Tree Fruit IPM

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Overview

- Defining IPM
- A brief history of pest management in agriculture
- The birth of IPM
- The philosophy of IPM
- Components of an IPM plan in Tree Fruit

What is Integrated Pest Management?

- IPM is an ecological approach for managing multiple pests with a variety of strategies to reduce pest damage to tolerable levels.
  - Principles of IPM apply to both conventional and organic production systems.
- The goal of IPM is to create an unfavorable environment for the pest while maximizing favorable conditions for the crop.
  - The level of pest and disease damage your market will bear, will impact the strategies you employ, but most consumers expect worm and blemish-free fruit.

A brief history of pest management

- Management of pests in crops began when people started to cultivate plants as crops to increase yield, quality, and profitability.
  - Early cultural practices to reduce pests included crop rotation, burning crop residues, tillage, and hand-removal of pests.
  - Some of these strategies were labor intensive.

A brief history of pest management

- The first pesticides contained copper, sulfur, lead, organic salts, antimony, and arsenic, and included botanical compounds such as nicotine and pyrethrum.
  - Many of these early materials were quite toxic to humans and expensive.
  - Equipment to safely handle and effectively apply pesticides came much later.

A brief history of pest management

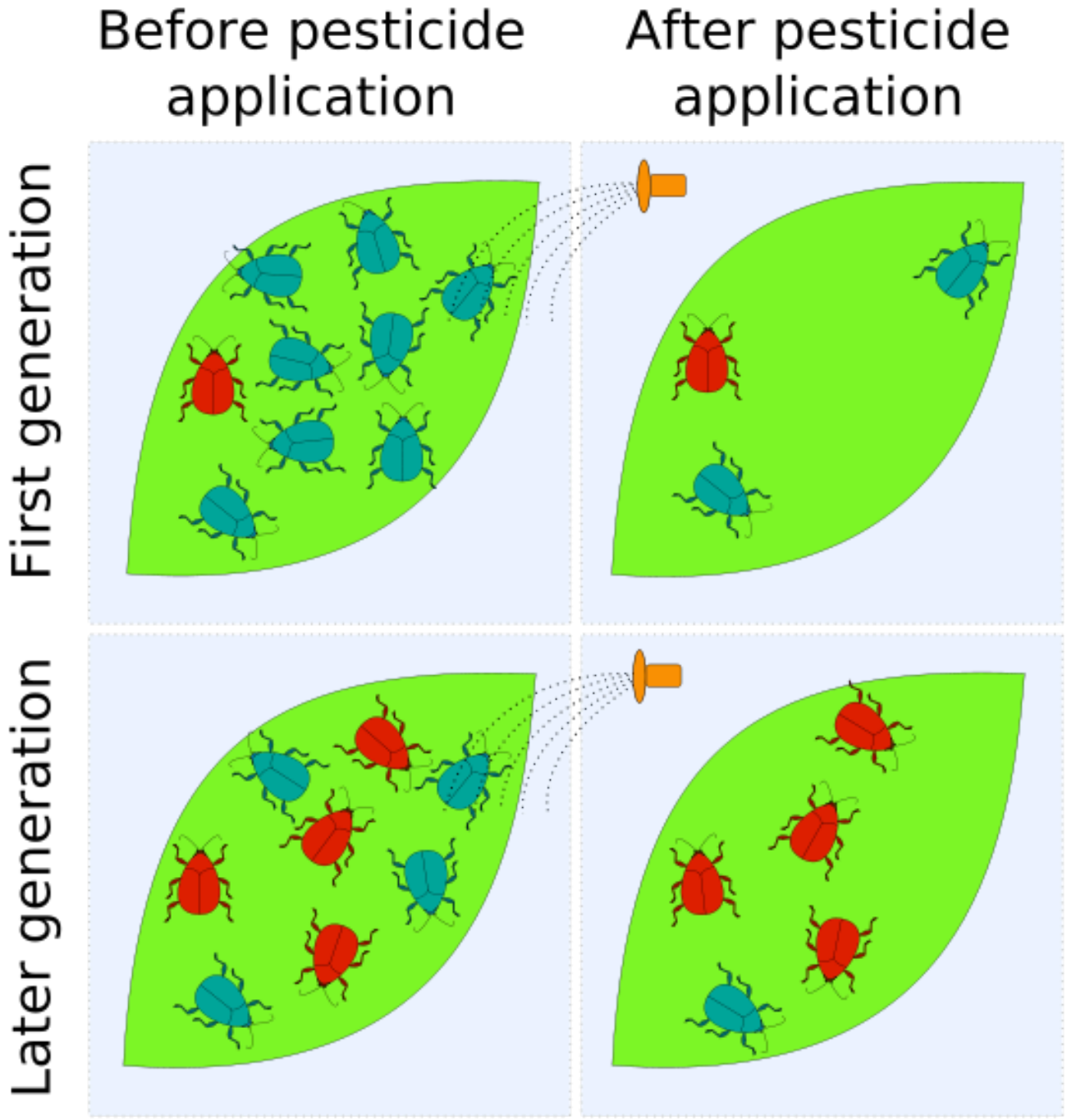
- Following WWII, synthetic pesticides and advances in application technology had a profound impact on pest control practices.
  - Broad spectrum, persistent, effective, cheap, requiring little labor to apply.
  - Use of these materials paralleled the growing mechanization of farming practices and a decrease in the number of people involved in farming.
  - Pest control became synonymous with pesticide use.

Pest management history cont.

- Widespread reliance on pesticides to control pests changed many agronomic practices, including where and how crops could be grown.
  - People were optimistic that pesticides offered the possibility of an essentially pest-free environment.
  - The fact that agricultural systems are embedded within natural systems and rely on and are impacted by natural processes, was often ignored.

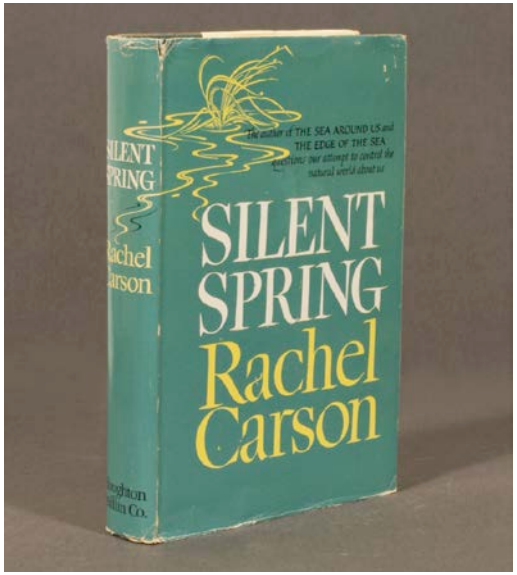
Pest management history cont.

- Heavy reliance on a single pest control method began to limit the usefulness of certain pesticides.
  - Pest resurgences
  - Secondary pest outbreaks
  - Pesticide resistance


Before pesticide application
After pesticide application
First generation
Later generation

Pest management history cont.

- Negative effects on non-targets began to be noticed including concerns about human exposure and environmental damage.



The birth of IPM

- As early as the late 1950s and 1960s, there was renewed interest in ecologically sound pest management strategies.
- Entomologists were the first to begin promoting integrated approaches to counteract insecticide resistance and secondary pest outbreaks by incorporating biological control methods with chemical control.
- Integrated pest management (IPM) has evolved from these early integrated control concepts.

The philosophy of IPM

- Natural control should be maximized, enhanced, and relied upon whenever possible.
- Pesticides should be used only when the population of a pest reaches a threshold level that causes economically significant damage and where natural controls are not available or effective.
  - This is true whether we are talking about synthetic or naturally derived pesticides.

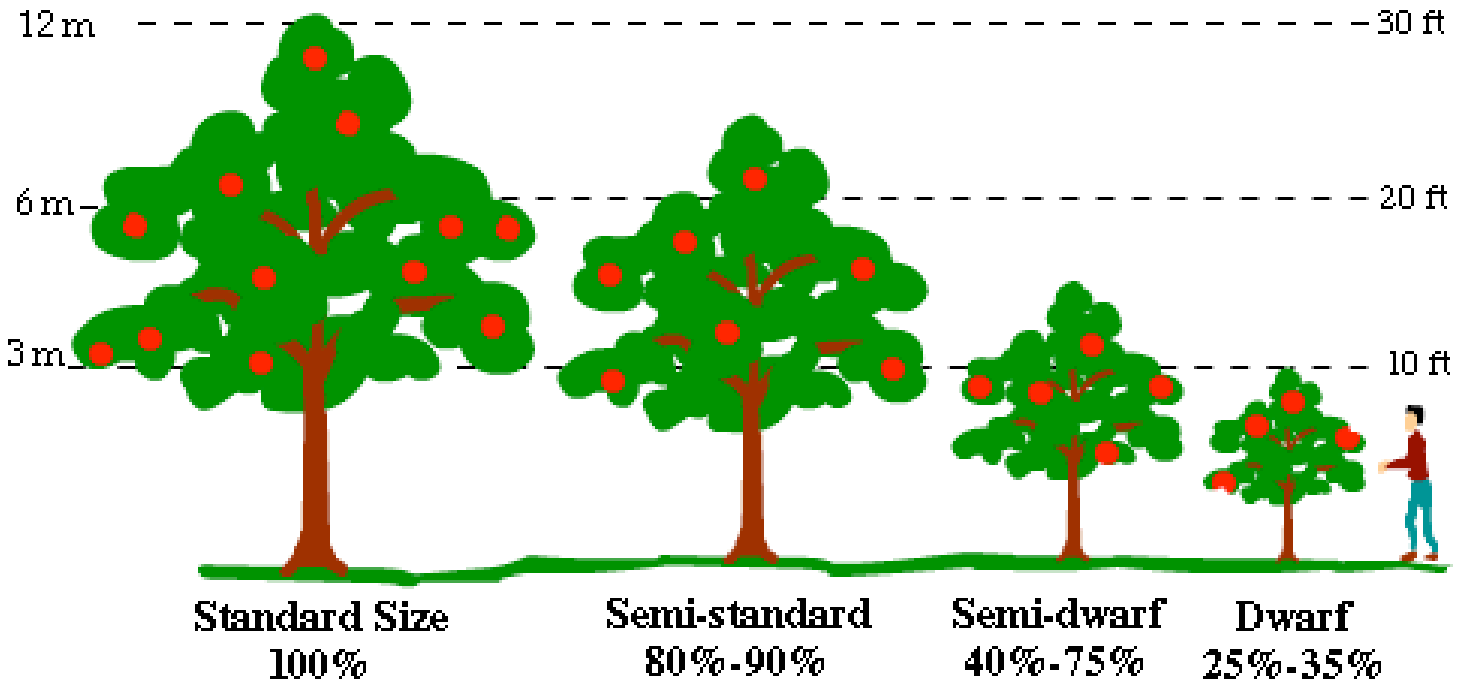
An IPM plan consists of:

1. **Preventing pest problems.**
2. Identifying pests.
3. Monitoring for and estimating pest populations.
4. Having a set of control action guidelines.
5. Combining biological, chemical, cultural, and physical/mechanical tools to manage pests.

1. Preventing pest problems

Set the stage for a successful orchard IPM program.

- Select trees suitable for your local climate; select certified virus-free stock and disease-resistant cultivars when possible.
- Determine which rootstocks match your soils to manage for vigor.


12 m
30 ft
6 m
20 ft
3 m
10 ft
Standard Size
100%
Semi-standard
80%-90%
Semi-dwarf
40%-75%
Dwarf
25%-35%

1. Preventing pest problems

Set the stage for a successful orchard IPM program.

- Use cover crops to build soil fertility and suppress soil-borne pathogens prior to planting.

1. Preventing pest problems

Set the stage for a successful orchard IPM program.

- Select the highest elevations on your property to plant orchards to minimize potential cold damage in low areas.

1. Preventing pest problems

Set the stage for a successful orchard IPM program.

- Install irrigation when you plant your orchard and develop an irrigation plan that suits your soils.

1. Preventing pest problems

Minimize stress to your trees – stressed trees invite pests and pathogens.

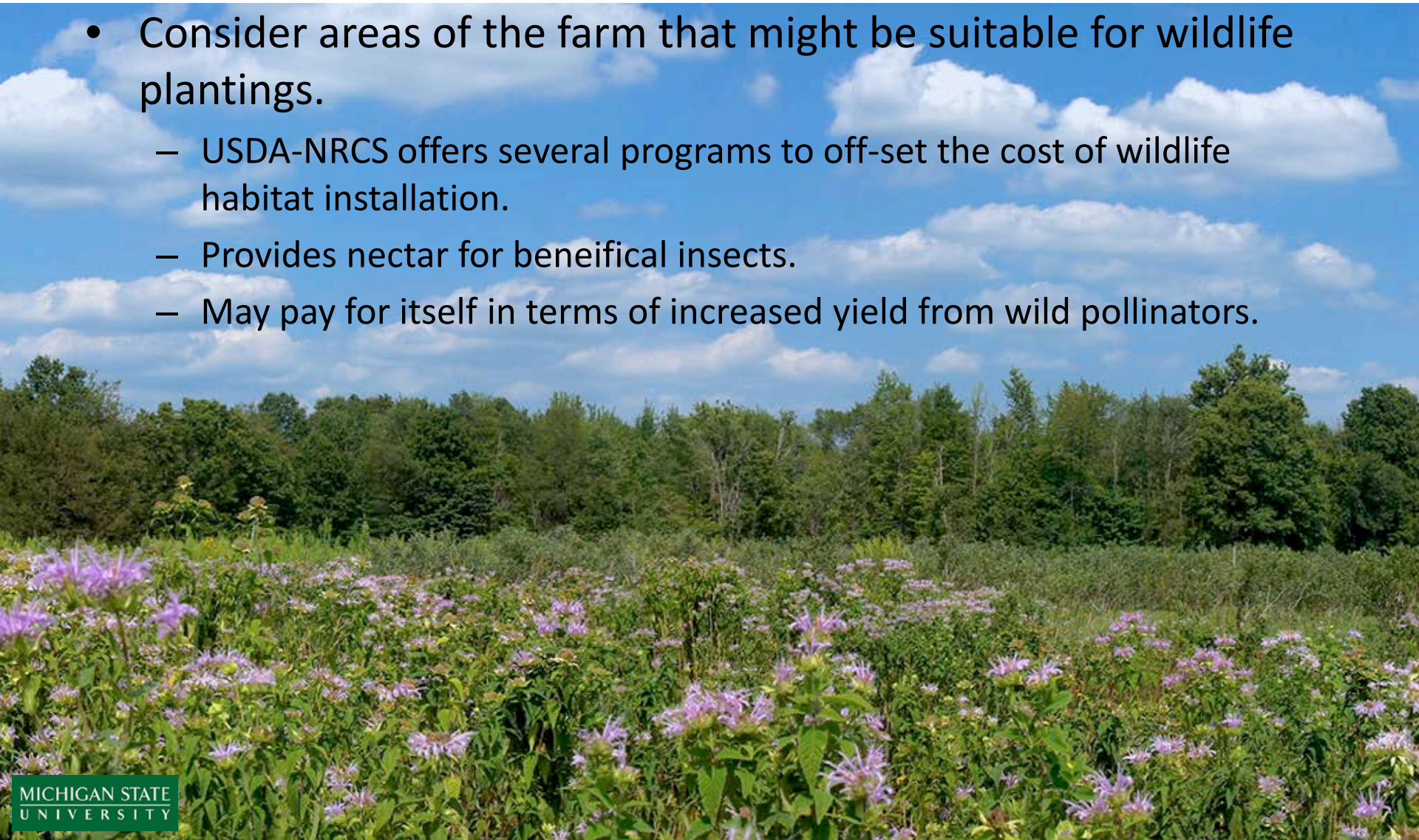
- Water and nutrient management are key to minimizing stressed trees.
- Regular testing of soil and plant tissues for nutrient levels will help catch nutrient deficiencies before they become a problem.

1. Preventing pest problems

Use sensible horticultural practices.

- Select trellis/training systems that fit with the labor you have available.
- Prune trees to open up canopies for better air circulation and better pesticide coverage.
- Prune trees when they will be least vulnerable to disease, so that cuts have time to heal.

Adding Non-crop Flowers



- Consider areas of the farm that might be suitable for wildlife plantings.
  - USDA-NRCS offers several programs to off-set the cost of wildlife habitat installation.
  - Provides nectar for beneifical insects.
  - May pay for itself in terms of increased yield from wild pollinators.

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2. Identifying pests

- Learn to identify key pests and diseases, those that appear every season and must be managed or there will be significant crop loss.
- Know where to get help to identify less common pests and beneficials.

2. Identifying pests

Specific pests and diseases are often associated with or target particular growth stages or plant tissues – knowing when and where trees may be most vulnerable will help with timing management strategies.

- Leaf-feeders vs. fruit-feeders
- Diseases that infect through flowers or wounds (manmade or natural)
- Winter feeding damage by vertebrate pests

An IPM plan consists of:

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2. Identifying pests.
3. **Monitoring and estimating pest populations.**
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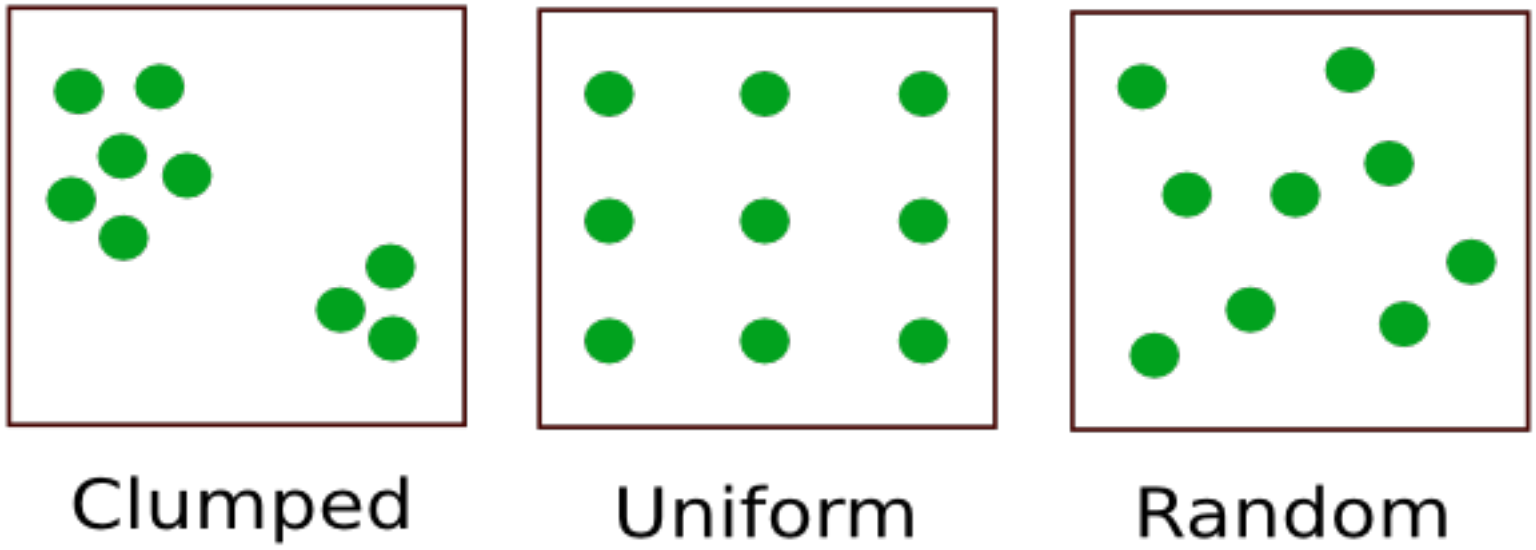
3. Monitoring and estimating pest populations

- For insect pests
  - Populations tend to be clumped in association with resources in the environment.

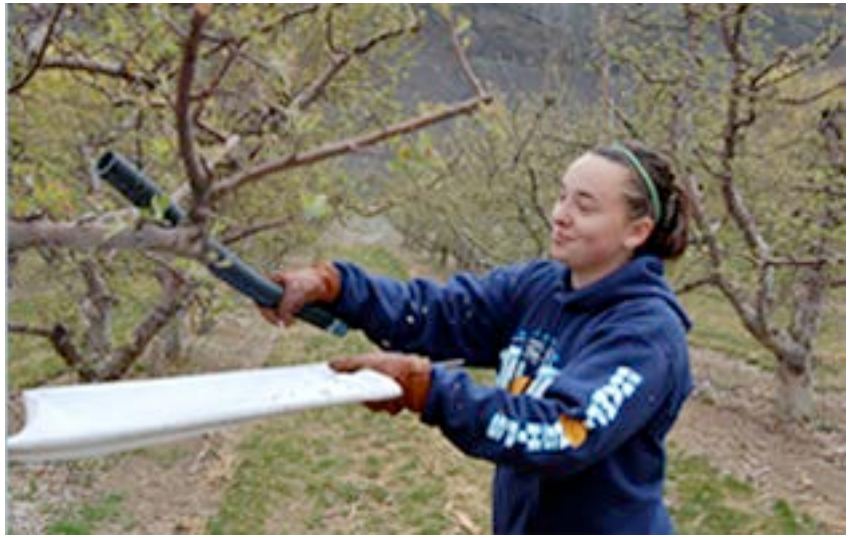


3. Monitoring and estimating pest populations

- For insect pests
  - Edge effects – where pests move into the orchard from an adjacent habitat and stay mainly in the borders of the orchard

3. Monitoring and estimating pest populations

- For insect pests
  - Monitoring is used to set biofixes for some pest models, or to provide triggers for management based on a threshold number of individuals captured or observed.



3. Monitoring and estimating pest populations

- For diseases
  - Looking for signs/symptoms
  - Knowing which plant growth stages are most vulnerable
  - Air column samples – if available

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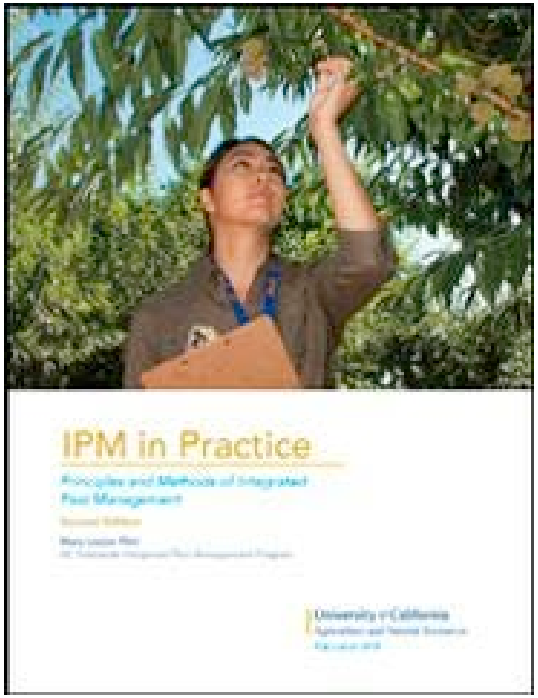
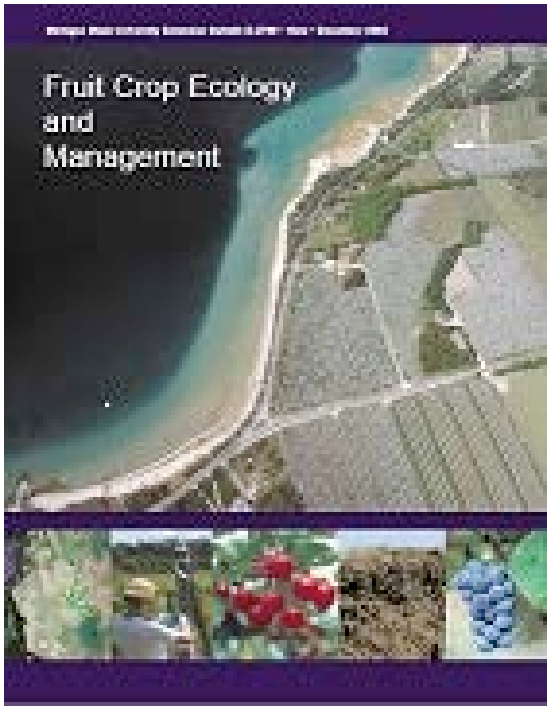
4. **Having a set of control action guidelines.**
5. **Combining biological, chemical, cultural, and physical/mechanical tools to manage pests.**

4. Having a set of control action guidelines

- What tools are at your disposal; when and how will you use them?





5. Combining biological, chemical, cultural, and physical/mechanical tools to manage pests

- Select the best tools and learn how to use them:
  - Use pest and disease prediction models available for your crop to guide management decisions.
  - Biological – beneficial insects/mites, microbes
    - Select chemical tools that are least likely to disrupting beneficial insects (e.g. parasitoids, lacewing larvae, ladybeetles) that might be suppressing secondary pests (e.g. aphids and scale insects).
  - Chemical – pesticides, pheromones for mating disruption
    - Minimize pesticide resistance by learning how to alternate pesticides with different modes of action.
  - Cultural methods
    - Trap cropping
    - Cultivation to suppress weeds

Weather-driven models

- Weather variables are used to help predict many pest and disease outbreaks and to time management strategies.
  - Accumulated growing degree days
  - Min/max temperatures
  - Rainfall and leafwetness
  - Humidity
- More on this in the afternoon!

Summary

- IPM principles can be applied to any cropping system in which pests need to be managed.
- Successful Tree Fruit IPM relies on establishing healthy orchards, knowing how and where to look for pests, and what tools are available for guiding management decisions.

Selected Resources