# Organic IPM for Insect Pests in Vegetable Systems

**Ellie Andrews** UCCE Specialty Crops Advisor - Sonoma, Marin, & Napa Counties

UNIVERSITY OF CALIFORNIA
Agriculture and Natural Resources

Pictured here: Singing Frogs Farm, Sebastopol

# Quick Bio

- Bachelor's in Field Ecology (Ohio University)
- Worked on several small-scale certified organic farms: mixed vegetables, greens, cut flowers, culinary herbs & mushrooms, microgreens, etc.




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- Bachelor's in Field Ecology (Ohio University)
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- Master's in Plant Health Management (Ohio State)
- PhD in Horticulture & Agronomy (UC Davis)







# My Role


- Specialty Crops Advisor for Sonoma, Marin, & Napa counties
- Orchard crops, veg crops, etc. –anything other than grapes!

# IPM Framework

- What is a pest?

Cucumber Beetles

Thistle


Field Bindweed

Gopher

# IPM Framework

- What is a pest?
  - An unwanted organism that damages/interferes with plants
  - Weeds, vertebrates, invertebrates, nematodes, pathogens that cause diseases (bacteria, fungus, virus)

Cucumber Beetles

Thistle


Field Bindweed

Gopher

# We Need Active Management

- No management = bad management
  - Example: “Letting nature do it’s thing.”
  - Great for insect pests, plant pathogens, invasive species
  - Bad for the environment: pest reservoirs
  - Bad for your neighbor farmers and vineyards


# We Need Active Management

- No management = bad management
  - Example: “Letting nature do it’s thing.”

*We are part of nature!*

*Doing nothing does a lot.*


Statewide IPM Program

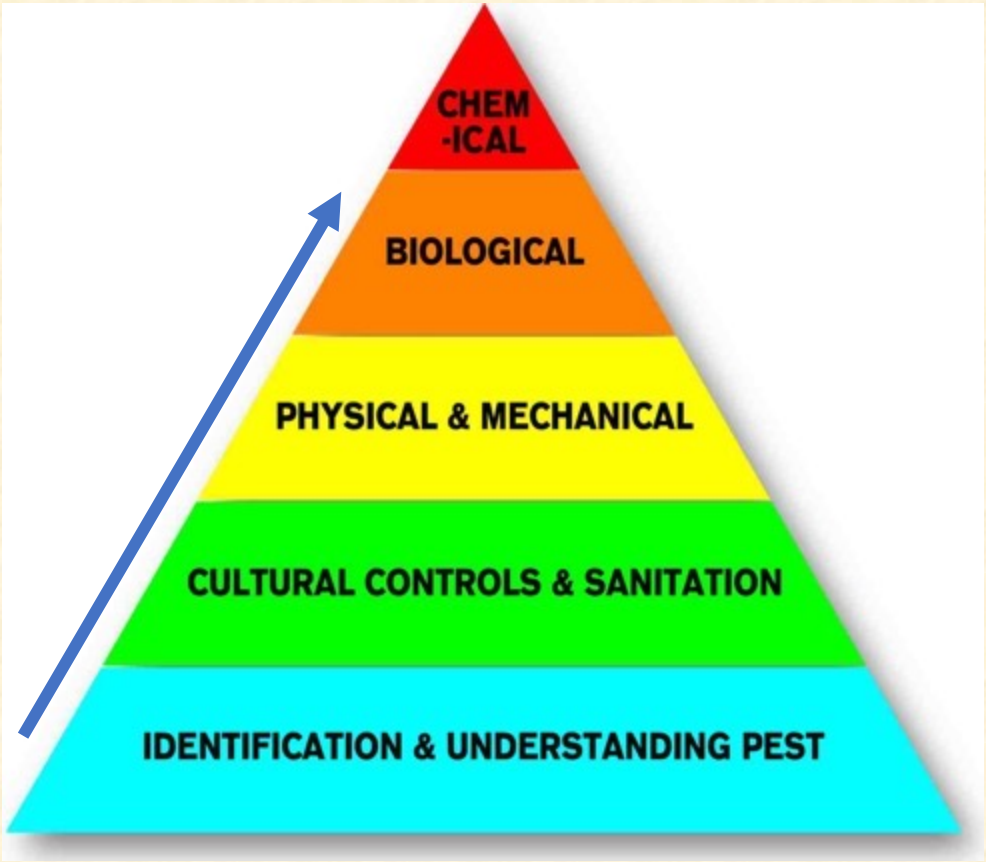
UC IPM

# What Is Integrated Pest Management (IPM)?

Integrated pest management, or IPM, is a process you can use to solve pest problems while minimizing risks to people and the environment. IPM can be used to manage all kinds of pests anywhere–in urban, agricultural, and wildland or natural areas.

# IPM

- A toolbox approach: choose a combination of strategies that makes sense for your unique context
- An ecologically oriented framework
- Focuses on long-term prevention
- Minimize risks to human health, nontarget organisms, & the environment
- Pesticides are used only after monitoring indicates they are needed, using established guidelines



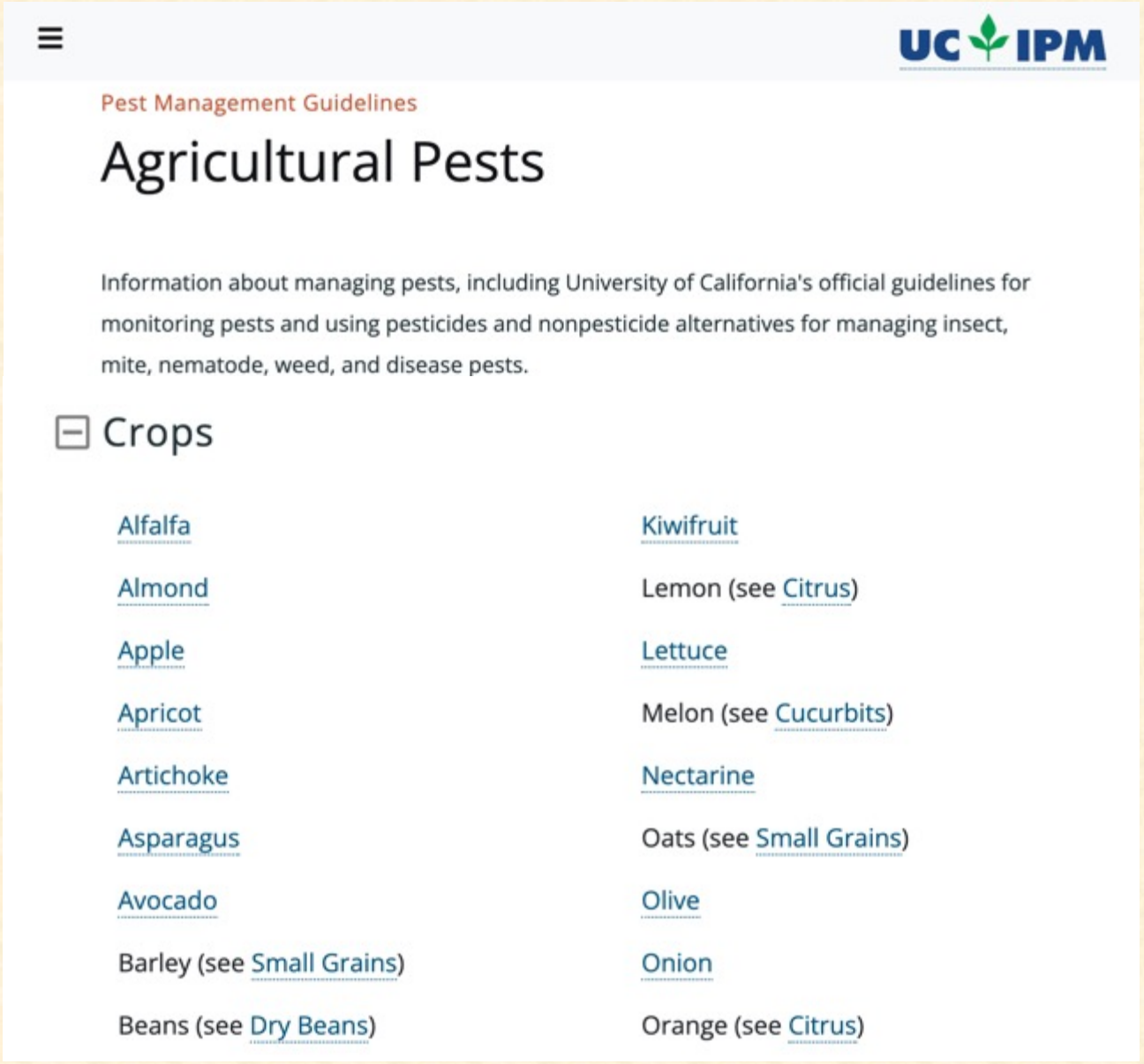

IPM Pyramid (Diagram Credit: Bee Health Guide)

# IPM

- Proactive management helps prevent spread to other plants, neighbors, the region
- An iterative process

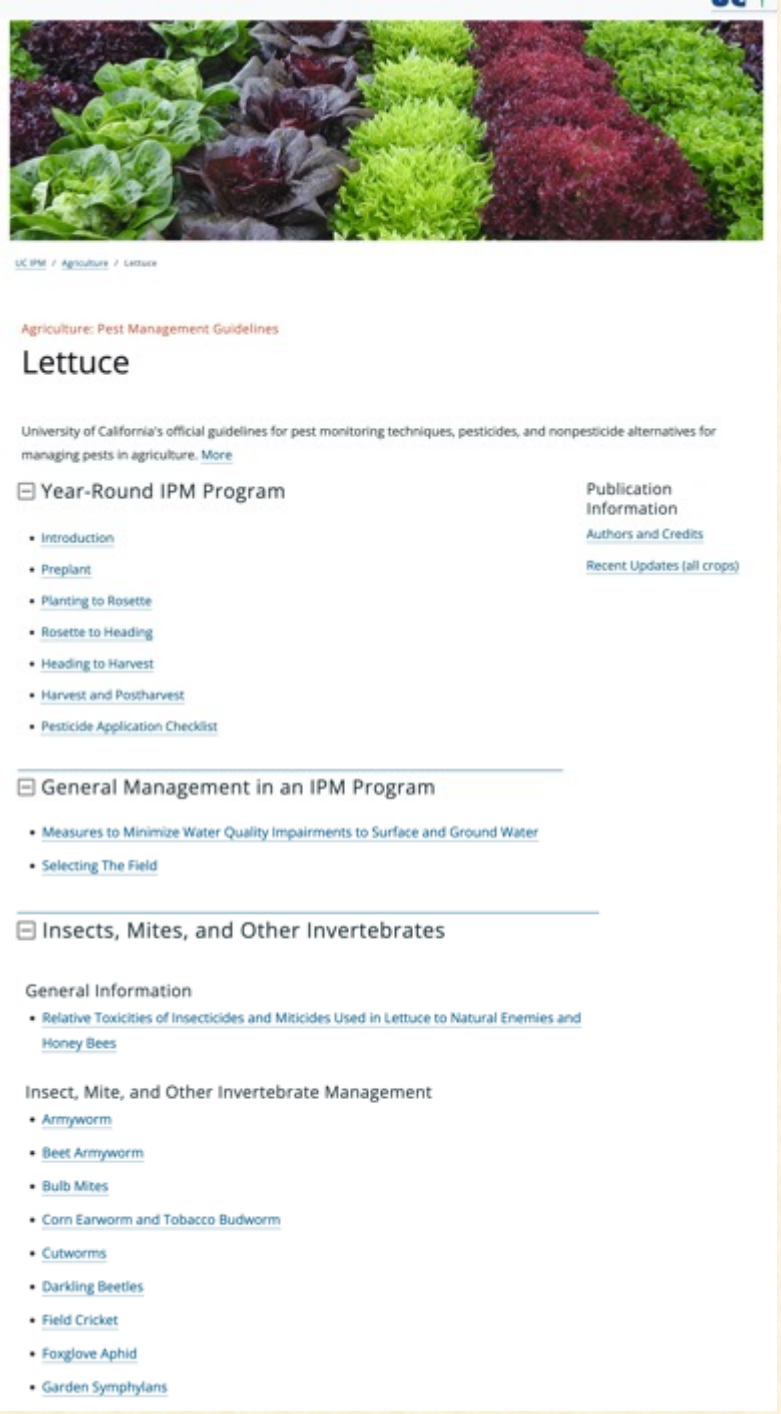

# IPM

- Check out the UC IPM website for resources
- Start with your crop type



# Identification

- ID pest & assess which IPM strategies make sense in your context



# IPM Concepts for Veg Crops

- Prevention thru Selection
  - Find out what pests are common in the area for vegetables you'd like to grow
  - Look for resistant varieties

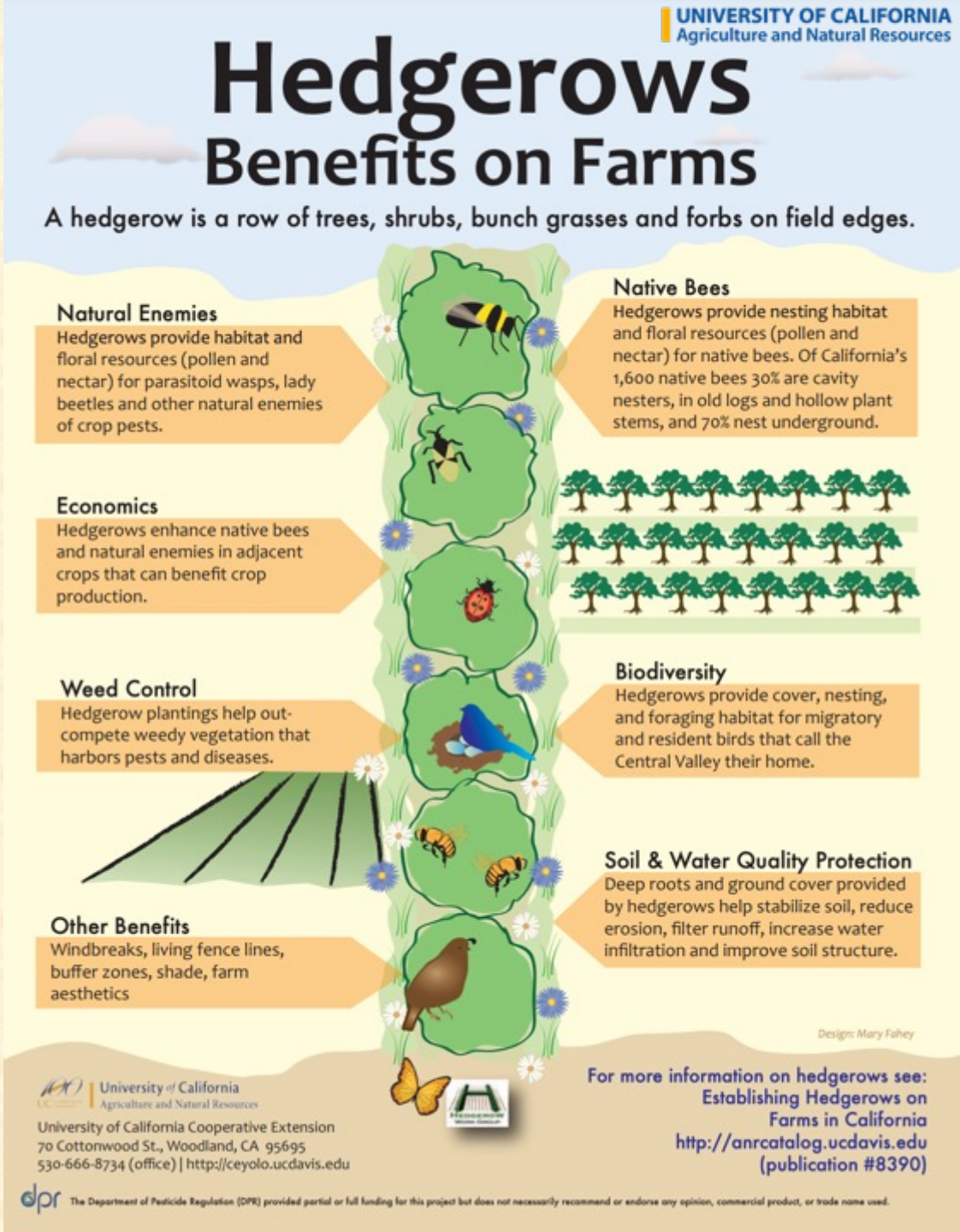
- Cultural Options
  - Disrupt pest habitat
  - Sanitize equipment to minimize spread
  - Shift crop planting location/time
  - Diversion thru trap cropping

- Physical/Mechanical Options
  - Floating row covers to exclude pests
  - Cultivation

Row cover can help exclude insect pests

# General IPM Concepts

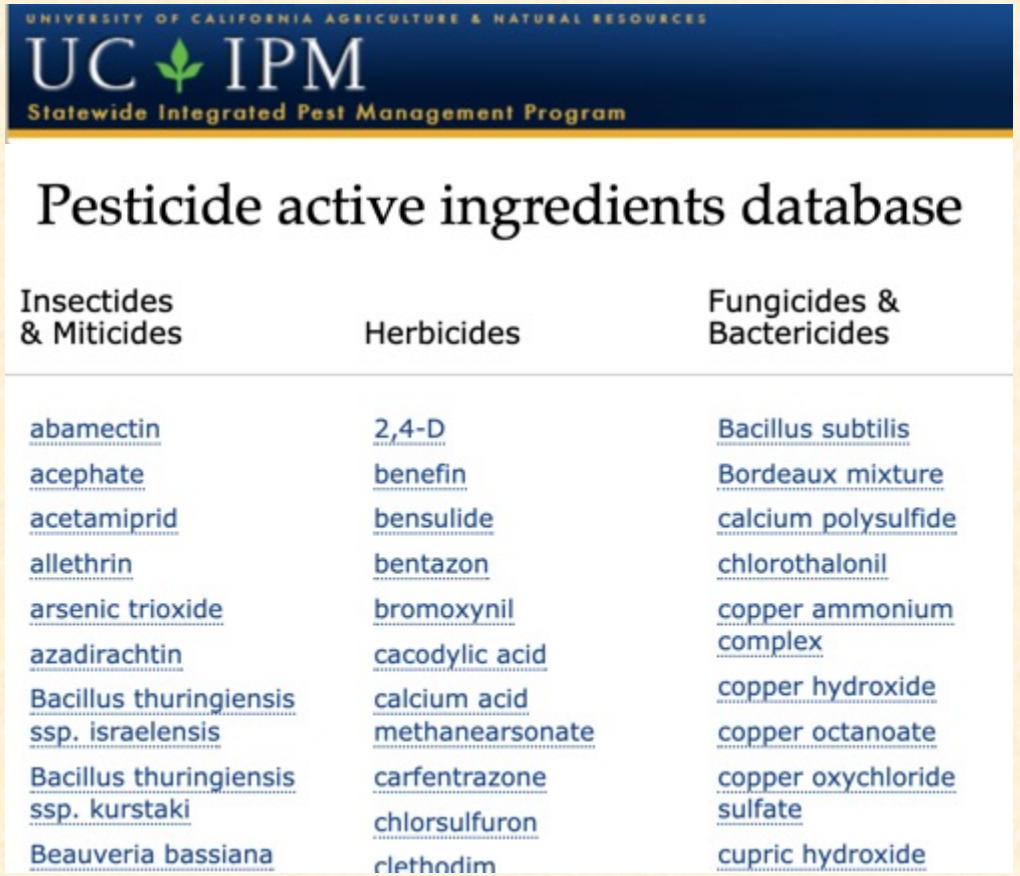
- Biological Options
  - Promoting natural predators of pests thru creating habitat
    - Hedgerows to encourage beneficial insects
    - Raptor perches & owl boxes to encourage rodent predation
    - Etc.



# General IPM Concepts

- Organic Chemical Options
  - Make sure you ID'ed the pest correctly
  - Make sure you've combined multiple other strategies & you're not relying on pesticides alone
  - Look up options for your pest and your crop: UC IPM website, local garden supply store
  - You read the label before you buy to learn more about it

npic NATIONAL PESTICIDE INFORMATION CENTER



# General IPM Concepts

- Organic Chemical Options
  - Look for certified organic (OMRI listed) options
  - Check with your organic certifier before applying
  - Learn strategies for protecting pollinators before applying
  - Always follow label instructions: rate, timing, personal protective equipment (PPE), etc.

# Scale & Goals Matter

- Mid-scale farm IPM can look a bit different than small-scale IPM due to scale & goals
    - For instance, handpicking bugs off plants is often not practical at commercial scales
    - Lower tolerance for blemishes if selling produce fresh
    - Higher tolerance if creating a value-added commercial product that gets processed

Star Route Farm

# Scale & Goals Matter

- Mid-scale farm IPM can look a bit different than small-scale IPM due to scale & goals
    - What works best at your scale? ...for your goals? Lots of different answers!
    - IPM provides a “toolbox” of options for strategies you can tailor to your unique situation

Star Route Farm

# Example: Symphylans

- Start with pest identification
- Understanding the pest's life cycle is important for effective management

# Damage

- They feed on living roots, sprouting seeds, & fungal hyphae

- Feeding damage causes:
  - Root death
  - Gnarled root appearance
  - Corky tissues in older roots
  - Plant stunting
  - Increased susceptibility to soil-borne pathogens

Stunted eggplant due to symphylans damage (left) and undamaged eggplant in the same field (right) (ATTRA)

# Damage

- They cause patchy distribution of stunting symptoms in the field
- Often occur in hotspots: can be several square feet to several acres

(Jon Umble & Jim Leap, ATTRA)

# Timing & Conditions

- Timing: high numbers are often observed in April/May, especially during rainy springs

- Soil moisture:
  - Symphylans tend to occur in heavier soils with high irrigation
  - They may be spread by flooding
  - They are common in alluvial soils in California
  - They tend to congregate in the upper soil layer when conditions are warm & moist

(Jon Umble & Jim Leap, ATTRA)

# Soil Conditions

- Symphylans cause problems in organic systems with:
  - High soil organic matter
  - Plant residue incorporations
  - Non-decomposed organic matter

- Symphylans are more often associated with good soil structure compared to soils that are compacted or sandy

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*Ironically, they could be considered the single pest that is an indicator of good soil management where soil aggregation & soil organic matter are high.*

(-Rex Dufour, ATTRA)

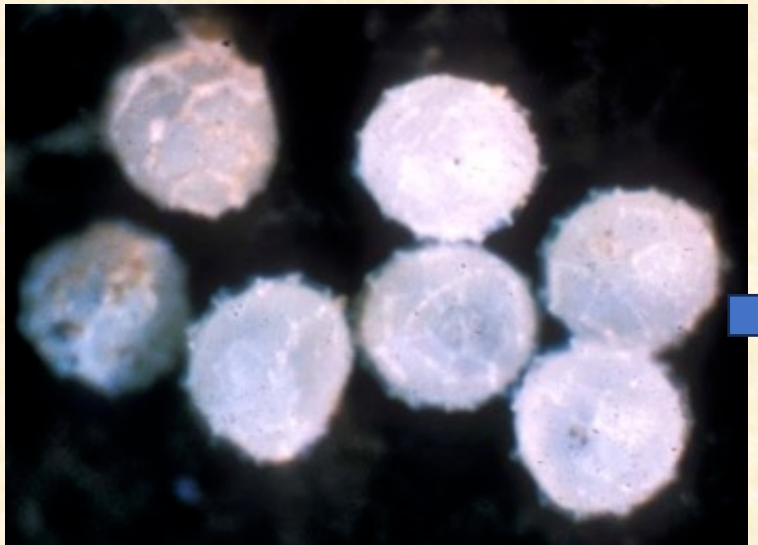
# Symphylans Mobility

- They rely on soil pore spaces made by roots & other organisms to move
- Very vertically mobile in soil profile thru soil pores, cracks & channels
- Need well aggregated soil to move, so sandy soils are less hospitable
- They can be found >3 ft below the soil surface

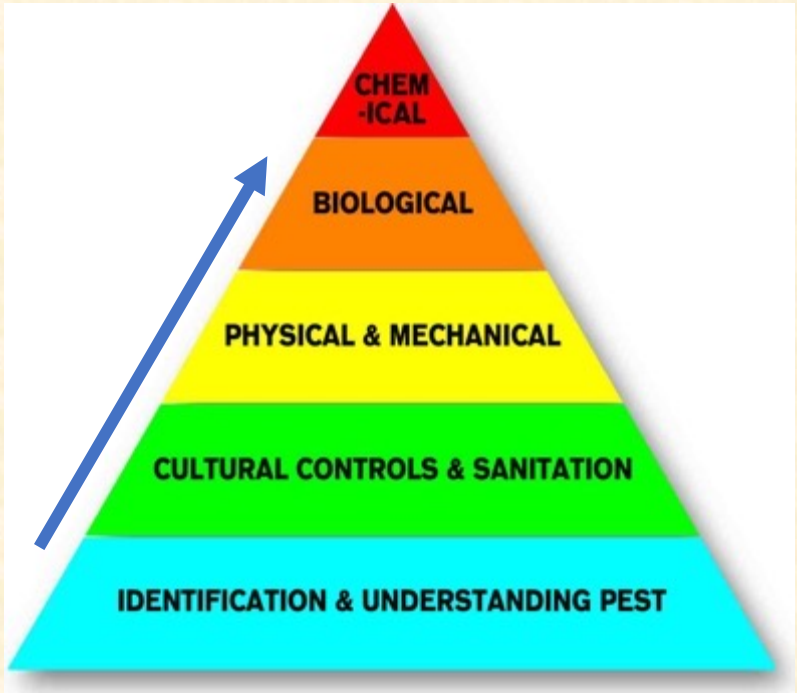
# Symphylans Mobility

- All life stages occur in the soil: they molt in the deeper soil layers & migrate up to the root zone to feed

Symphylans eggs and newly emerged symphylans (first instar) (Ralph Berry, ATTRA)



# IPM "Toolbox" Approach for Symphylans




IPM Pyramid (Diagram Credit: Bee Health Guide)

- Prevention
- Monitoring
- Strategic Tillage
- Mild/Moderate Compaction
- Potato Rotation
- Limiting Undecomposed Residues
- Moderating Organic Matter Inputs
- Transplants
- Overplanting
- Sanitizing Farm Equipment
- Encouraging Natural Predators
- Organic Insecticides & Oil-Based Products

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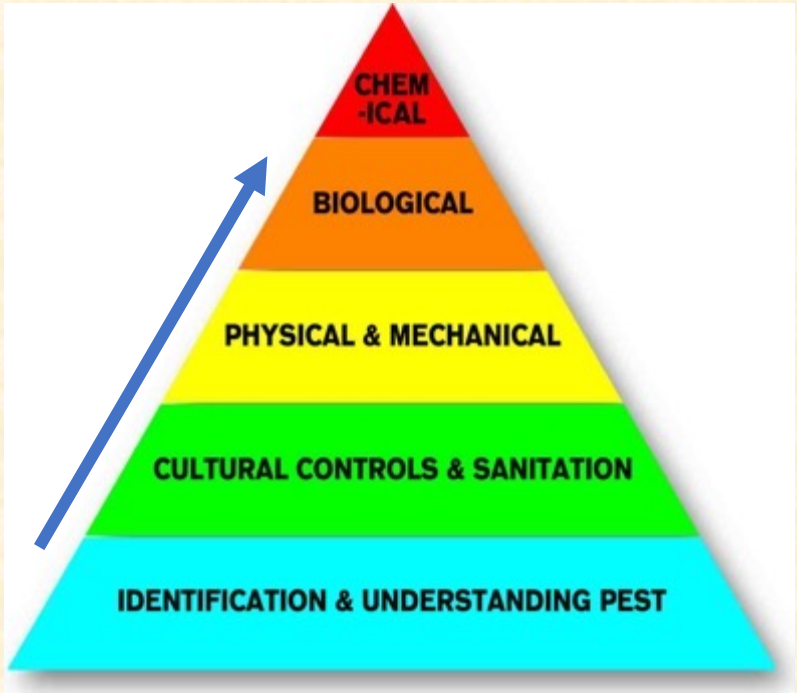


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- Encouraging Natural Predators
- Organic Insecticides & Oil-Based Products

You don't have to do everything! Just choose the strategies that are appropriate for your context and goals.

YouTube

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## Symphylans IPM

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30 subscribers

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# Example: Shao Shan Farm

- Scott Chang-Fleeman shared that the success of the potato rotation may depend on planting timing after potato rotation
- Immediate fall planting after potato harvest led to no problems with symphylans in the following crop
- But waiting to plant until spring might have led to issues

Shao Shan Farm: potatoes growing in a field known to have symphylans (shared with permission)

# Example:
# Shao Shan Farm

- Scott and several other local growers have suggested that intercropping potatoes around other crops could potentially help provide some level of control

- Growers continue to innovate and experiment!

Shao Shan Farm: soybeans growing next to potatoes in a field known to have symphylans

# Example:
# Coyote Family Farm


- See their Instagram post for details
- They needed to plant early brassicas in a bed they new had symphylans – risky!
- Their strategies:
  - Tilled soil with a power harrow
  - Added lime to raise the pH, then planted
  - Then compacted soil by stepping all over the bed
- The plants looked uniform and lush, no stunting!

# Example:
# Coyote Family Farm


*"Intentionally creating* ***extra disturbance and compaction*** *is counter to all we know about good soil management,* ***but in this case*** *it was the right prescription!"*

– Sonya Perrotti (shared with permission)

# Example: Coyote Family Farm

Integrated multiple pest management strategies…

*"Intentionally creating **extra disturbance and compaction** is counter to all we know about good soil management, **but in this case** it was the right prescription!"*

– Sonya Perrotti (shared with permission)

…in a way that effectively reduced pest pressure in a specific farm context!

# Example: Cucumber Beetles

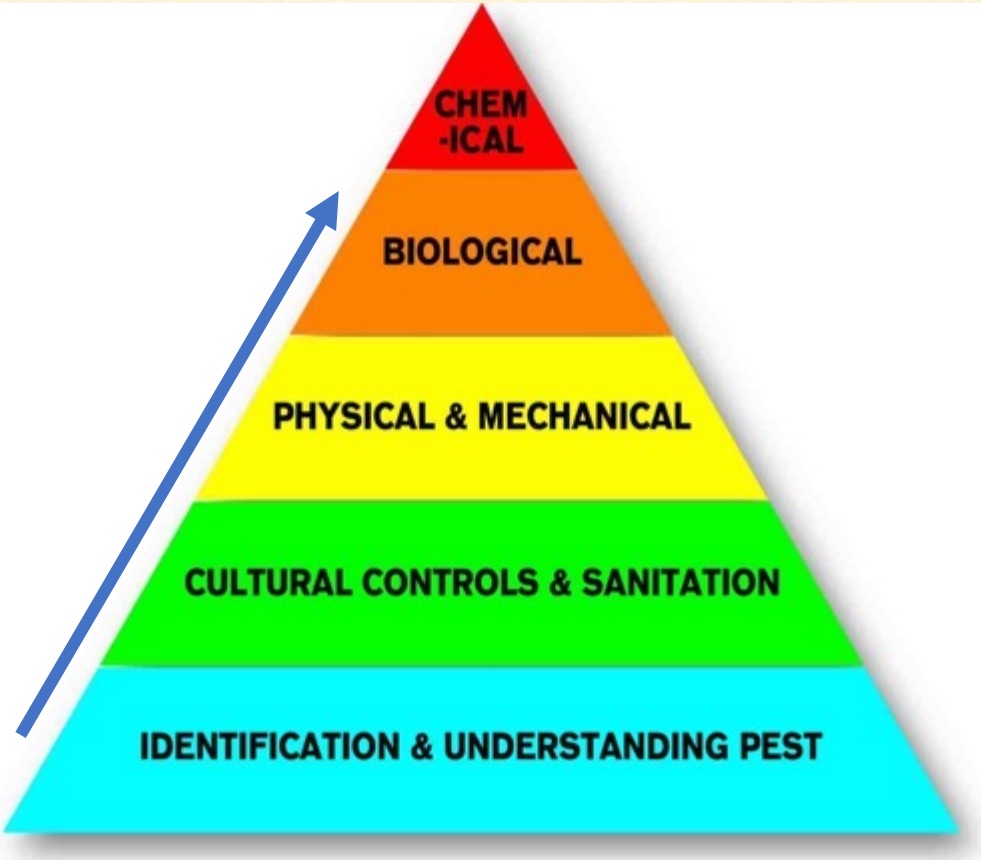
- Start with identification
- Learn about the pest's life cycle

# Cucumber Beetles

- Damage
  - Destroy flowers, leaves, and melons by feeding on them
  - When temperatures are high, adults feed on undersides of young melons, scarring them
  - Larvae can feed on roots
  - Can vector squash mosaic virus and bacterial wilt

# Cucumber Beetles

# IPM "Toolbox" for Cucumber Beetles




IPM Pyramid (Diagram Credit: Bee Health Guide)

- Prevention thru crop & site selection
- Crop rotation out of cucurbits
- Monitoring with appropriate threshold
- Row cover for exclusion
- Transplants to give plants a head start
- Mulches to discourage egg laying around plants
- Trap cropping with Hubbard squash can distract
- Physical deterrent spray with kaolin clay
- Biological & organic insecticide products

# Cucumber Beetle

- Biological and organic insecticides:
  *(mention of product names serve as examples, not endorsements)*
  - Products using beneficial nematodes such as NemaSeek kill the pre-emergent grub stage of cucumber beetles in the soil, so very low risk to pollinator insects
  - There are many organic products: Pyganic, Azera, Spinosad, Beauveria, Bacillus, etc. kill cucumber beetles, but they are riskier when it comes to off-target damage to pollinator insects

# Cucumber Beetle

University of New Hampshire

Extension

## Over-informed on IPM - Episode 025 What cucumber beetles want

**Anna dives deep into what we know about cucumber beetle behavior and chats with Simon Zebulo (UMD Eastern Shore) about how to make the most of that knowledge in organically-produced watermelon.**

THURSDAY, AUGUST 13, 2020

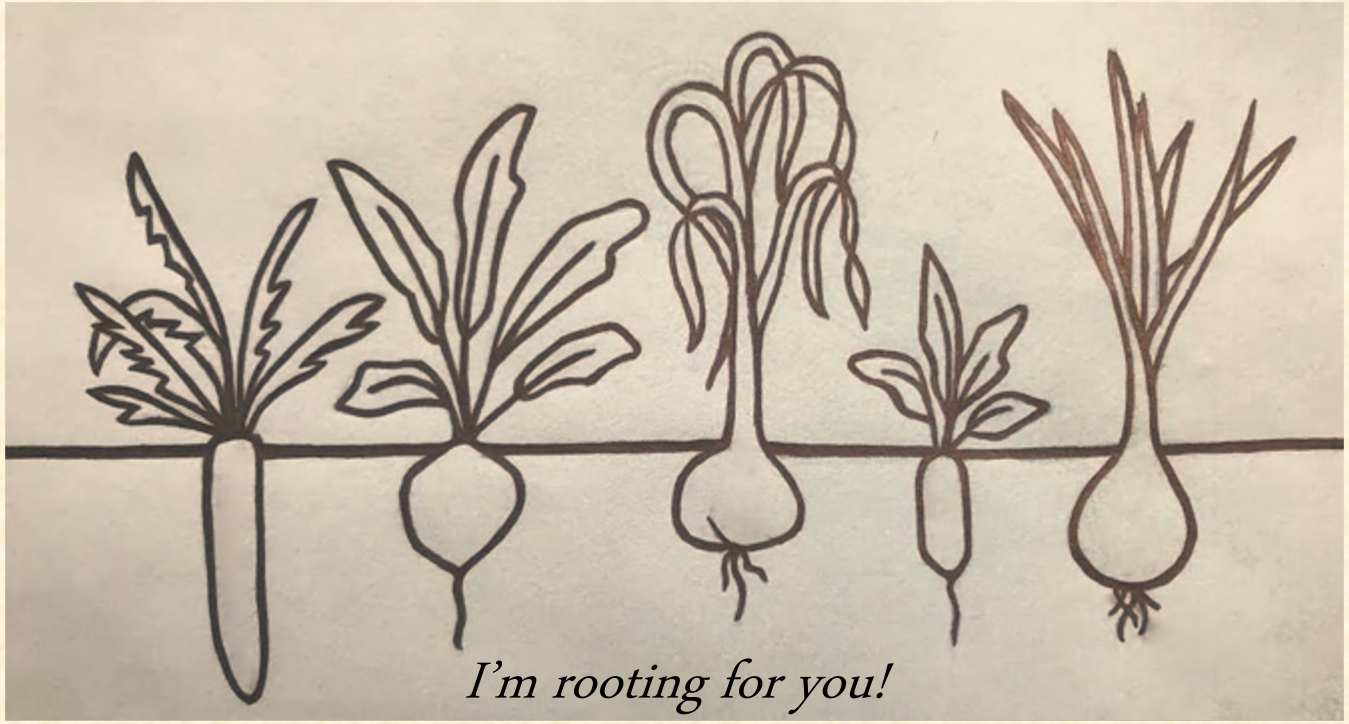
SHARE

# It's a process.

# Thank you!


PEST ID
PREVENTION
MONITORING
CHOOSE OPTIONS
ACTION
EVALUATION
IPM

# Questions?



# References & Resources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