Elements of Organic Farming

Pest Insect, & Disease Management

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OKBFRP Horticulture Program, July 2013

Regarding Weeds
Pest Insects & Diseases

- **Well-designed organic systems have higher ecological stability and lower pest pressure overall. "*1000 tiny hammers*"**

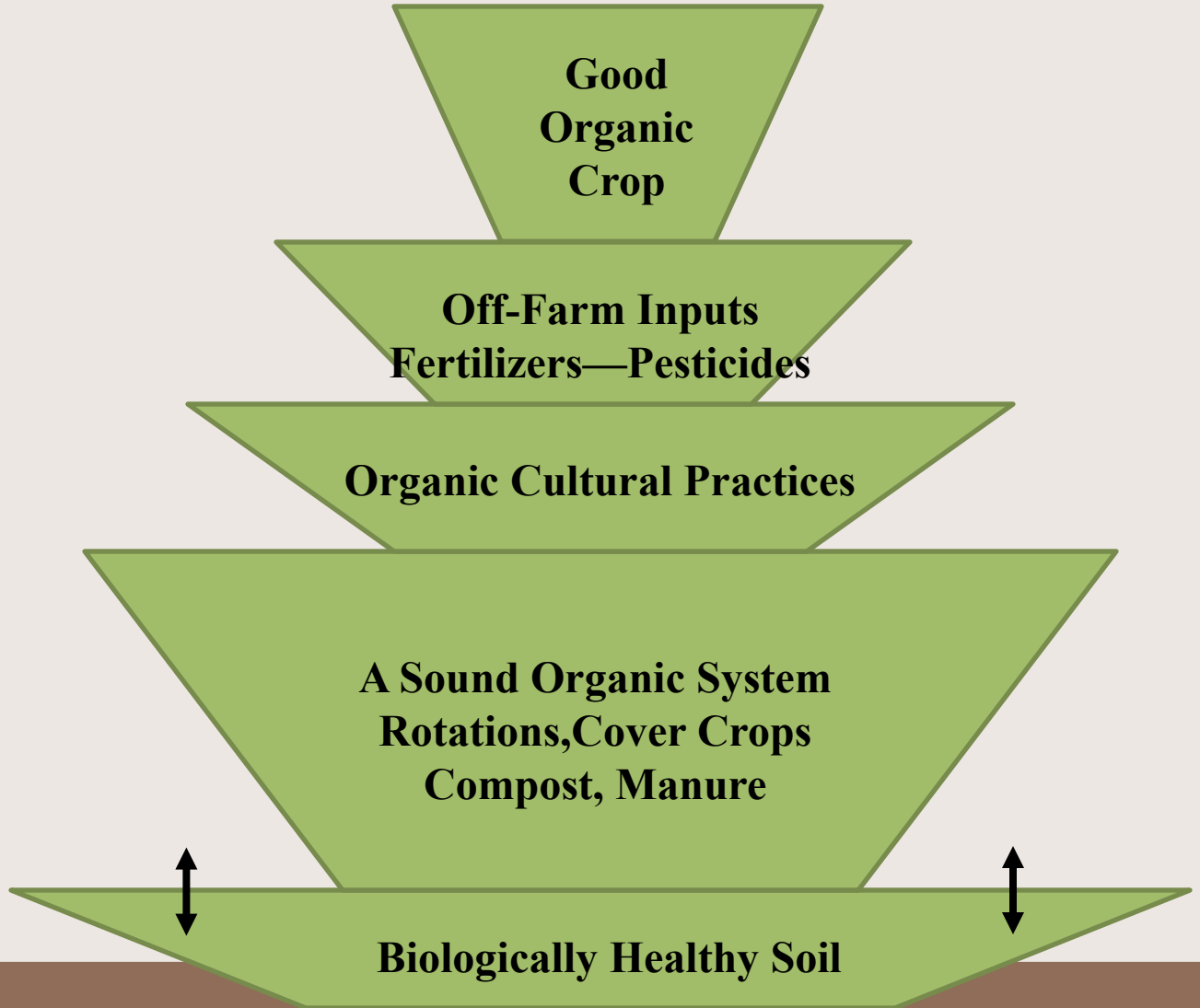
Organic System Effects On Pests

- Systemic Practices:

rotation, cover cropping, organic fertilization, adapted and resistant cultivars, composting and basic sanitation practices. *"Nurturing the soil food web plus…"*

- Systemic Effects:
  - innate and induced resistance/tolerance
  - biocontrol of pests and diseases in the soil
  - biocontrol of above ground pests
  - life cycles of weeds and pests disrupted
  - weed seedbank reduced
  - beneficial shift in weed populations

Putting It Together: Setting the Foundation



Regarding Weeds Pest Insects & Diseases

- ✓ **Well-designed organic systems have higher ecological stability and lower pest pressure overall.**
- ✓ **However, many pests require additional management (i.e. cultural practices) to ensure that they don't get out of control. *"More tiny hammers…"***

Traditional Organic Pest Control Practices

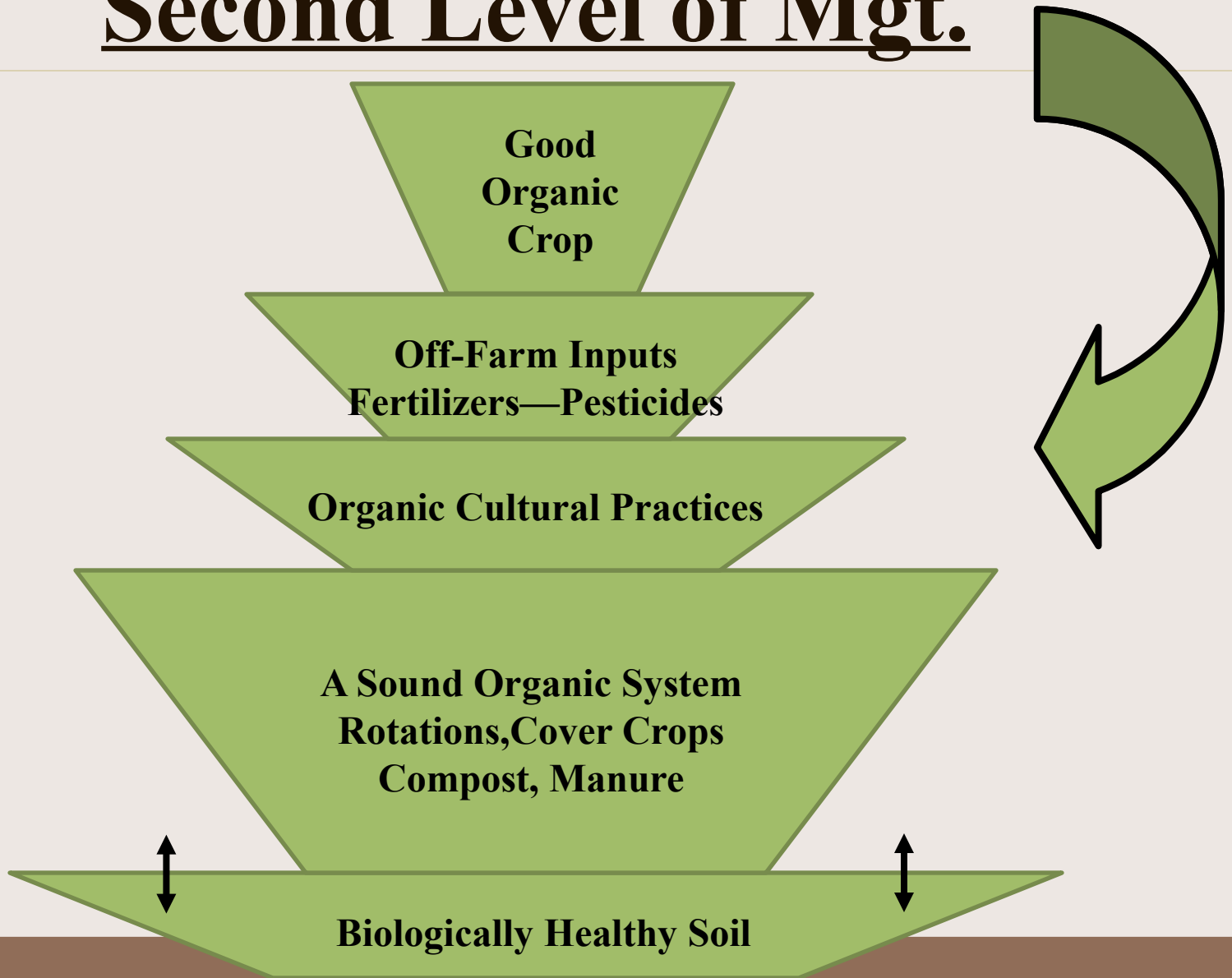
Weeds

- cultivation
- organic mulches
- mowing
- grazing
- weeder geese
- handweeding
- flame weeding
- plastic mulch

Insects & Disease

- beneficial habitats
- augmentation of beneficials
- physical barriers
- nonsynthetic lures, traps, repellents
- adjusting timing
- trap crops
- Hand-picking

Putting It Together: Second Level of Mgt.



Regarding Weeds Pest Insects & Diseases

- ✓ **Well-designed organic systems have higher ecological stability and lower pest pressure overall.**
- ✓ **However, many pests require additional management (i.e. cultural practices) to ensure that they don't get out of control.**
- ✓ **While organic management precludes *most* pesticides, many allowable materials are available.**

Organic-Allowed Pesticides

(Insecticides, Miticides, Fungicides, Herbicides, etc.)

Mineral-based

- Coppers
- Sulfur
- DE
- Baking soda

Biologicals

- Bt (Dipel®, etc.)
- B. bassiana (Mycotrol®, etc.)
- Bacillus subtilis (Serenade®, etc.)
- Spinosad (Fire Ant bait, etc.)

Botanicals

- Pyrethrum (Pyganic®, etc.)
- Neem (Bioneem®, neem oil, etc.)
- Garlic

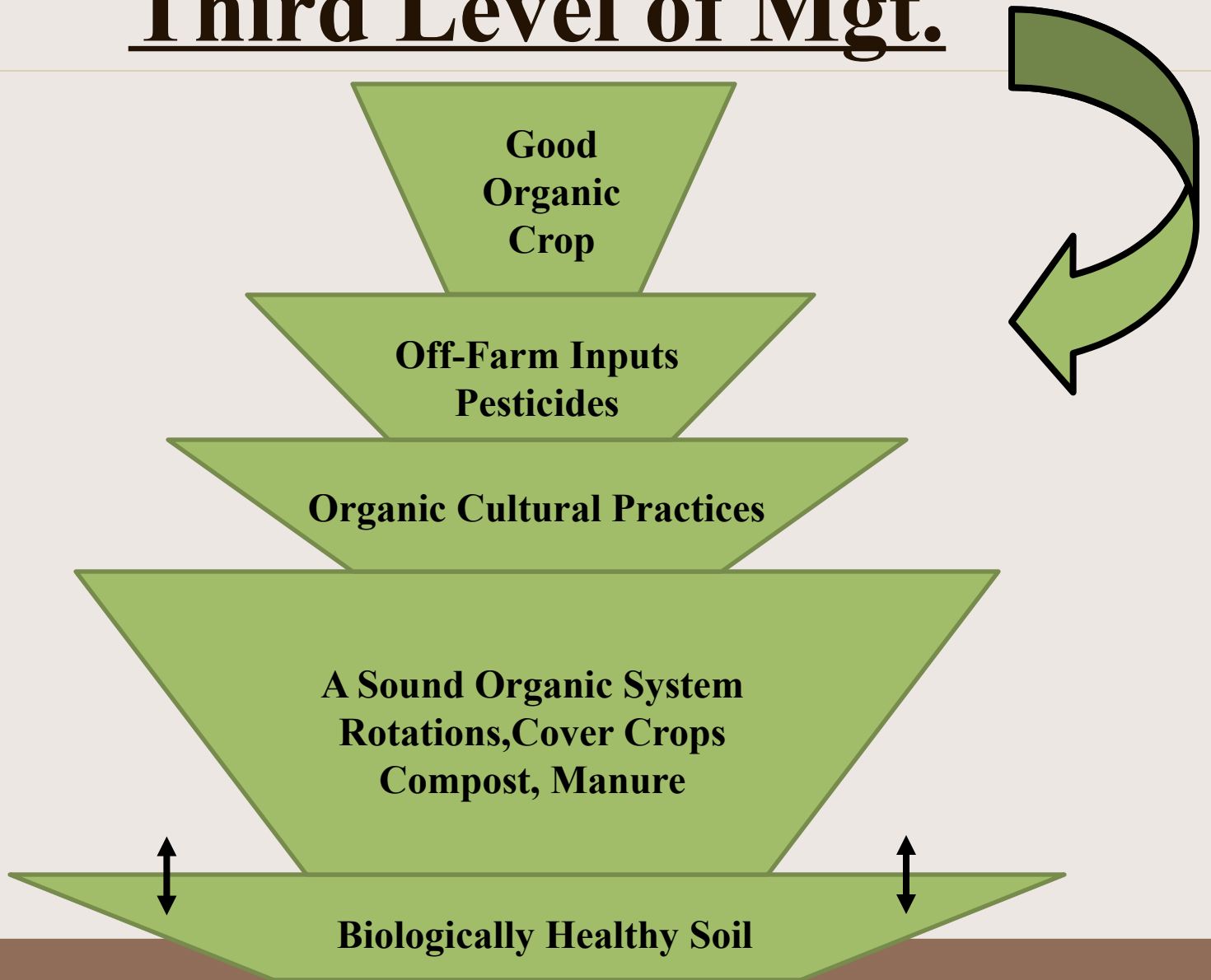
Refined oils

- Dormant oil
- Superior oil

Soaps

- Insecticidal soap
- Herbicidal soap

Putting It Together: Third Level of Mgt.



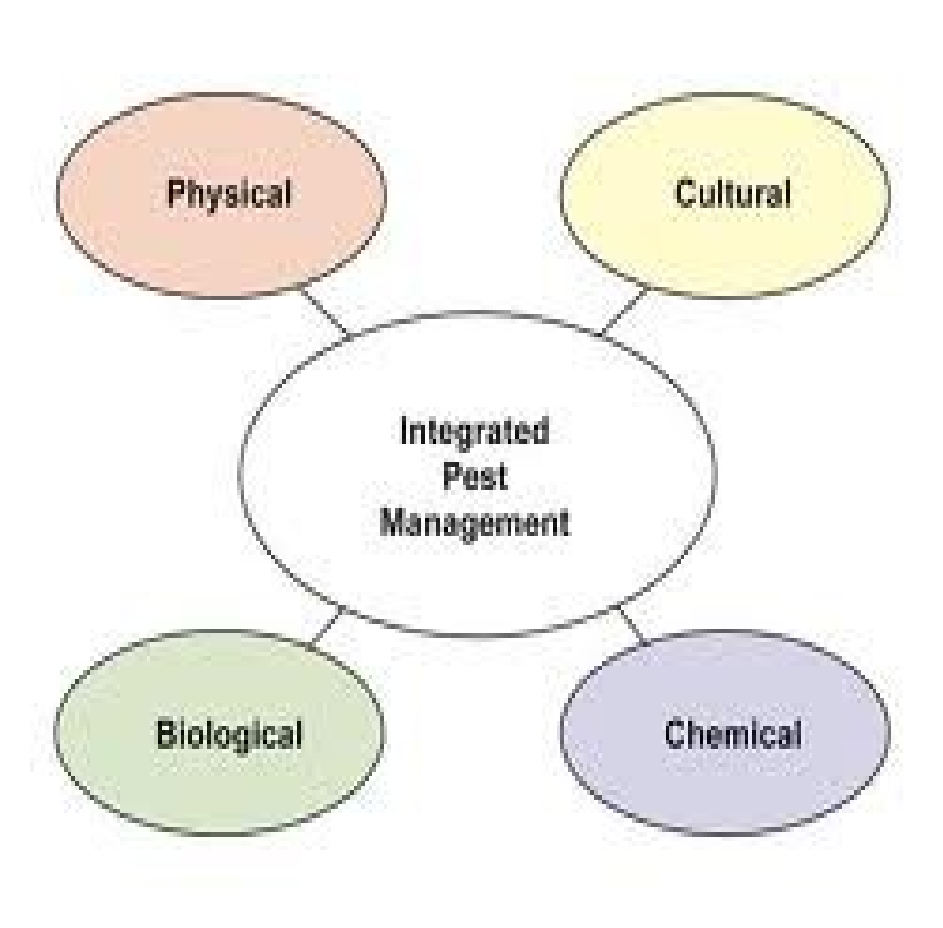
Organic Strategy For Weed & Pest Management

I. **Organic System Effects**

II. **Traditional Organic Practices**

III. **Allowed Pesticides**

Integrated Pest Management (IPM)



IPM is a systematic strategy for managing pests which considers prevention, avoidance, monitoring and suppression. Where chemical pesticides are necessary, a preference is given to materials and methods which maximize public safety and reduce environmental risk.

MASSACHUSETTS IPM COUNCIL'S DEFINITION OF IPM

http://massnrc.org/ipm/what-is-ipm.html

Insect/Arthropod Pests

Traditional Organic Insect/Arthropod Control Practices

- beneficial habitats
- augmentation of beneficials
- physical barriers
- traps
- adjusting timing
- trap crops
- hand-picking/ vacuums
- flaming/fire

Pest I.D. is Critical

Cue in Kate

Flea Beetles

Phytophthora

Septoria Blight

A Face Only a Mother Could Love!

A tomato hornworm—very pleased with itself!

Tomato Hornworm

Handpicking
Fall cultivation
Bacillus thuringiensis
Biological control

Bio-control for Hornworm

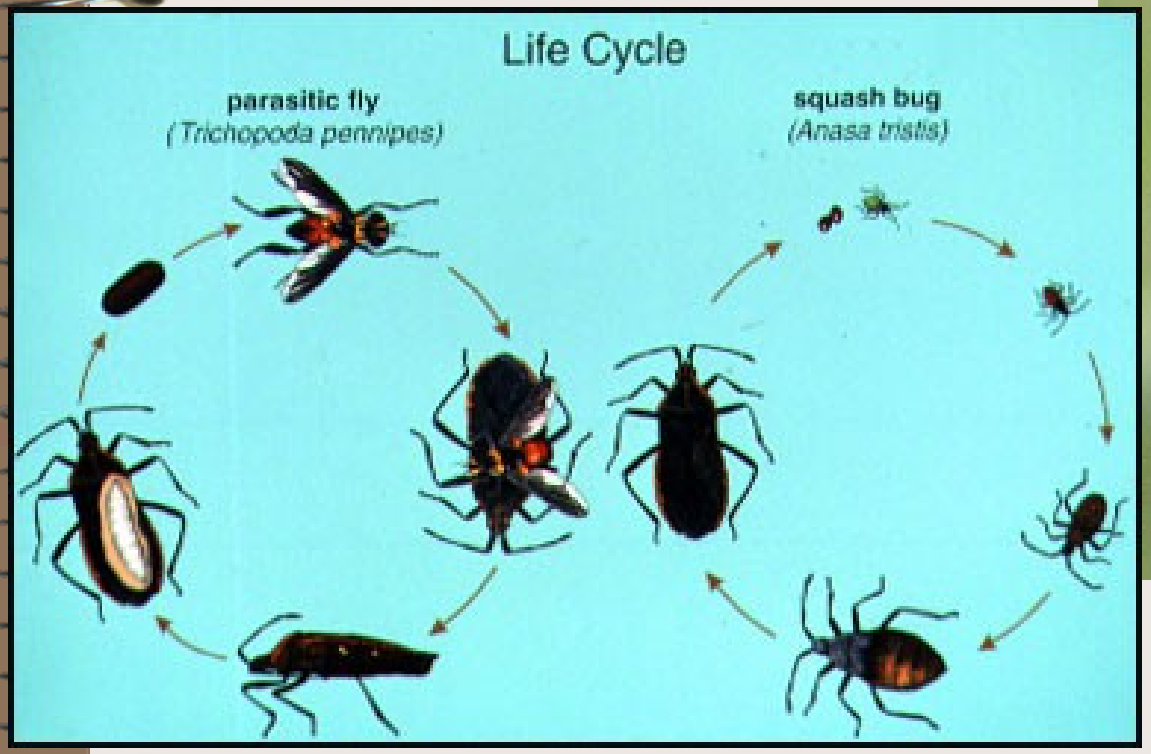
Braconid **wasp**
-parasitic-

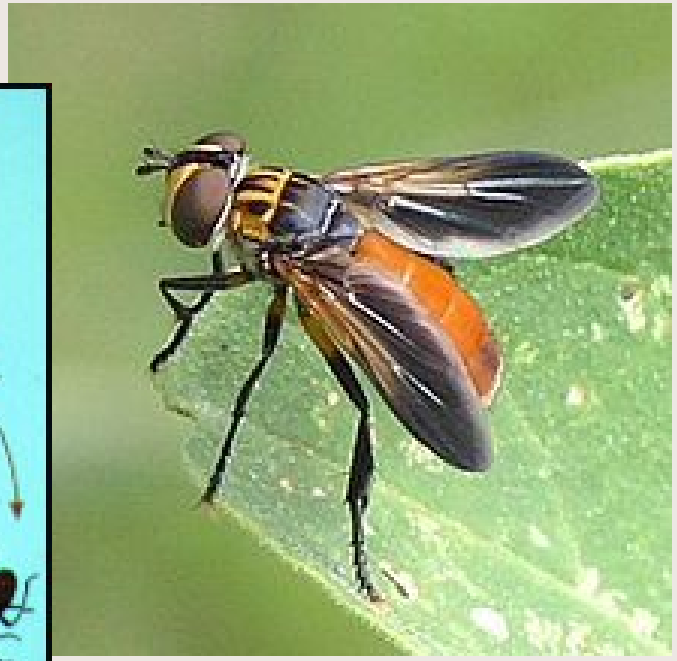
Polistes **wasps**
-predatory-

Squash Bug

- Timed planting
- Sanitation
- Barriers
- Resistance/tolerance
- Allowed chemicals??
- Biological control

Squash Bug Parasite





Tachinid fly
Trichopoda pennipes

Stink Bugs as tomato pests

- Sanitation
- Trap cropping
- Allowed chemicals
- Biological control

Buckwheat as a Trap Crop

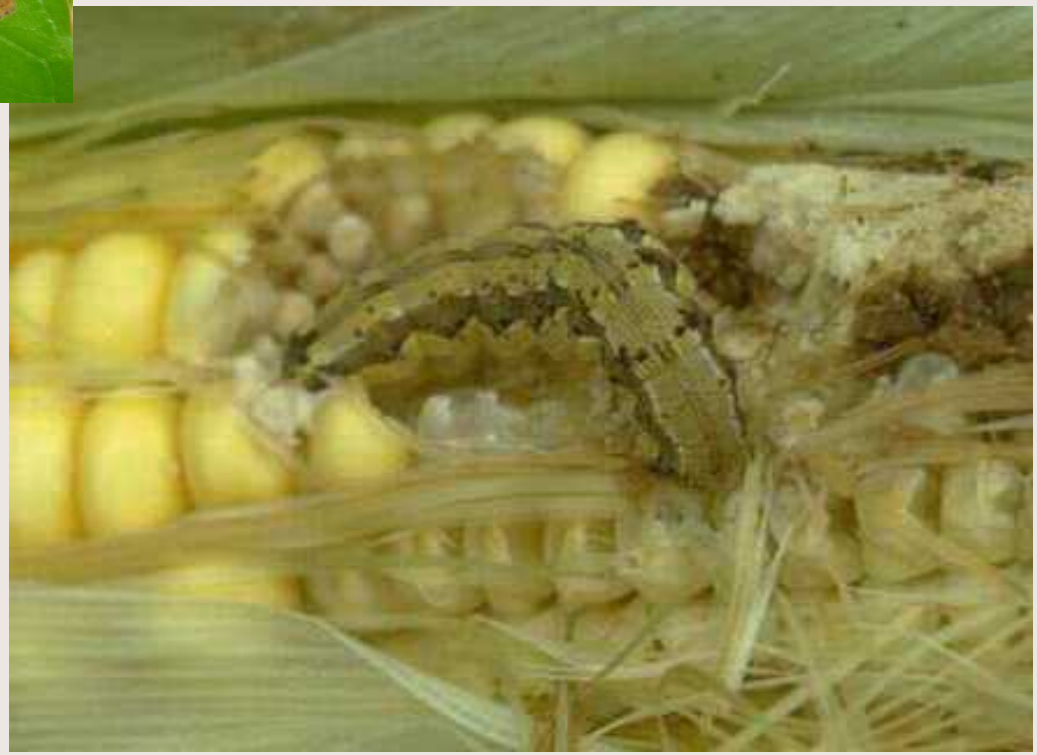
Stink Bugs as tomato pests

- Sanitation
- Trap cropping
- Allowed chemicals
- Biological control

Trissolcus basalis: a parasitic wasp

Corn Earworm/ Tomato Fruitworm

- Resistant varieties
- Natural oil ear treatment
- Bt sprays
- Biological control

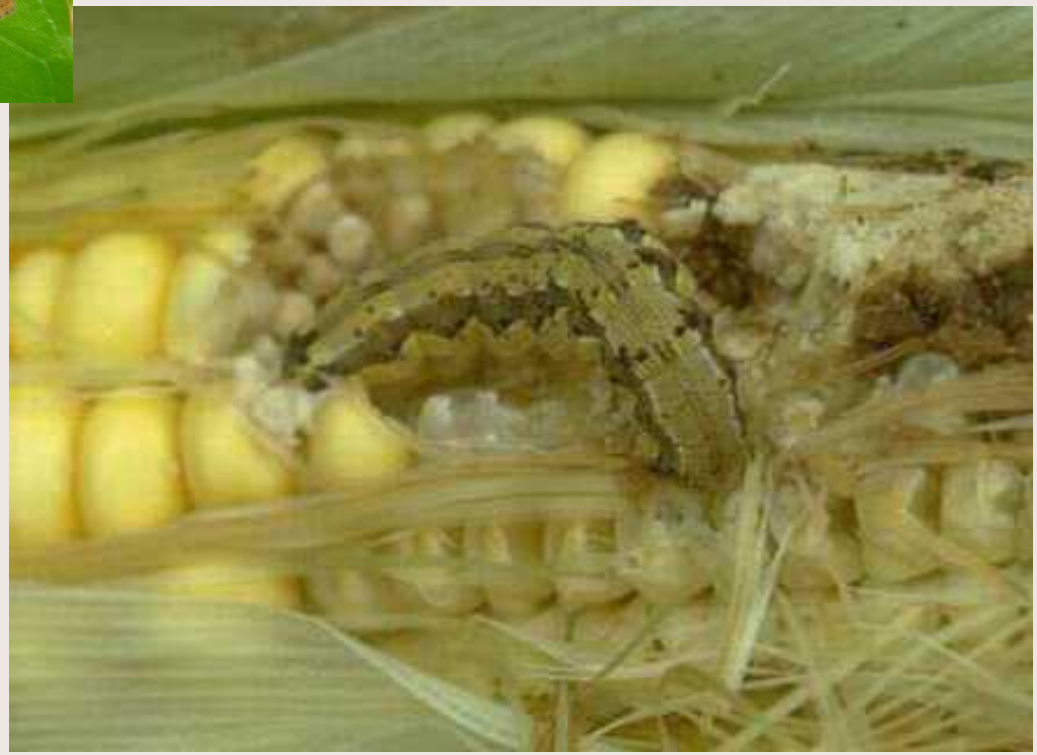


Zea-Later

Used to inject natural oils with or without allowed pesticides

Corn Earworm/ Tomato Fruitworm

- Resistant varieties
- Natural oil ear treatment
- Bt sprays
- Biological control



Trichogramma spp: parasitic wasps

Aphids *aka:* plant lice

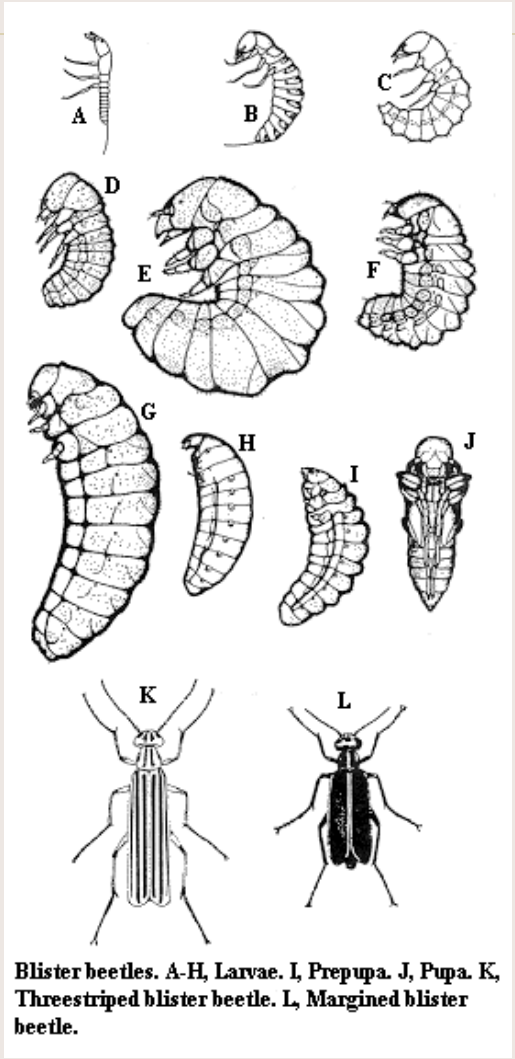
- Avoid excess nitrogen fertilization
- Allowed pesticides
- Biological control

Aphid Predators

Generalist Predators

Striped Blister Beetle

Pest on damn-near everything



Blister beetles. A-H, Larvae. I, Prepupa. J, Pupa. K, Threestriped blister beetle. L, Margined blister beetle.

Two tools for blister beetle management

Plant Diseases

Plant Disease Triangle

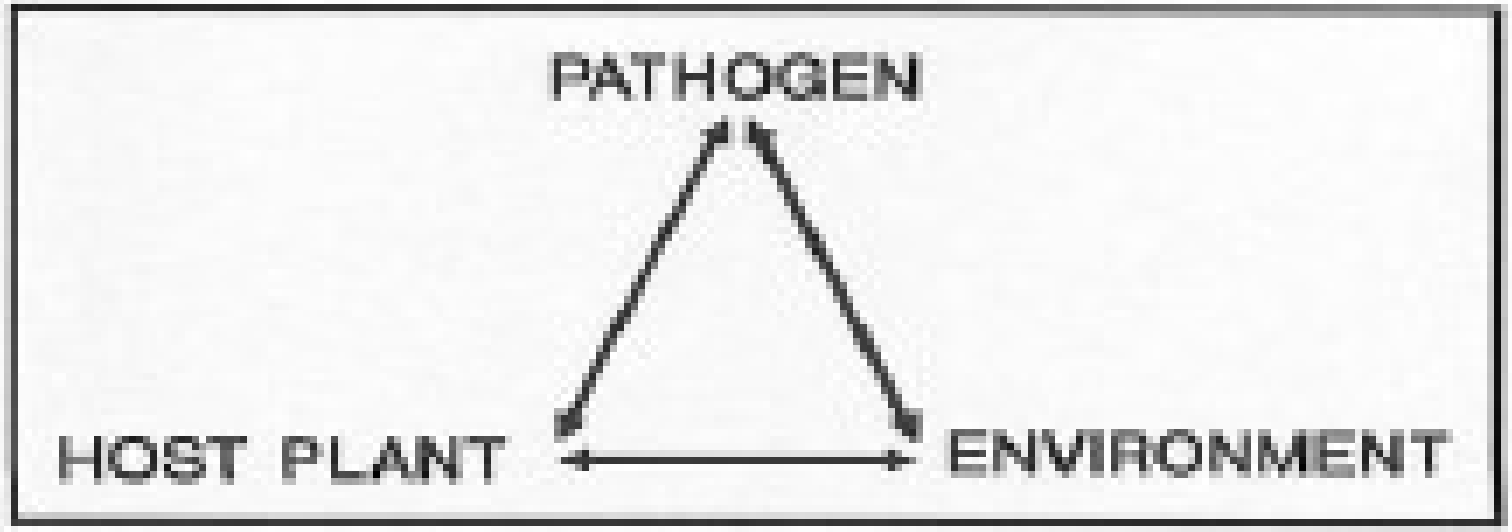
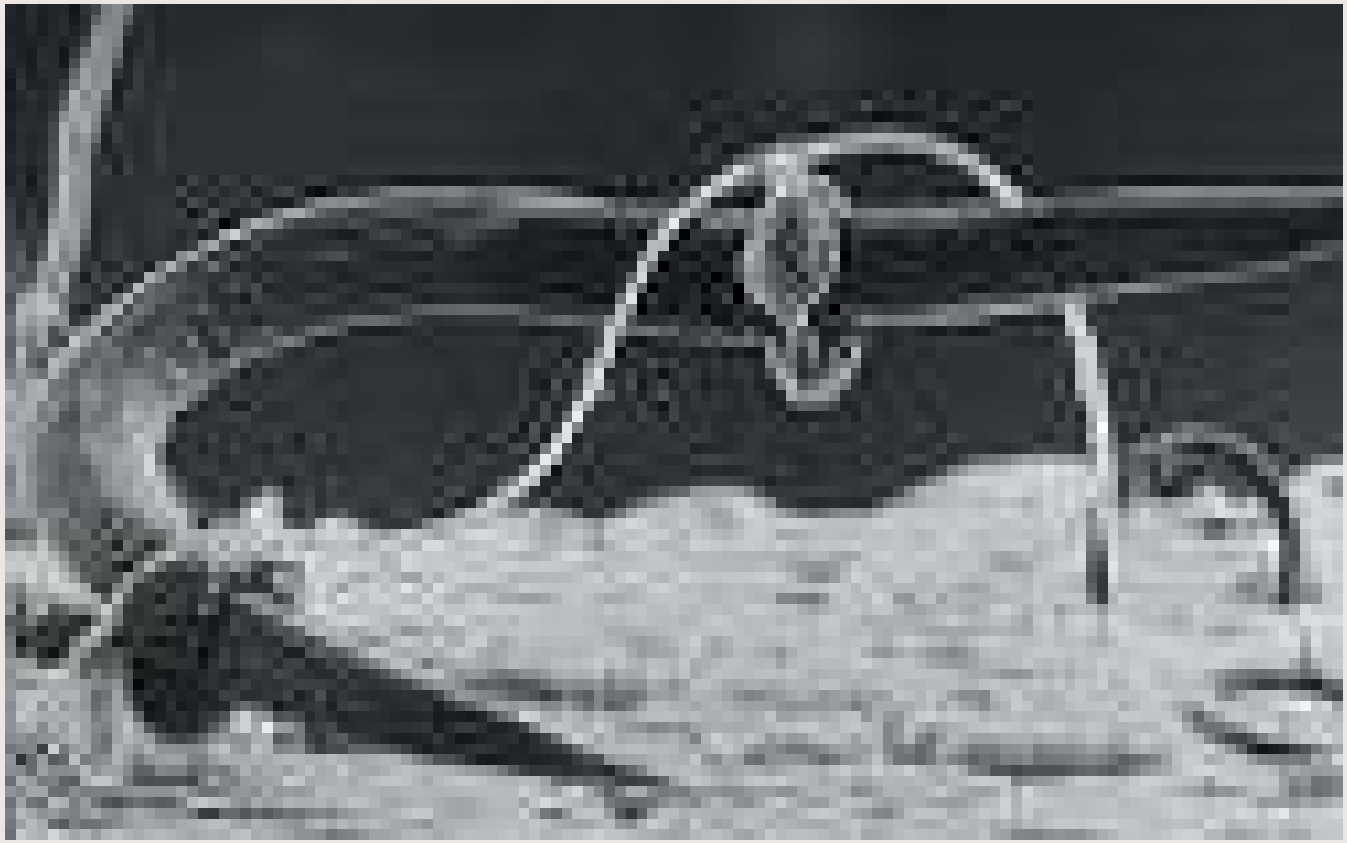


Figure 1. The Disease Triangle. These three factors interact and must be present for disease development to occur.

Nematode-Trapping Fungi



Reality Check!

- Some diseases are wind-borne or carried by mobile insect vectors. Rotation has little to no effect on such diseases.

Asters yellows, on Black-eyed susan. Vectored by leaf-hoppers.

Early blight of tomato

Serenade®
Bacillus subtilis

Powdery Mildew

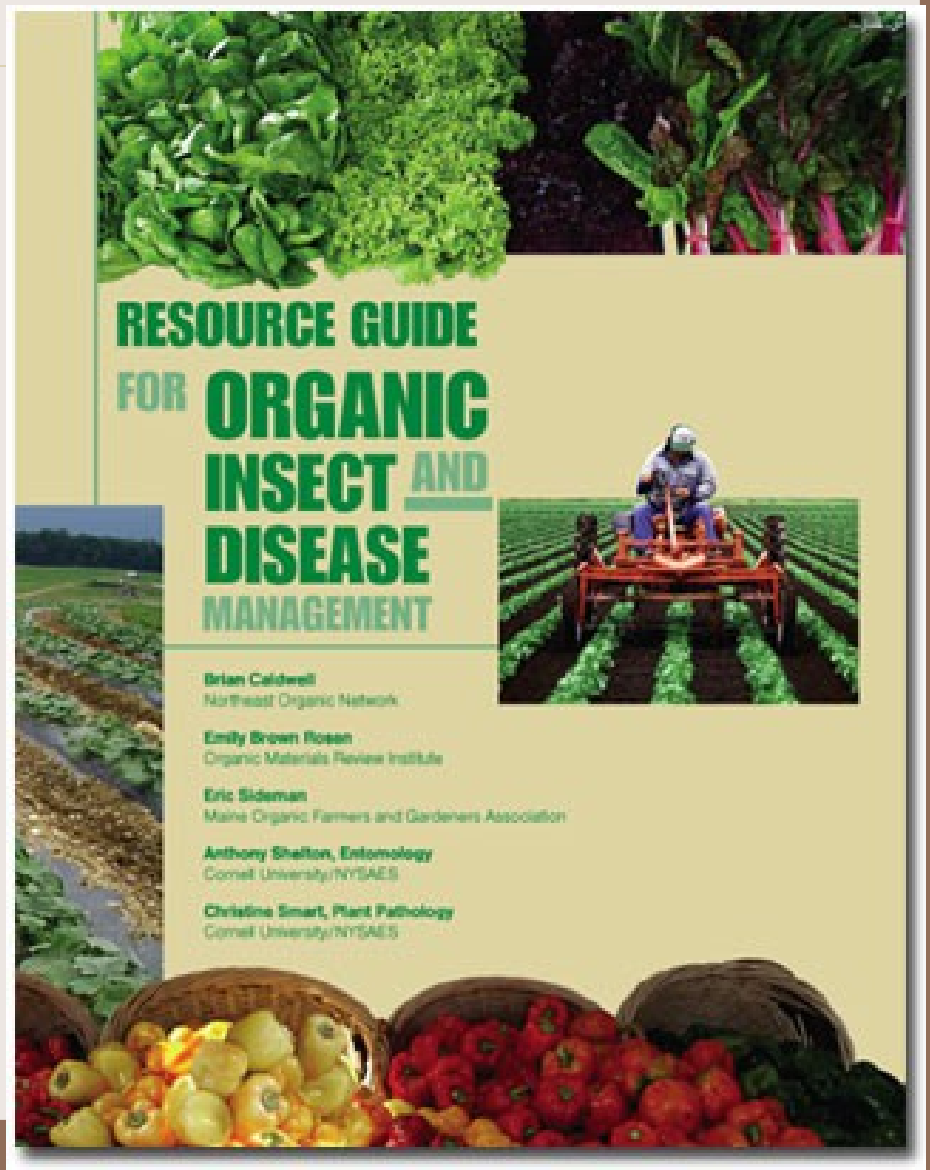
Problem on many crops

“Use of Baking Soda as a Fungicide”

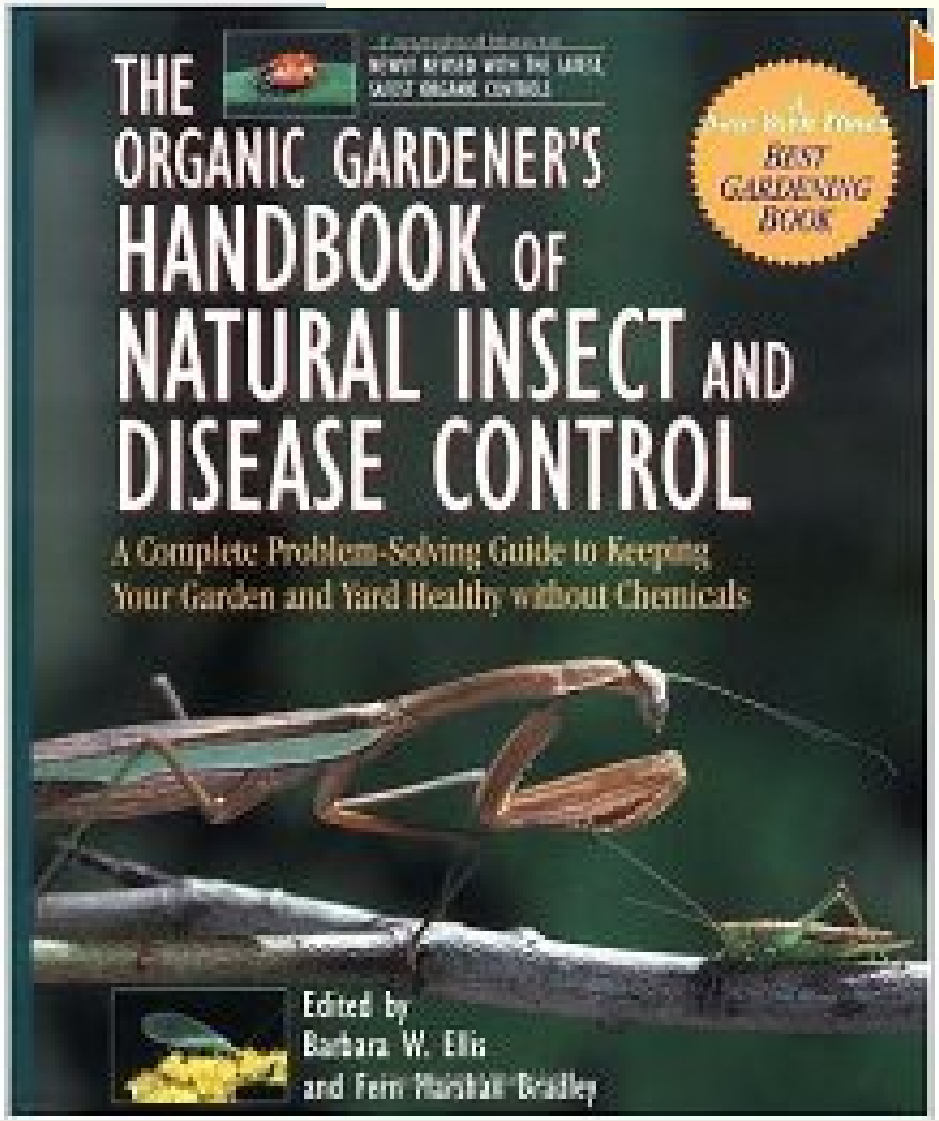
https://attra.ncat.org/attra-pub/summaries/summary.php?pub=126

http://web.pppmb.cals.cornell.edu/resourceguide/

Useful Resource



Useful Resource



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