organic apple pest management

1 Organic Apple Pest Management
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2 Not Your Granddad's Orchard...
   - Gone are the days of big trees
   - Old style orchard density: ##
   - Modern density: 400, 600, 1000
   - Orchards over the years...

3 Small is Beautiful....
   - Advantages
     - Bear fruit quicker
     - Easily pruned
     - Easily harvested
     - Produce more fruit/acre
   - Disadvantages
     - More prone to wind damage
     - Prone to vertebrate woes
     - Shorter lifespan = replant problems
     - Aesthetics?

4 Pests of Apples
   - Weeds
     - Important during orchard establishment
   - Pathogens
   - Fungal and Bacterial
   - Insects
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- Too many to list
- However....only a few direct primary
- The Problem with Fruit....
  - High value
  - Consumers expect clean fruit
  - Many direct pests
  - Top down strategies $$$$  
  - Stable ecosystem

5 The first question...
- Where/How do I sell my apples
- Local-Direct vs. Regional
- Fresh market vs. Processing market
- Whole vs. Value added (e.g. juice, crunch packs, cider)

6 The second question...
- How do I know what to do?
- SCOUTING: of ultimate importance in apple PM
- Many, Many pests
- Many are well described
- Use phenological models to guide scouting and PM tactics

7 Weeds: Friend, Enemy, or Neighbor?
- Bare ground = tractor problems, erosion, and nutrient loss
- Row middles NEED good plant cover
- Within row weeds can compete for moisture and nutrients
- Flowering or N fixing plants provide ecosystem services
- Weed Management
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- Weeds may hurt young trees
- Compete for Water and Nutrients
- Weeds are less likely to hurt established trees
- Major effect is competing for top dressed N

**8 Weed Management: Young Trees**
- Site preparation: multiple years of cover crops
- Mulches: Wood, Straw, Synthetic
- Cover crops: "CHOOSE YOUR WEED"

**9 Swiss sandwich system**
- till close to trees
- throw mowing up onto tillage strips

**10 Weed Management: Older Trees**
- Mowing: 2-3 times per season
- Light tillage
- Grazing
- Flaming

**11 Weed Management: Complications**
- Rodents like cover
- Weeds or Mulches
- Girdle Trees and can cause death

**12 Weed Management: Complications**
- Arthropod diversity tied to plant diversity
- NE's and pollinators
- Also some pests: Stinkbugs, Mites, Aphids

**13 Diseases of Apples**
- Two major pathogens: Apple Scab and Fire Blight
- Many minor pathogens: Flyspeck, sooty bloch, blossom blast, powdery mildew, rusts
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14 Apple Scab: Venturia inaequalis
- The most regularly damaging disease in apples
- A fungus with a complex lifecycle
- Minor damage is cosmetic, major damage is not
- Driven by humidity and temperature
- Early season control extremely important

15 Apple Scab
- Primary infection
- Sexual cycle
- Infects leaves
- Secondary infection
- Asexual cycle
- Infects leaves and fruit
- Secondary infection: fruit
- Insert Life Cycle

16 Apple Scab Management: Bottom Up
- Resistant Varieties
- Liberty, Crimson Crisp, ##
- Most effective tactic
- Problem??

17 Apple Scab Management: Bottom Up
- Sanitation: Clean up leaves
- Competitive/antagonistic BC
- Predation by earthworms and other shredders
- Fall fertilizer applications (High N)

18 Apple Scab Management: Top Down
- Copper is the most effective fungicide
- Cannot be used on soils with high Cu
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- Sulfur is also effective
- Bicarbonates not as effective

**19 Apple Scab Management: Top Down**
- Cu and S have broad activity
- Kill beneficial fungi and bacteria
- Kill/Repel Earthworms
- Disrupt predatory mites
- Disrupt other NE's?

**20 Fire Blight: Erwinia amlovora**
- Bacterial pathogen
- Infects shoots, blossoms, wood
- Can rapidly kill trees
- May be carried by pollinators
- Like scab is tied to humidity and temperature conditions

Fire Blight Management
- Bottom Up:
  - Conservation BC
  - Sanitation
- Top Down:
  - Copper
  - Streptomycin
    - Streptomycin: natural extracts allowed...for now
  - Augmentative BC
    - Antagonistic bacteria that can be sprayed or insect vectored

Fire Blight Management: The Future
- Description/conservation of natural BC
- Further development of augmentative BC
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- New resistant varieties