids to establish a population.

   There is a low threat of crop injury from LR at petal fall or in the period following.

5. 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.

   Use of Carzol and Proclaim – see comments above.

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 to choose pesticides and timings that would be least harmful to or avoid periods when natural enemies are most active.

Monitoring program changes

Pest	Codling moth	Campy /thrips	Leafroller	Mites	Aphids	Other pests
Method used (traps, visual, beat tray, other)	***Combo lures***	***Beat tray***	***Visual 2-minute sample***	***Visual exam of leaves***	***Visual exam of shoots***	
Number (traps, samples, trees)	***One delta trap***	***3 beats on 25 trees***	***30 trees***	***5 leaves 10 trees***	***20 trees***	
Unit area sampled (acre, tree, etc.)	***2.5 acres***	***20 acres***	***20 acres***	***20 acres***	***20 acres***	

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

Delay LR control until summer.

(Optional) If not confident in monitoring for LR then apply Bt or lower rates of Intrepid timed using LR model, which would allow survival of some LR to sustain NEs.

This approach will shift pesticide intervention away from periods when LR parasitoids are most active and when later instars are present (late spring and late summer).

Refer to LR models for the periods in degree days when NE are present.

Pest control program – products used	CM gen	Timing	Target(s)	% Area treated	Cost est.
Oil Application		Delayed dormant	Scale, mites, aphids	$20 $25	100%
Pheromone Application		Bloom	Codling moth	$110 $15	100%
Oil Application	1st	375 CMDD	Codling moth	$10 $25	100%
Altacor Application	1st	1st spray *delayed egg hatch*	Codling moth	$40 $25	100%
Altacor Application	1st	2nd spray ***optional***	Codling moth	$40 $25	100%
Bt OR Intrepid Application		3rd spray – early July	leafroller	$30 $25	100%
			Total	***$390 versus $424***	

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?

   Based on injury in packout and monitoring it does not appear that thrips OR scale are a serious problems. Put more effort into monitoring and base the need to control thrips on these data.

   Consider a more aggressive scale control program every second or third year and use targeted treatments where scale is present in orchard.

   Plant rose-strawberry gardens to enhance biological control of LR by parasitoids.

5. ***Optional***: Compare the costs of your new pesticide program with the original pest control program. ***See program cost comparisons above.***

Case Study #2 Scenario 1

Designing BC Friendly IPM Programs

Crop = Apple

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*
- *Lists of NEs most common in apple and pear orchards*
- *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:**
Codling moth	None or few
Leafroller	Parasitoids – *C. florus*
Scale	Parasitoids, general predators
Secondary pests:	
Woolly apple aphid	General predators, *A. mali*
Green apple aphid	General predators
Spider mites	Predatory mites
While apple leafhopper	Egg parasitoid
Leafminer	Parasitoids – *Pnigalio flavipes*

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

   All NE can be enhanced using the right approach

   Easiest to enhance are predatory mites and general predators

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

Pest	Codling moth	Campy/ thrips	Leaf-roller	Mites	Aphids	NE Green lacewing	NE WAA parasite
Method used (traps, visual, beat tray, other)	***Combo lures***	***Beat tray***	***Visual 2-minute sample***	***Visual exam of leaves***	***Visual exam of shoots***	***Traps and HIPV lures***	***Traps and lures***
Number (traps, samples, trees)	***One delta trap***	***3 beats 25 trees***	***30 trees***	***5 leaves 10 trees***	***20 trees***	***As advised by WSU***	***As advised by WSU***
Unit area sampled (acre, tree, etc.)	***2.5 acres***	***20 acres***	***20 acres***	***20 acres***	***20 acres***	***As advised by WSU***	***As advised by WSU***

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?

Recommend retaining use of Lorsban in year one. Identify where scale problem is coming from and target the area. Lorsban use in the first year would help suppress WAA.

In future years move towards an oil only program. If scale control is needed could include Esteem in some years but would delay application for optimum timing for LR.

No bloom treatments unless dictated by monitoring that shows Campylomma or thrips – if these pests are present could use Success for thrips or Carzol for Campy.

    - How would you change application timing to protect natural enemies and effectively control the pests?

Use oil to delay first CM spray

Tank mix Altacor and Calypso at 525 CMDD. Reasoning is to combine 1st generation control into one application for CM at a time when many NE are not present. Minimize effects on predatory mites by using Calypso.

To ensure good control of CM, add CM virus at end of egg hatch period

Implement a soft but aggressive CM control 2nd generation to set up orchard for a reduced pest control program in years 2-5.

Treatments in 2nd generation should be based on need due to number and distribution of moth capture in traps and on level and location of 1st generation fruit injury.

    - How would your management program change from year 1 to year 5, assuming your control practices are effective? **SEE PROGRAM FOR YEAR FIVE**

- Use the tables showing effects of pesticides on natural enemies to help you choose pesticides and the chart for application timing.
- **Optional:** if you have time calculate the cost of the new pest control program by using the table on pesticide costs.

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

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%
Pheromone Application		Bloom	Codling moth	$110 $15	100%
	1st	Petal Fall			
Oil Application	1st	***375 CMDD topical ovicide***	Codling moth	$10 $25	100%
Altacor+ Calypso Application	1st	***1st spray delayed egg hatch***	Codling moth	$40 $54 $25	100%
CM virus Application	1st	2nd spray at end of egg hatch	Codling moth	$30 $25	100%
CM virus+oil Application	2nd	3rd spray – mid July	Codling moth	$30+ $10 $25	100%
Intrepid Application	2nd	4th spray – late July	Codling moth	$30 $25	100%
CM virus+oil Application	2nd	5th spray – late July	Codling moth	$30+ $10 $25	100%
CM virus+oil Application	2nd	6th spray – late July	Codling moth	$30+ $10 $25	100%
			Total cost	***$624*** versus ***$610***	

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

In delayed dormant use an oil only program or possibly include Esteem. If Esteems is used it should be applied at optimum timing for LR.

Pheromone at bloom but reduce rates to 75% as CM problem diminishes

Bloom/Petal Fall - No treatments unless dictated by monitoring that shows injury levels of Campylomma or thrips; if needed use Success for thrips or Carzol for Campy.

Use oil to delay first CM spray

Implement a soft CM control 1st generation if needed in years 2-5.

Altacor at 525 CMDD – if needed

Anticipate no need for 2nd generation CM treatments – monitor.

Optional treatment of Bt for LR if spring sampling indicates a need.

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

Pest control program - products applied	CM gen	Timing	Target(s)	$ per acre with appl.	% area treated
Oil Application		Delayed dormant	Scale, mites, aphids	$20 $25	100%
Pheromone Application		Bloom	Codling moth	$80 $10	75%
	1st	Petal Fall			
Oil Application	1st	375 CMDD topical ovicide	Codling moth	$10 $25	100%
Altacor Application	1st	1st spray delayed hatch 14-17 day residue	Codling moth	$40 $25	100%
CM virus+oil Application	1st	2nd spray 17 day residue	Codling moth	$10+ $10 $25	100%
CM virus+oil Application	1st	3rd spray 7day residue	Codling moth	$10+ $10 $25	100%
Bt Application	2nd	4th spray – early July	Leafroller	$30 $25	100%
			Total cost	***$380*** versus ***$ 610***	

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

Plant and manage rose/strawberry gardens

Invest time into training on-farm labor to sample for secondary pest presence

Invest in trapping for general NE to understand presence and impact of program on abundance.

Cost of monitoring program would be offset by a reduction in the cost of pesticides and applications.

Case Study #2 Scenario 2

Designing BC Friendly IPM Programs

Crop = Pear

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:**
Codling moth	Few or none
Secondary pests:	
Pear psylla	*Deraeocoris brevis*, Campylomma, lacewings, *Trechnites psyllae*, minute pirate bug, yellow jackets
Pear rust mite	*Typhlodromus pyri* & *T. occidentalis* (predatory mites), lace wings
Spider mites, European red mite	*Typhlodromus pyri* & *T. occidentalis* (predatory mites), lace wings, Stethorus
OBLR	*Colpoclypeus florus*, tachinid flies
Scale	Parasitoids, general predators

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

All NE can be enhanced using the right approach

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

Pest	Codling moth	Pear psylla	Leafroller	Mites	Aphids	NE Green lacewing	NE Deraeocoris
Method used (traps, visual, beat tray, other)	***pheromone trap***	***Beat trays***	***pheromone traps***	***spurs***	***visual observation***	***traps and HIPV lures***	***beat trays***
		leaves	***visual observation***	***leaves***			
Number (traps, samples, trees)	***1***	***20 to 40***	***1***	***40***	***20***	***As advised by OSU/WSU***	***20 to 40***
		40	***20***				***40***
Unit area sampled (acre, tree, etc.)	***2.5 to 5 acres***	***20 acres***	***10 to 20 acres***	***20 acres***	***20 acres***	***As advised by OSU/WSU***	***20 acres***

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?

Intrepid for early CM spray, Altacor for 1st generation covers
Mating disruption for codling moth.
No Delegate for 1st generation CM.
Apply summer mite and psylla sprays based on monitoring.

   - How would you change application timing to protect natural enemies and effectively control the pests?

Use Delegate for summer psylla spray in 2nd CM generation if needed based on monitoring.

   - How would your management program change from year 1 to year 5, assuming your control practices are effective?

CM sprays may be eliminated as pressure is reduced. Need for sprays for secondary pests should be reduced.

- Use the tables showing effects of pesticides on natural enemies to help you choose pesticides and the chart for application timing.
- **Optional:** if you have time calculate the cost of the new pest control program by using the table on insecticide costs.

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

Pest control program - products used	CM gen	Timing	Target(s)	$ per acre with appl.	% area treated
Sulfur 80W +		Dormant	Pear psylla + mites	25	100%
Oil				20	
Application				20	
Esteem +		Delayed dormant	Pear psylla, ***leafroller, San Jose scale***	48	100%
Oil				20	
Application				20	
Mancozeb 75DF +		Cluster bud	Pear psylla + mites	35	100%
Nexter 75WP				78	
Application				20	
Mating disruption	***all***	***Before full bloom***	***Codling moth***	125	100%
Mancozeb 75DF		Petal fall	Pear psylla	35	100%
Application				20	
Oil +	1st gen	Post petal fall	Mites + pear psylla ***San Jose Scale, Codling moth***	5	100%
Agrimek 0.15EC +				87	
Ultor 1.25SC				53	
Intrepid				30	
Application				20	
Altacor+	1st gen	1st cover codling moth spray	codling moth	40	100%
oil				3	
Application				20	
Altacor+	1st gen	2nd cover codling moth spray	codling moth	40	100%
oil				3	
Application				20	
Sulfur 80W +		Post harvest	Pear psylla + pear rust mite	25	100%
oil				10	
Application				20	
			Total cost	$842 versus $901	

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

Pest control program - products used	CM gen	Timing	Target(s)	$ per acre with appl.	% area treated
Sulfur 80W +		Dormant	Pear psylla + mites	25	100%
Oil				20	
Application				20	
Esteem +		Delayed dormant	Pear psylla, ***leafroller, San Jose scale***	48	100%
Oil				20	
Application				20	
Mancozeb 75DF +		Cluster bud	Pear psylla + mites	35	100%
Nexter 75WP				78	
Application				20	
Mating disruption	***all***	***Before full bloom***	***Codling moth***	125	100%
Mancozeb 75DF		Petal fall	Pear psylla	35	100%
Application				20	
Oil +	1st gen	Post petal fall	Pear psylla+ ***San Jose Scale***	5	100%
Ultor 1.25SC				53	
Application				20	
Sulfur 80W +		Post harvest	Pear psylla + pear rust mite	25	100%
oil				10	
Application				20	
			Total cost	$599 versus $901	

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

1. ***Eliminate extra-orchard sources of codling moth***.

2. ***Work with neighbors to implement areawide mating disruption for codling moth and areawide psylla control with postharvest sulfur + HMO applications.***

Case Study #3 Scenario 1

Resistance in the key pest

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)	$ per acre with appl.	% area treated
Oil Application		Delayed dormant	Scale, mites	$20 $25	100%
Pheromone Application	1st & 2nd	Pink	Codling moth	***$110*** $15	100%
No treatment unless needed		Bloom	Campy*, thrips ???		
Esteem (Rimon or Intrepid) Application	1st	Petal Fall ***Timed at optimum for CM***	Codling moth, leafrollers	***$48*** $25	100%
Delgate+Rimon (NN+Intrepid (Pyreth+Ovicide) Application	1st	1st spray ***tank mix @ delayed egg hatch***	Codling moth	***$59+55*** $25	100%
Calypso (Assail, Delegate, pyrethroids) Application	1st	***2nd spray 17 day interval***	Codling moth	***$54*** $25	100%
CM virus+oil Application	2nd	***3rd spray Egg hatch timing***	Codling moth	***$40 $25***	100%
Intrepid Application	2nd	***4th spray 7 day interval***	Codling moth	***$30 $25***	100%
CM virus+oil Application	2nd	***5th spray 10 day interval***	Codling moth	***$40 $25***	100%
Intrepid Acramite Application	2nd	***6th spray 7 day interval***	Codling moth	***$30 $38 $25***	100%
CM virus+oil Application	2nd	***7th spray 10 day interval***	Codling moth	***$40 $25***	100%
			Total cost	***$804 versus $654***	

- What will be the impact of the program outlined above on biological control in the orchard?

The primary goal is to restore control of codling moth and produce a crop that has low fruit injury and might be eligible for export.

Avoiding the use of Altacor or any other insecticides in the same class is critical

An aggressive program of control in the first generation is the recommended approach, even at the expense of biological control, but every effort should be made to minimize impacts on NEs.

Increase pheromone to full rate – this will help improve CM control

Use ovicide at petal fall period – choice should be based on what product you might want to use late in the year

Apply delayed tank mix of ovicide+larvicide. There are several possible options, even use of a pyrethroids such as Warrior as a way to reduce cost

Apply a larvicide after the tank mix to obtain a high level of control of CM in 1st gen

Plan an aggressive but soft control program for CM in the 2nd gen – alternation of CM virus+oil and Intrepid would be a good example

Treatments in 2nd generation should be based on need – monitoring program results

A control treatment for spider mites is likely – use of a product or rate that would allow survival of predatory mites is recommended

Monitor for aphids and spider mites as the potential for disruption of BC is high and intervention may be necessary

- 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.

Implement controls for CM only if needed based on monitoring program

A good monitoring program would pay for itself from control treatments that are not applied or in crop protection actions that are justified – reduce potential injury

The program outlined on next page is expensive but less than in year one and it is not likely that it would all be required

- 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?

Most BC could be restored in year two but most likely a stable BC program would require more than one year following correction of year one actions

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

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	1st & 2nd	Pink	Codling moth	***$110*** $15	100%
No treatment unless needed		Bloom	Campy*, thrips ???		
Bt Application	1st	Petal Fall	leafrollers	***$25*** $25	100%
Oil Application	1st	1st spray ***375 CMDD***	Codling moth	***$10*** $25	100%
CM virus+oil Application	1st	***2nd spray delayed hatch 525 CMDD***	Codling moth	***$40*** $25	100%
Calypso Application	1st	***3rd spray 7 day interval***	Codling moth	***$54*** ***$25***	100%
CM virus+oil Application	1st	***4th spray 14 day interval***	Codling moth	***$40*** ***$25***	100%
CM virus+oil Application	1st	***5th spray 7 day interval***	Codling moth	***$40*** ***$25***	100%
CM virus+oil Application	2nd	***6th spray egg hatch***	Codling moth	***$40*** ***$25***	100%
Intrepid Application	2nd	***6th spray 7 day interval***	Codling moth	***$30*** ***$25***	100%
CM virus+oil Application	2nd	***7th spray 14 day interval***	Codling moth	***$40*** ***$25***	100%
			Total cost	***$714 versus $ 804***	

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

An aggressive monitoring program for CM should be implemented to determine if there is sufficient need to apply treatments in the 2nd gen

A monitoring program should also be implemented for spider mites

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

Implement better monitoring programs for CM and other pests

Understand cross-resistance possibilities between different insecticide classes

Identify new controls for CM that rely less on pesticide applications, e.g. attract and kill

Case Study #3 Scenario 2

A new pest invades the region and your orchard

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

GOAL: Manage the crisis associated with the appearance 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?

There are few available options and none are deemed compatible with biological control in orchards

Pyrethroids seem to be the best control option but even these have weaknesses

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

Programs designed to conserve biological control in orchards would be sacrificed to protect the crop

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

Lack of chemical controls for BMSB that are compatible with conservation of biological control agents is the obvious barrier

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

A good monitoring system to detect BMSB when in the orchard or moving into the orchard

Efficacy of orchard border sprays to reduce damage and minimize disruptive effects of pesticides on BC

New chemical controls or strategies that have lower negative impacts on BC - Possibly the development of attract and kill strategies to protect orchards

Biological controls for BMSB to reduce populations in non-agricultural areas

2012 BioControl Short Course

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