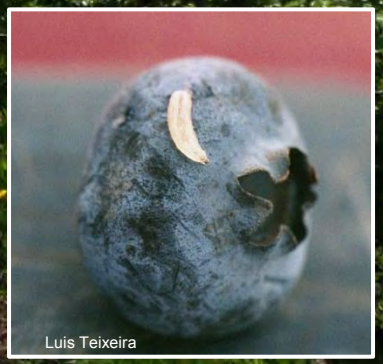
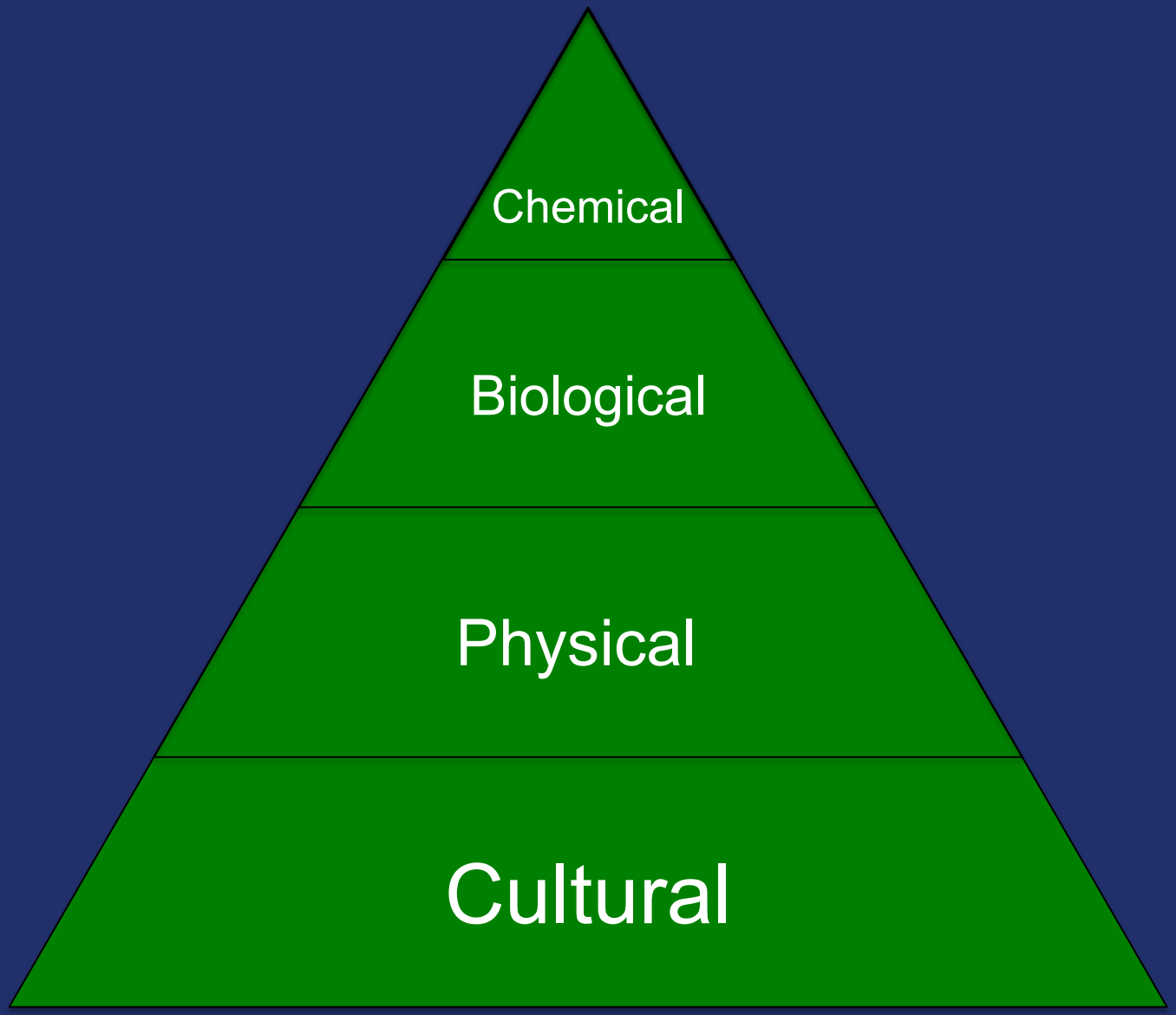
Tactics for Biological Management on Fruit Farms

Nate Walton



Integrated Pest Management



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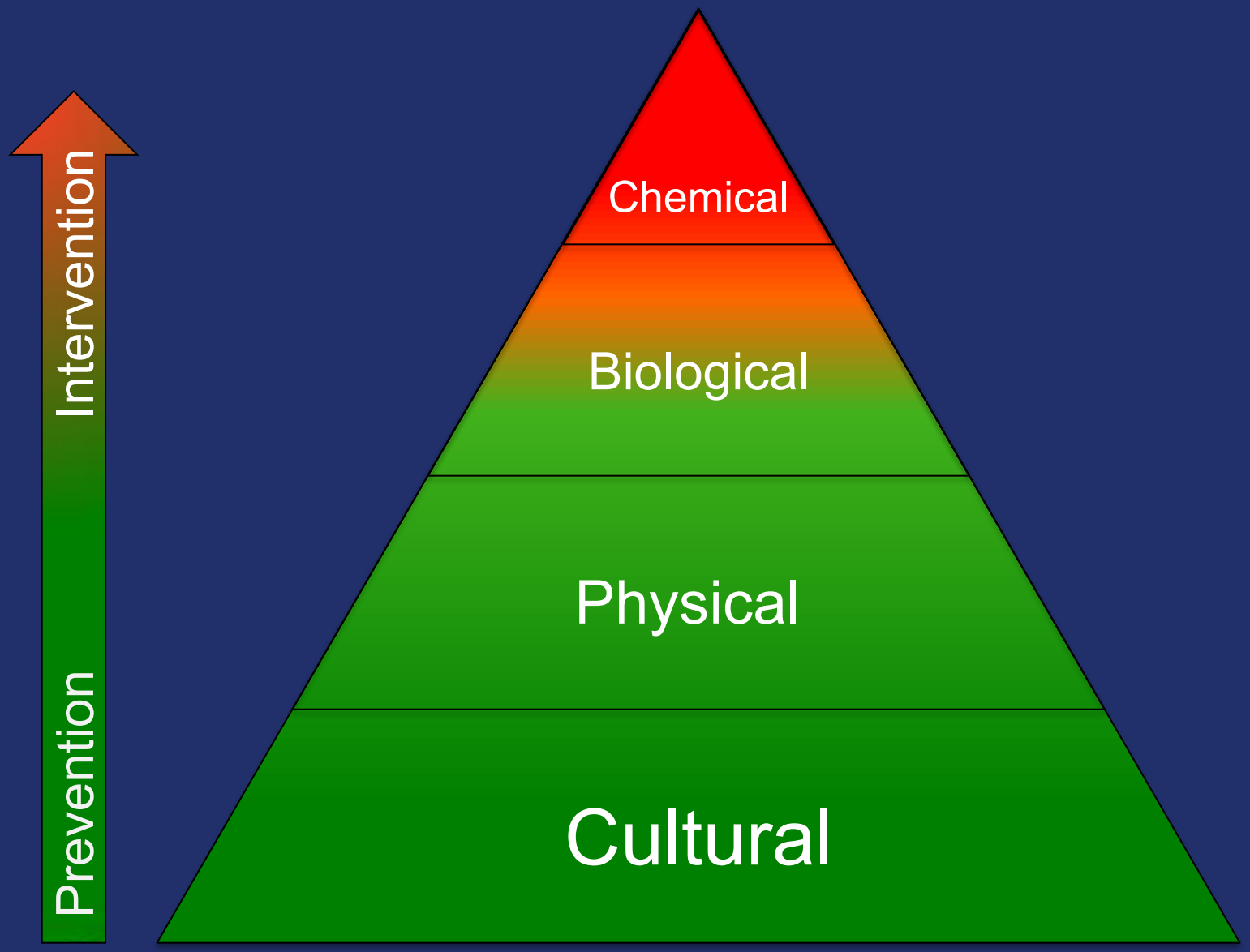
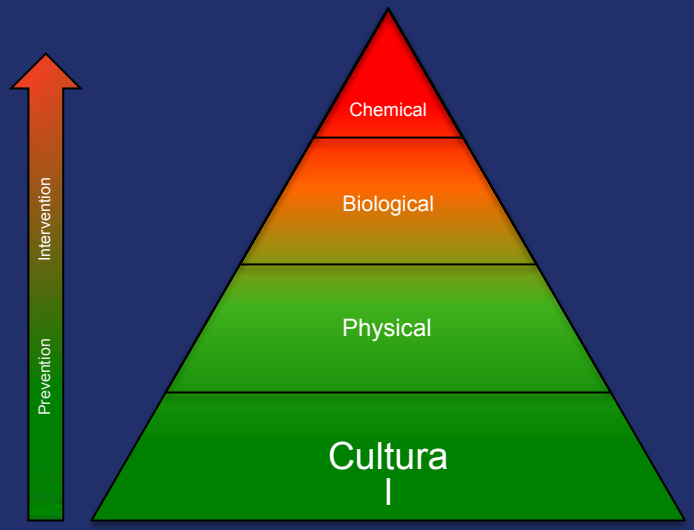


Biological control - use of Natural Enemies

Classical
- importation from other continents

Augmentative
- mass release of natural enemies

Conservation
- enhancing the survival of existing natural enemies



Natural Enemies

– Organisms that help us manage pests –

Natural Enemy Types:

- Predators
- Parasitoids
- Pathogens

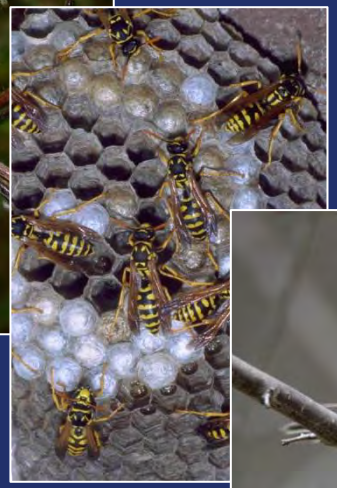
Major Natural Enemies - Predators

Ladybeetles

Ants

Pirate bugs

Spiders



Wasps and Hornets

Birds

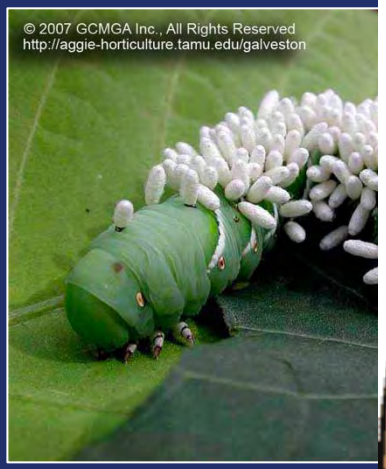
Major Natural Enemies - Predators

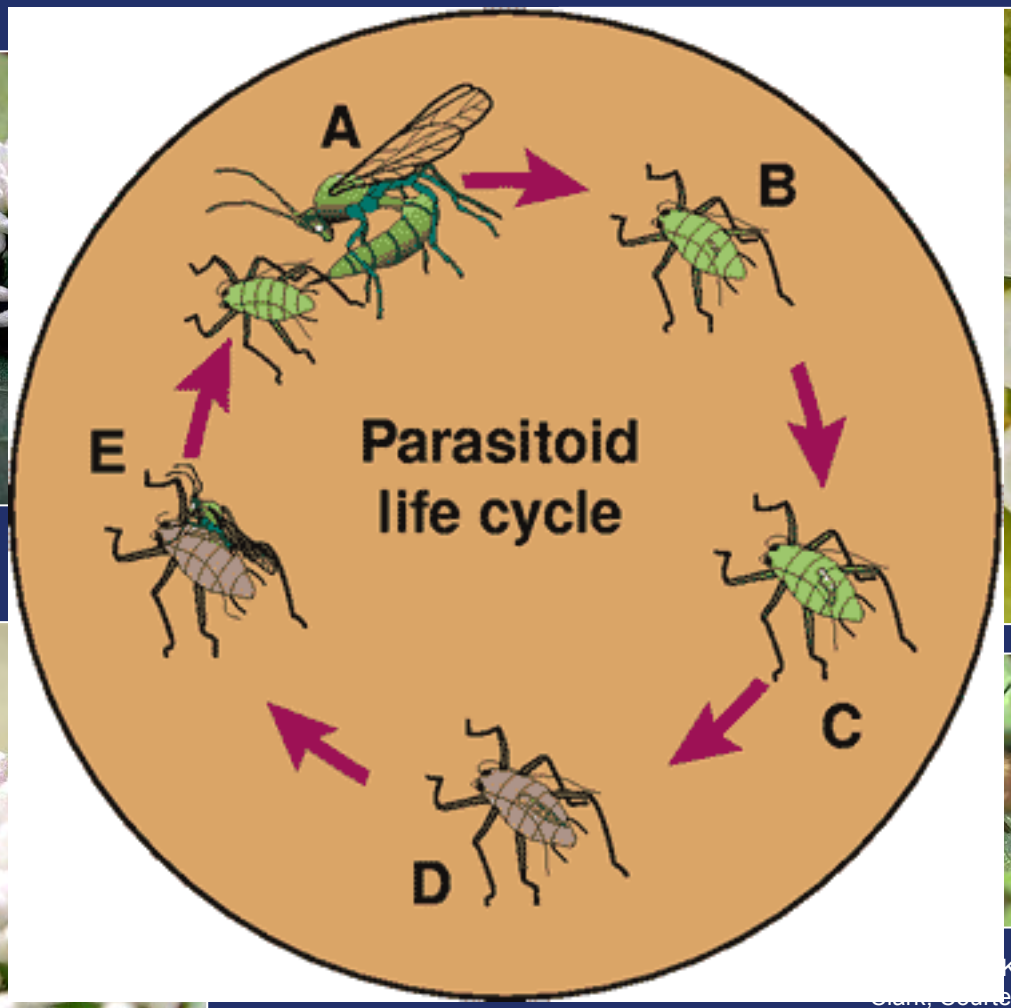
Syrphid Flies

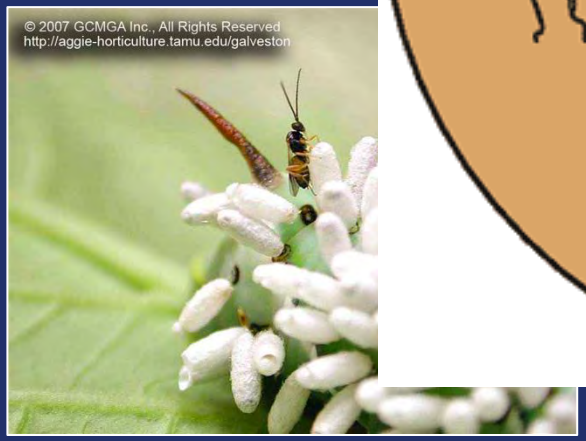
Major Natural Enemies - Predators

Lacewings

Major Natural Enemies - Parasitoids







K.
Clark, courtesy
of University of
California
Statewide IPM
Program

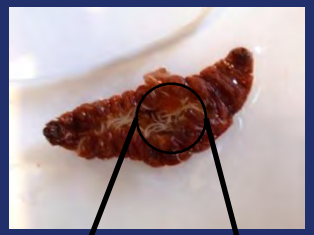
(www.grapes.msu.edu)

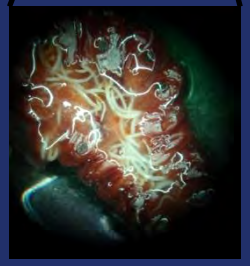
Major Natural Enemies - Pathogens

Bacteria

Fungi

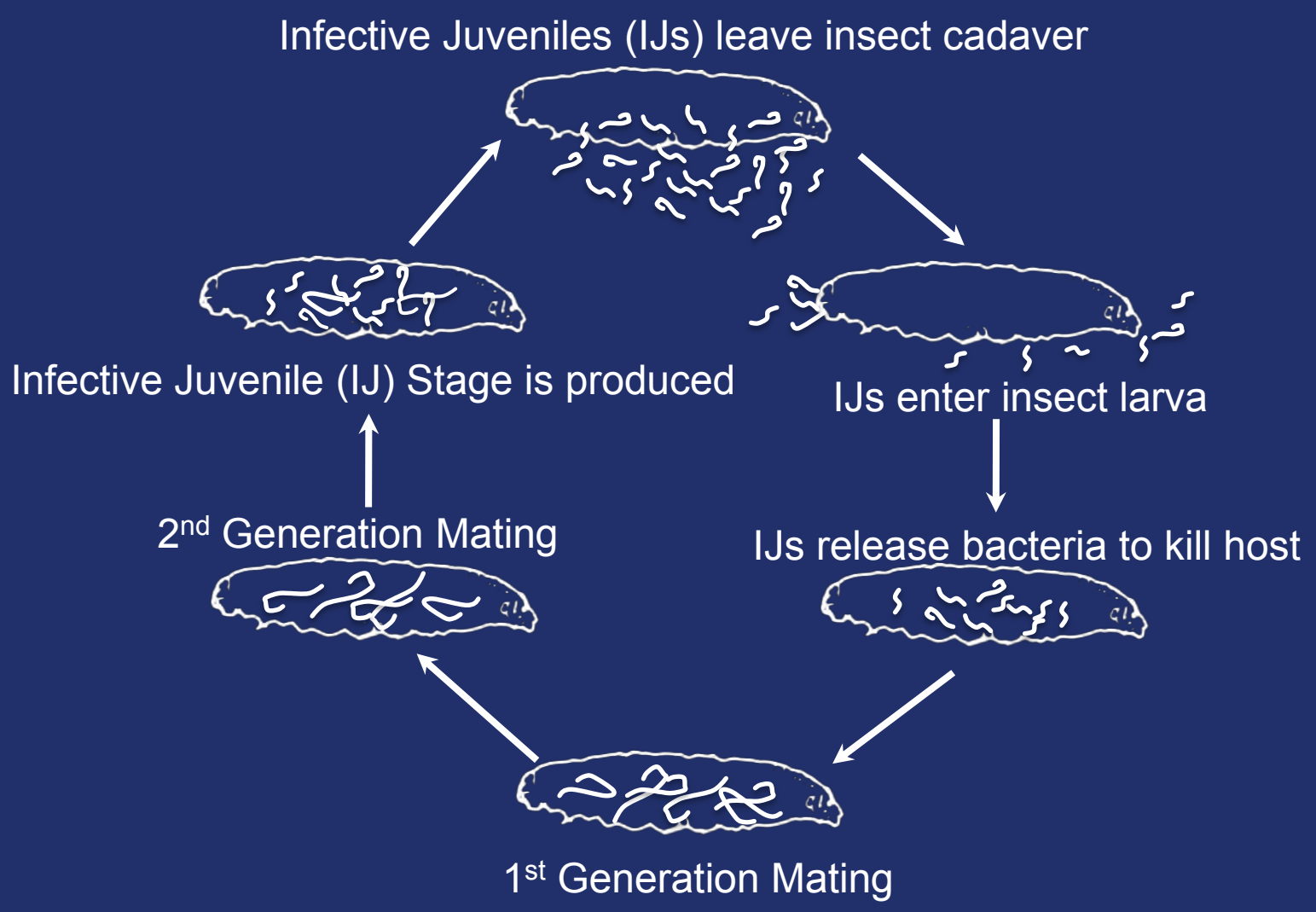
Nematodes





Viruses

Entomopathogenic Nematode (EPN) – Life Cycle



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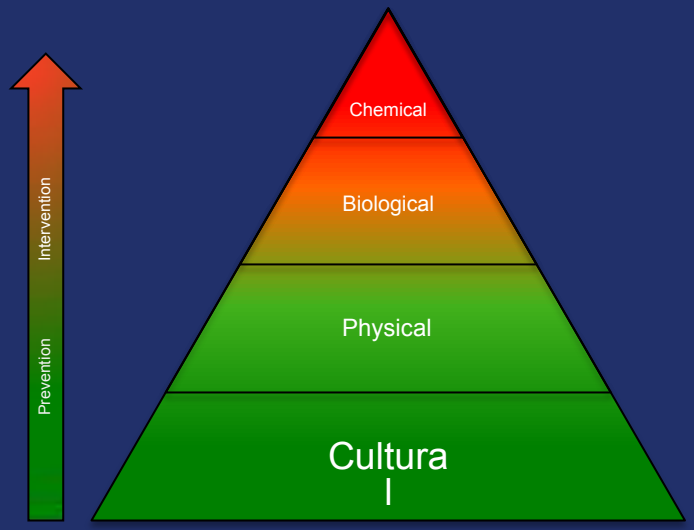
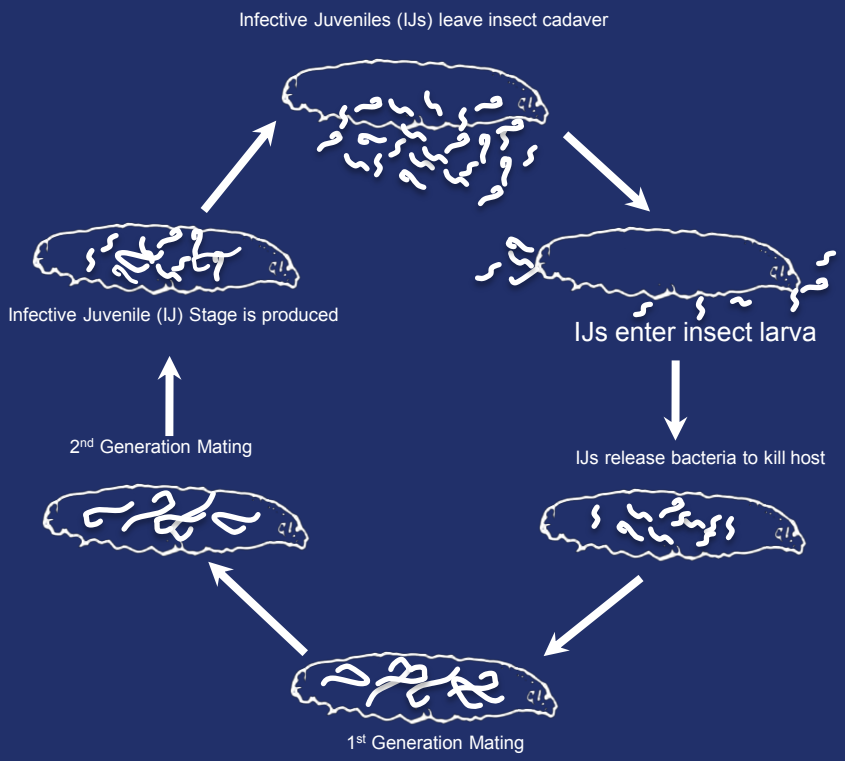


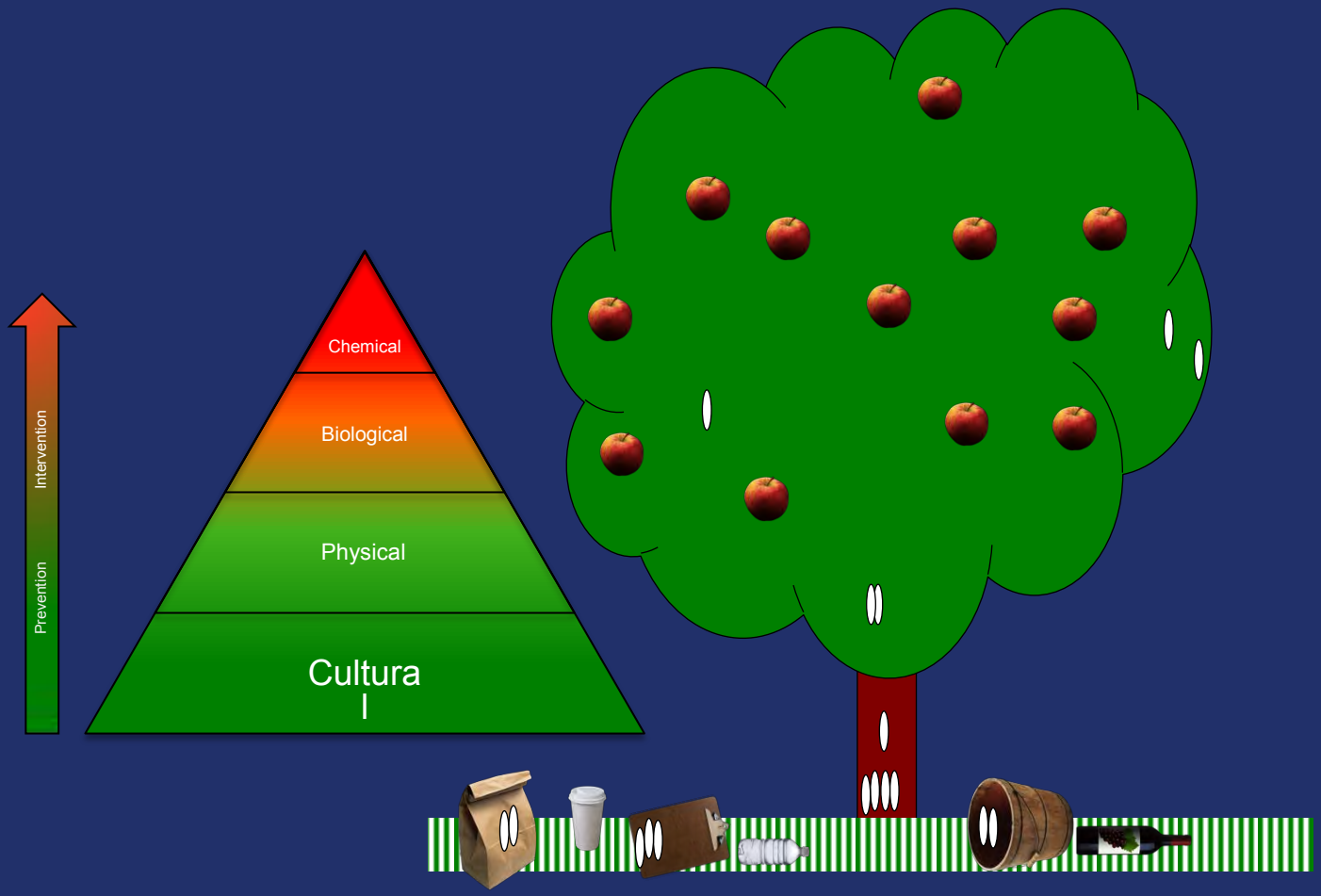
Example: Augmentative Biocontrol



The Codling Moth (*Cydia pomonella* (L.))

- ✧ Very wide host range
- ✧Severe pest in pear, apple, and walnut production
- ✧Economic damage is done by larvae feeding inside fruits
- ✧2-3 generations in Michigan
- ✧Mature caterpillars overwinter in a cocoon

Apple orchard in the Fall



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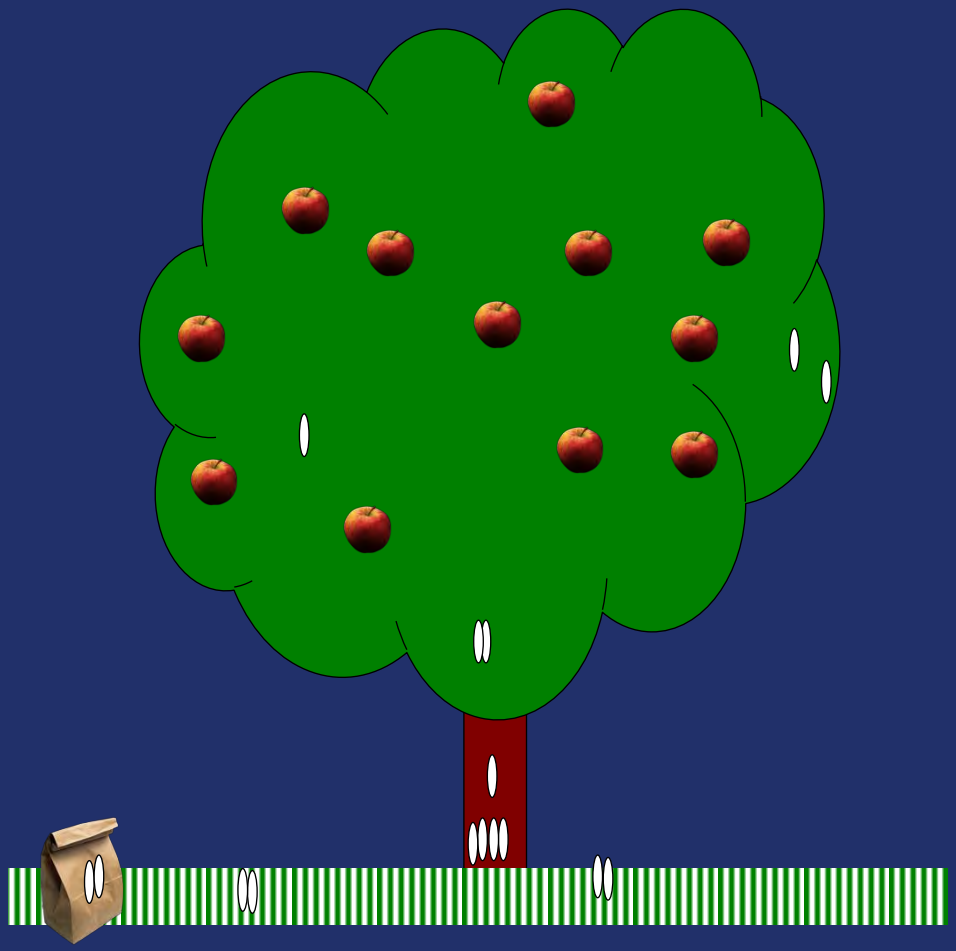


Entomopathogenic Nematodes (EPNs)

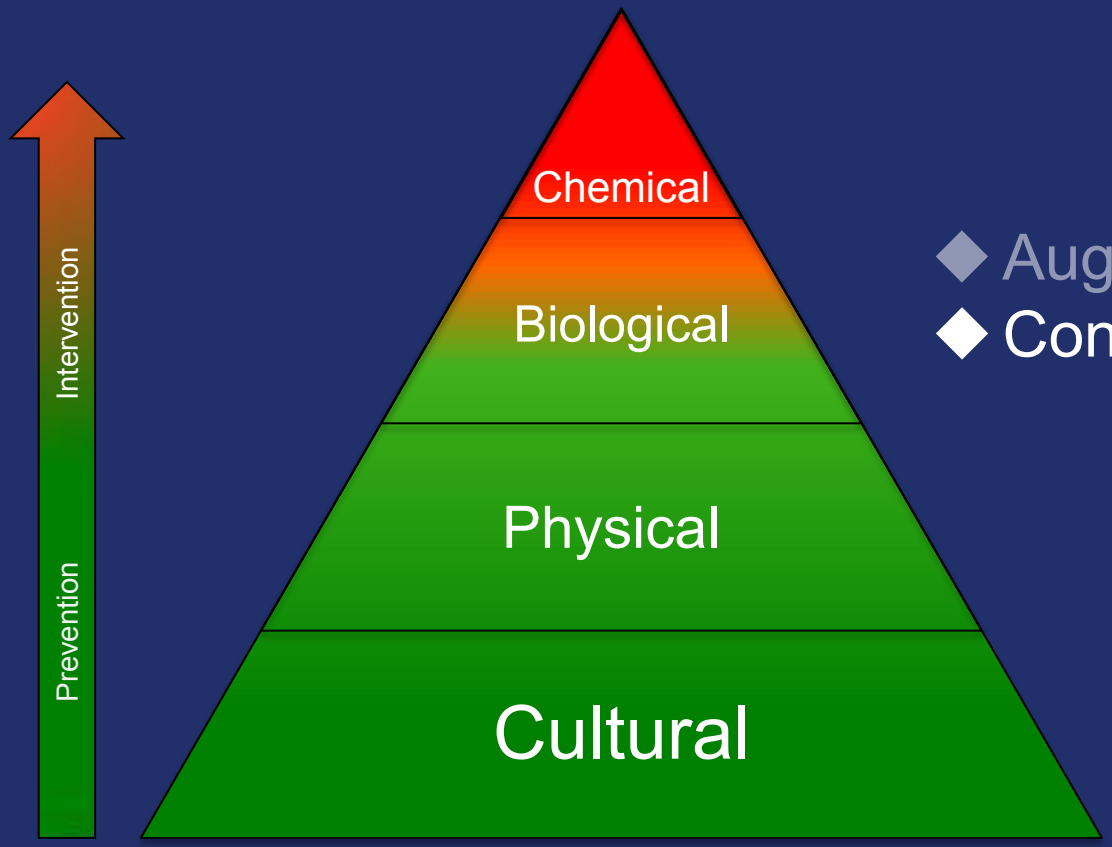
Infective Juveniles (IJs) leave insect cadaver

1st Generation Mating

Using Natural Enemies Augmentatively: Know thy Enemy

- ☑ Behavior
- ☑ Environmental tolerances (e.g. Light, Heat, Humidity)
- ☑ Life Cycle
- ☑ Host specificity

Biological Control



- Augmentative Biocontrol
- Conservation Biocontrol

Conservation Biocontrol: Tactics

- ☑ Withhold Pesticide Application
- ☑ Use Selective Pesticides
- ☑ Habitat and Resource Management

Sample and Monitor

Selective Insecticides:

Insecticides that kill pests and are less harmful to beneficial insects

Selective Insecticides

Spinosyn based (Entrust®, Spintor®, Delegate®, etc)

✧ (Mostly) just kills the insects that eat it

- ✓ Safer for beneficial insects than broad-spectrum insecticides

Insect Growth Regulators (IGRs)

✧ Can be very specific, but not always (do your research!)

- Usually safer for beneficial insects than broad-spectrum insecticides

Bt based

✧ Very specific

- ✓ Safer for beneficial insects than broad-spectrum insecticides

Conservation Biocontrol: Tactics

☑ Withhold Pesticide Application

☑ Use Selective Pesticides

☑ Habitat and Resource Management

Resources for Beneficial Insects: Food and Water

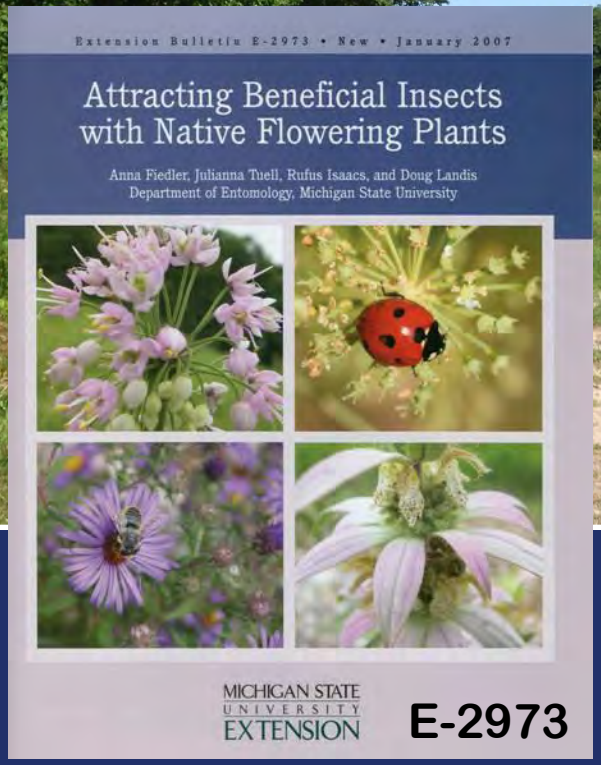
Prey

Pollen and Nectar

Resources for Beneficial Insects: Shelter

- ☑ Tussock forming grasses
- ☑ Mulches
- ☑ Undisturbed areas
- ☑ Nesting boxes

Resources for Beneficial Insects



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Thank You!