

Integrated Pest Management
Pesticides and Pest Management

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Disclaimer

- OSU Extension Service does not endorse or recommend the use of any of the products listed or mentioned in this module.
- Product trade names are listed purely to provide examples of certain types of pesticides that you may come across in your home and garden store.
- The information in this presentation shouldn't be regarded as a substitute for professional consultation.

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What are we talking about today?

- Informed decision making
- Developing a tool kit to holistically monitor your home garden
- Choosing management strategies that align with your goals and ethics

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What is a pest?

- Pests can be
- insects
 - mice, deer and other animals
 - unwanted plants (weeds)
 - microorganisms (fungi, bacteria and viruses)

Pests are living organisms **out of place.**



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Herbicide active	SCA (Group #)	Products
2,4-D	4	various
acifluorfen (bom)	1	Blazer, Clarity
atrazine (bom)	1	various
glyphosate (bom)	5	Princap
metolachlor (bom)	27	various
trifluralin	10	

Some State Recommendations (Not for Classes)

Example:

Pigweed (Amaranth)

- Highly invasive in cropping systems
- Family in known to take over entire fields
- Elaborate tank mixes commonly used to spray it out

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Pigweed (Amaranth)

- Some species/varieties edible
- \$9-10/lb
- Traditional food source in some places

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What is integrated pest management?

Integrated Pest Management aims to reduce crop losses from pests that are effective, economically viable and ecologically compatible (Pedigo 2008).

Integrated Pest Management (IPM) is a strategy to prevent and suppress pests with minimum impact on human health, the environment and non-target organisms (Steve Dreistadt, University of California)

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ABC's of IPM

- **A: Always be monitoring**
- Scout your garden
- **B: Be confident in identifying the pest**
- Learn to identify pests and diseases
- **C: Choose the appropriate control**
- Learn when to use cultural, physical, biological, and chemical controls



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Always be monitoring

In the garden:

- Scouting (looking for problems)
- Diagnosing early
- Applying controls at the optimal time

Outside the garden:

- OSU Extension Garden Calendar
- PNW Handbook
- Social Media! (PNW Disease management on Facebook)
- Degree day monitors

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Monitoring

- Look for pests and their damage
- Look for beneficial organisms
- Keep a garden journal




John Vander Houwen, WA State University

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Monitoring your garden

- Visual monitoring
 - What pests am I seeing? How many?
- Color traps
- Sticky cards and water bowls
- Shelter, food, and Mate traps
- Beer and bread traps
- Pheromone traps





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Black Vine Weevil



Erineum mite



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Color traps



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Best for small, flying insects and arthropods (e.g. aphids, thrips, whiteflies), as well as spider mites

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Snails on Board Trap

OSU Research: Bread dough > beer



Slug at Beer Trap



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Commercial Trapping



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Home-made traps





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Monitor your garden

- If you catch flies in your trap, and
- If fruit is in the ripe to overripe stage
- Spray for Spotted Wing Drosophila



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Pheromone traps



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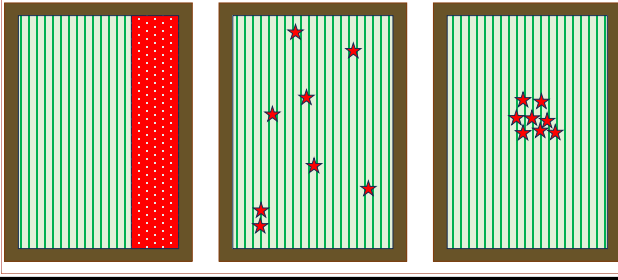
Monitor Your Garden



- If you catch moths in your traps, and
- If apples/pears are in petal fall
- Spray for codling moth.

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Look for patterns in the problem area



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Be Confident in your Identification of the pest



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First, make sure it's a pest

Location on the plant	Common Symptoms	Cause	Frequency	
No fertility Low fertility	Plant is stunted with the entire plant becoming chlorotic. Chlorosis may be more pronounced in the top of the plant.	Sulfur deficiency	Uncommon	
	Plant is stunted with little leaf expansion. Lower leaves may turn purple in some species.	Phosphorus deficiency	Common	
Upper part of the plant (new growth) is affected	Chlorosis develops in the new growth, that sometimes progresses from interveinal to an overall chlorosis, and the color of the chlorosis changes from yellow to white.	Iron deficiency	Very common	
	Chlorosis develops in the new growth that remains interveinal, or the chlorosis can develop various patterns.	Manganese deficiency, Zinc deficiency, copper deficiency	Uncommon	
Lower part of the plant (older growth) is affected	Distortion in the new growth, sometimes in conjunction with tip abortion.	Boron deficiency, calcium deficiency	Common	
	General chlorosis in the older leaves. As it progresses, the chlorotic leaves drop off the plant.	Nitrogen deficiency	Very common	
	Bronzing coloration with necrotic spots on older leaves.	Iron/manganese toxicity	Very common	
	Interveinal chlorosis in the older leaves	Magnesium deficiency	Common	
	Edges of the lower leaves become chlorotic or necrotic.	Boron toxicity, potassium deficiency, molybdenum deficiency	Uncommon	

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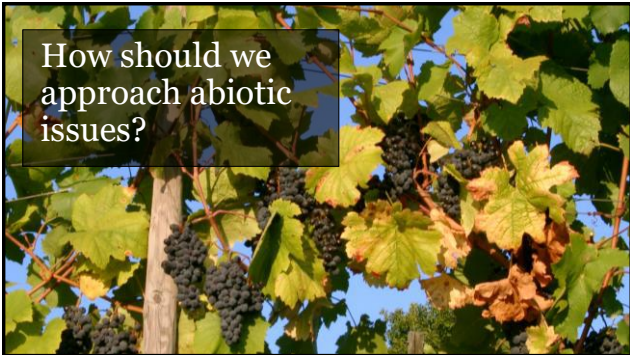
Abiotic issues



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Key Pests:
Plant disease



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Biotic issues

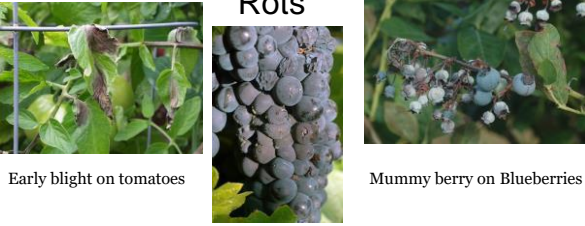
Galls



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Biotic issues

Rots



Early blight on tomatoes

Botrytis on grapes

Mummy berry on Blueberries

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**Key Pests:
Insects**



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Biotic issues

Chewing insects



Strawberry root weevil


Earwigs

Impacted cabbageworm damage on cabbage
[Photo by St. James]

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Biotic issues

Sucking Insects




Thrips

Spider Mites

Aphids

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**Key Pests:
Invasive species**




stopbmb.org

Walgenbach Lab

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Thresholds

- Depends
- Treatment thresholds are determined by grower tolerance
- Is it worth it to spray?
- Your tolerance for pests may vary among plants



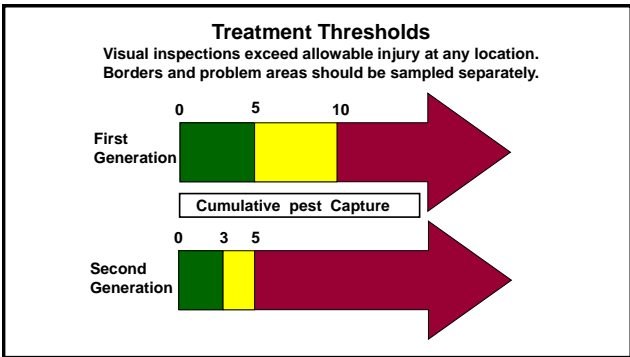
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ABC's of IPM

- **A: Always be monitoring**
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 - Learn when to use cultural, physical, biological, and chemical controls



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Choose an integrated approach to control



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Manage using all available strategies

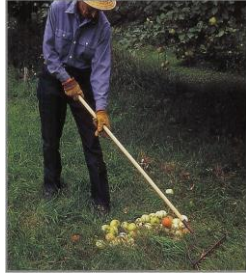
- Cultural
- Physical/
Mechanical
- Biological
- Chemical



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Cultural controls

- Plant healthy stock
- Select for plants with resistance
- Plant them correctly!
- Maintain your garden, water deep, fertilize (but don't over do it), water the soil, prune for airflow, and get rid of diseased plants.
- Sanitize tools



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Planting healthy stock

- Be cautious of stores that aren't primarily in the sales of plants
- Look for certified stock when possible
- Inspect plants for diseases and pests before planting
- Choose reputable brands



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Select for disease resistance

Table 1. Nut and kernel characteristics of hazelnut varieties with the Gasaway gene for resistance to eastern filbert blight.

Variety	Altilas (grams)	Kernel ¹ (%)	Nut shape	Grade size	Blemching ²	Good nut (%)	Kernel Blot ³
Doris	1.12	3.4	43	Round	Medium	2.4-2.9	79-81
Jefferson	1.3	3.7	45	Round	Medium	4-5	76-84
Norfolk	8.26	2.3	49	Round	Small	4.6-5.0	75-91
Wapato	1.2	2.4	46	Round	Small	3.0	80
Felix	15.21	2.5	50	Round	Small	1.8	81
York	2.21	2.8	44	Round	Small	4.4-4.8	81-84
Eta	11.26	2.8	48	Round	Small	3.0	75
Theta	6.16	2.3	50	Round	Small	2.5	85-90
Gamma	2.10	2.5	52	Round	Small	4.0	80

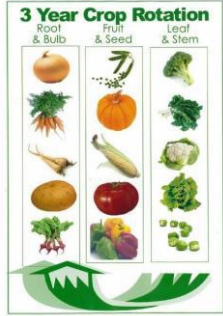
¹Percentage of nut weight that is from the kernel.
²Scale 0-5, with 0 = 100% removal of the pedicel and 5 = no pedicel removal after roasting at 200°C-300°C (120°C-150°C) for 15 minutes.
³Scale 0-4, with 0 = No blot and 4 = severe blot.

Table 2. Nut and kernel characteristics of hazelnut varieties susceptible to eastern filbert blight.

Variety	Altilas (grams)	Kernel ¹ (%)	Nut shape	Grade size	Blemching ²	Good nut (%)	Kernel Blot ³
Bancrofta (standard)	9.2	3.3-4.0	39-43	Round	Medium-large	4-5	70-82
Clara	10.21	1.8-2.2	35-53	Round	Small	6.0	78-89
Clark ⁴	3.8	2.5-2.8	48-51	Round	Small	2.6-3.5	66-81
Ensis	1.11	3.1-4.8	63-66	Oblong	Large	6.7	64-92
Gem	2.16	4.7-5.0	37-42	Long	Large	6.5-7.0	67-83
Hoff's Giant	5.15	3.3-4.5	38-44	Round	Medium	3.0	79-95
J5	2.3	3.4-3.6	50-51	Round	Medium	6.0	34-45
Louis ⁵	3.8	2.7-2.9	46-48	Round	Small	4-5	82-90
Sacajawea ⁶	1.22	2.8	48-50	Round	Small	2.5-3.5	84
Tonda di Giffuni ⁷	2.23	2.7-3.2	45-50	Round	Medium	2.5-3.5	71-79

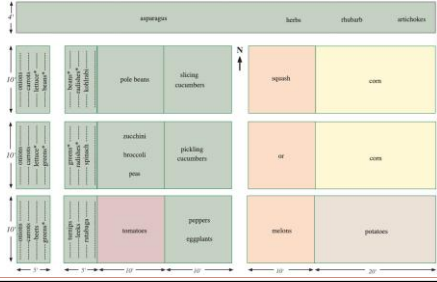
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Crop Rotation



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What might a crop rotation look like?



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Intercropping and Undersowing



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Sanitation



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Easy as 1-2-3, sanitize between pruning and crops!

- Sanitize using alcohol or bleach solution
- Sanitize between fields, orchards or prunings
- When working in diseased crops, it may be prudent to sanitize between plants
- Tools include your boots!



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Reduce Pest Habitat



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What is pest habitat?



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Physical controls

- Prevent Infestations
- Row covers
- Barrier or bait crops
- Bird netting or sound deterrents
- Use water to remove small infestations
- Remove diseased or infested material
- Pick off the bugs!



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Lets try
that
again



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Bait or trap crops

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Hand Picking: it can be a lot of work!

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Biological controls

- Using biological organisms to control pests
- Parasites
- Predators
- Pathogens

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Approaches to bio-control


- Conservation
- Augmentation
- Importation

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How can I conserve natural enemies in my garden?

Garden-scaping

- Habitat conservation and creation
- Modify cultural practices if needed
- Planting beneficials to attract natural predators
- Chemical choice and timing



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Garden-scaping

- Parking lots are not good habitat for beneficial insects
- When preparing a garden, think about the surrounding area
- What can be done to increase beneficial habitat?







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Creating habitat for beneficials

- Don't fall into the trap of Chocolate box ecology
- Consider timing of available nectar and pollen from plants, does it line up with when pests are present?
- Think about your predators, are they present when the pest is?
- Look for insectary plants



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 Tickseed	 Yarrow	 Pincushion flower
		

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What about the little guys?

- Spiders and beetles are beneficial too!
- Create ground covers
- Mulch or live plants are both good to give these beneficial insects some protection



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Bugs need water too!

- If you are using overhead irrigation, you are good to go
- If not, you can spritz water on your plants in the morning
- Fountains and other sources of moving water are great
- Do not leave stagnant pools of water in your garden



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Question!

- What habitat do you have in your garden for beneficials?
- What can you do to improve habitat for beneficials?



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Cultural modifications

- If it doesn't need to be pulled, consider keeping it
- Reduce tillage to a minimum
- Keep living roots in the ground
- Keep overwintering habitat (be careful with this one)



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Biological control

- Research before you implement
- Native biological controls-encourage habitats
- Some programs exist to implement new species
- Some controls available to purchase



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Approaches to bio-control

- Conservation
- Augmentation
- Importation



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Augmentation

- Supplemental biological control
- Mass production of a control species
- Usually repeated use of species
- Often used to target slow moving species like mites

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Augmentative practices

- Bacteria
- Fungi
- Viruses
- Nematodes
- Parasites
- Predators



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Augmentative pesticides



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Augmentation example

- Two Spotted Spider Mite
- Serious pest in the PNW on hops, strawberries, pears, apples
- Neoseiulus fallacis is a commercially available mite species that will prey on two spotted spider mites
- Can overwinter in Oregon



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Augmentation

- Mass production of treatment species
- Parasitic controls are pest-specific
- Need more predators than prey
- Boom and bust- When they prey species run out, the controls can die-off or leave
- Meant to have an acute effect
- More effective when pest densities are lower

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Approaches to bio-control

- Conservation
- Augmentation
- Importation

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Importation (Classical biological control)

- Classical biological control is the importation of natural enemies for release and permanent establishment in a new region
- Sometimes its best to bring the predator to the pest
- Pest's country of origin is determined
- Natural enemy is determined
- Put in quarantine and studied to determine effectiveness, other species targeted
- Permit is obtained and then species is bred

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Importation Example

- *Trioxys pallidus*, the Filbert Aphid Wasp
- Introduced in Oregon by OSU in the 1980's
- Has helped to keep aphids under economic thresholds in Oregon since



Photo credit: Heather Andrus

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Importation

- Raised in insectaries
- Long term control or suppression
- Boom and bust cycles for pest-specific species
- Tested to make sure they only feed on intended species



UGA0023040

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Importation

- Requires multiple releases over several growing seasons
- Requires population build up
- Can be intolerant to insecticide sprays
- Wind, heavy rains, and other environmental factors can change effectiveness

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Should you import bugs to your garden?

- Depends!
- Long-term populations have needs
- Habitat
- Prey
- Space that is not treated with pesticides



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Chemical controls

- The label is the law: **READ BEFORE YOU APPLY**
- Choose the appropriate chemical for the pest- check the PNW Handbook for recommendations
- Talk to your local extension agent before you apply



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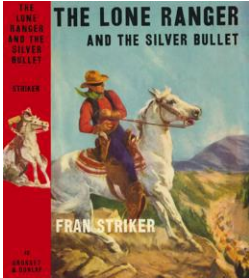
Why should I care about pesticides?

- A pesticide may be the best or only choice
- Pesticides can be used to avoid worse problems
- Making informed management choices
- Knowing how handle and dispose of pesticides safely increases efficacy and decreases mystery around pesticides



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Misconceptions of pesticides



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What is a pesticide?

US Environmental Protection Agency definition

A pesticide is:

- Any substance or mixture of substances intended for preventing, destroying, repelling, or mitigating any pest.
- Any substance or mixture of substances intended for use as a plant regulator, defoliant, or desiccant.

Federal Insecticide, Fungicide and Rodenticide Act (FIFRA) of 1947

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Ready-to-Use vs. Concentrate

Pesticides that are pre-mixed or packaged in containers that double as applicators.



- Fewer steps
- No measuring and mixing
- Less chance of mistakes

Pesticides that must be measured and mixed by user

- Better for larger areas



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<p style="text-align: center;">Organic</p> <ul style="list-style-type: none"> • Derived from an organic source • Biodegrades rapidly • Varying levels of toxicity <p>3 Classes</p> <ul style="list-style-type: none"> • Botanicals <ul style="list-style-type: none"> • Pyrethrum • Neem™ • Microbials <ul style="list-style-type: none"> • Bt sprays • Naturalytes <ul style="list-style-type: none"> • Spinosad™  <p style="color: red; margin-left: 100px;">Neem Oil</p>	<p style="text-align: center;">vs. Synthetic</p> <ul style="list-style-type: none"> • Manufactured via chemical reactions • May persist in environment  <p style="text-align: center;">Synthetic Pyrethroid</p>
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Broad Spectrum Pesticides

- Kill a wide range of pests (and beneficials)
 - Organophosphates
 - Carbamates
 - Pyrethroids
 - Neonicotinoids



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Narrow Spectrum Pesticides

- Requires Ingestion of Product
 - Dipel Dust, Thuricide Concentrate = caterpillar
 - Mosquito Dunks, Mosquito Bits = flies
 - Cyd-X = Codling Moth



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Minimizing Negatives of Pesticides

- Choose narrow over broad-spectrum insecticides.
- Spot treat, rather than broadcast a pesticide.
- Always read the label, follow directions and do not apply more than is recommended.
- Wear protective clothing and eyewear.
- Dispose of unwanted pesticides and empty containers properly.
- Use the appropriate timing when spraying

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Mating Disruptors

- Disrupts mating signals for pests
- Releases pheromones that deter males typically
- Works better in large areas



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Before Using Pesticides

- IPM steps review:
 - Scout your plants
 - Identify the problem
 - Establish an injury threshold
 - Evaluate appropriate management steps
 - Manage using all available strategies
 - Cultural control
 - Physical control
 - Biological control
 - Chemical control
 (In this order!)



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Case Scenario #1: Aphids



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Case Scenario #2: Powdery Mildew



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Case Scenario #3: Field Bindweed



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Thank you

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