

# **Ornamental Insect Pest Management NOFA Organic Land Care Course**

**Rose Hiskes (Rich Cowles & Tim Abbey)**

**The Connecticut Agricultural Experiment Station**

**123 Huntington Street**

**New Haven, CT 06511**

**[Rose.Hiskes@ct.gov](mailto:Rose.Hiskes@ct.gov)**



**Additional photos by Jillian Cowles (JHC)**

# Overview

- Entomology basics
- Recognizing your unpaid workers (beneficials)
- Defining organic and IPM
- Steps in an IPM program
- Important example pests

# Is this an insect?

- **Jointed feet**
- **Segmented body**
- **Three body segments**
  - **Head: sensory – antennae, eyes**
  - **Thorax: locomotion – 6 legs, wings**
  - **Abdomen: digestion and reproduction**



**Is this an insect?**



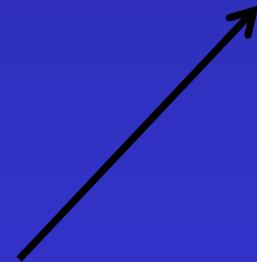
# Arachnids (mites, spiders, ticks)

- No antennae
- No wings
- One or two body segments
  - Head:
    - sensory – eyes,
  - Cephalothorax:
    - digestion and reproduction
    - locomotion – 8 legs



# Insect Development

- Complete metamorphosis
  - immatures are called larvae



# Insect Development

- Gradual/simple metamorphosis
  - immatures are called nymphs



# Most insects are not pests

- Beneficial insects: predators and parasites
  - Pollinators
  - Decomposers
  - Aesthetics
- 
- Plant diversity in the landscape enhances diversity and abundance of “good guys”



# Types of Natural Enemies

- **Predators**

- Kills many prey during its lifetime.
- Immatures must find their own food.
- May have to control ants if they are interfering with useful beneficials.





**Lady beetle adult**



**Lady beetle larva**



**Lady beetle pupa**

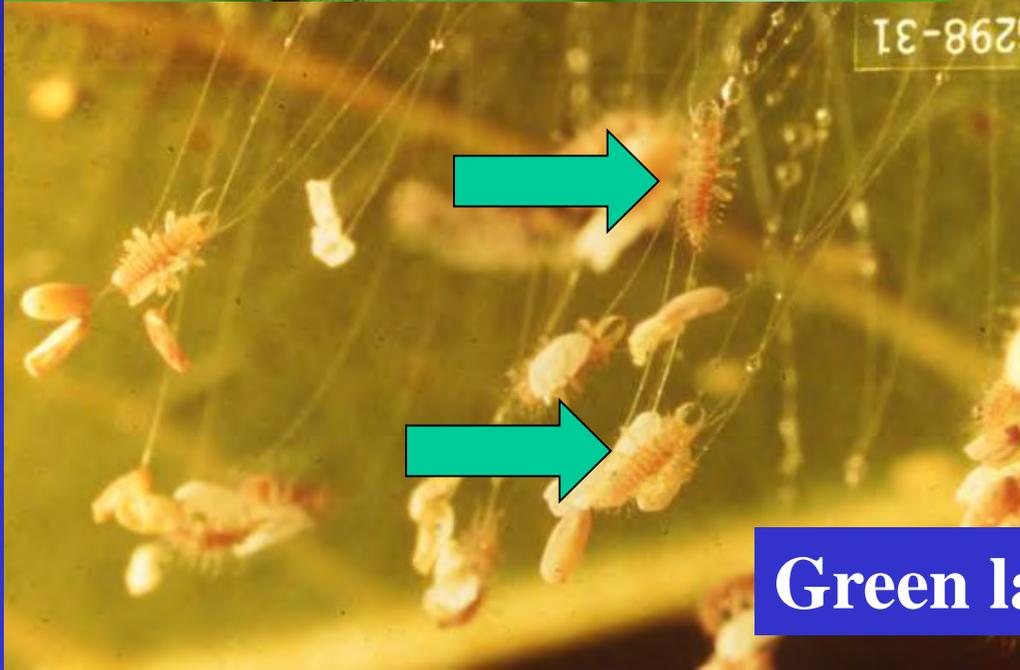
Photo: JHC



Lacewing adult



Green lacewing nymph



Green lacewing eggs, nymphs hatching



**Minute pirate bug**



**Big-eyed bug**



**Spined soldier bug**



**Vespid wasp attacking an  
armyworm caterpillar**



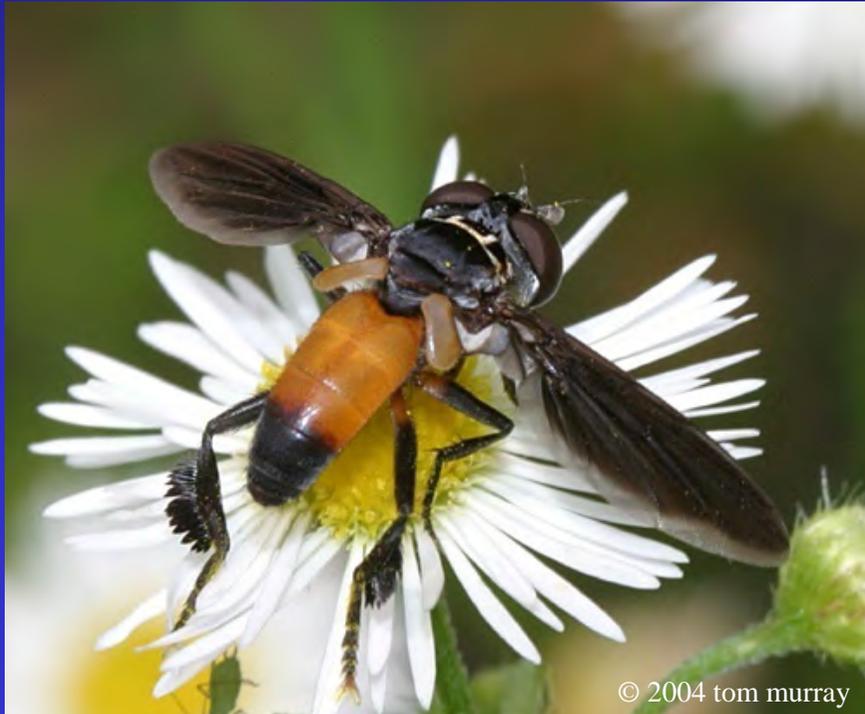
**Syrphid or flower fly.  
Larvae are predaceous.**



# Types of Natural Enemies

- **Parasites**

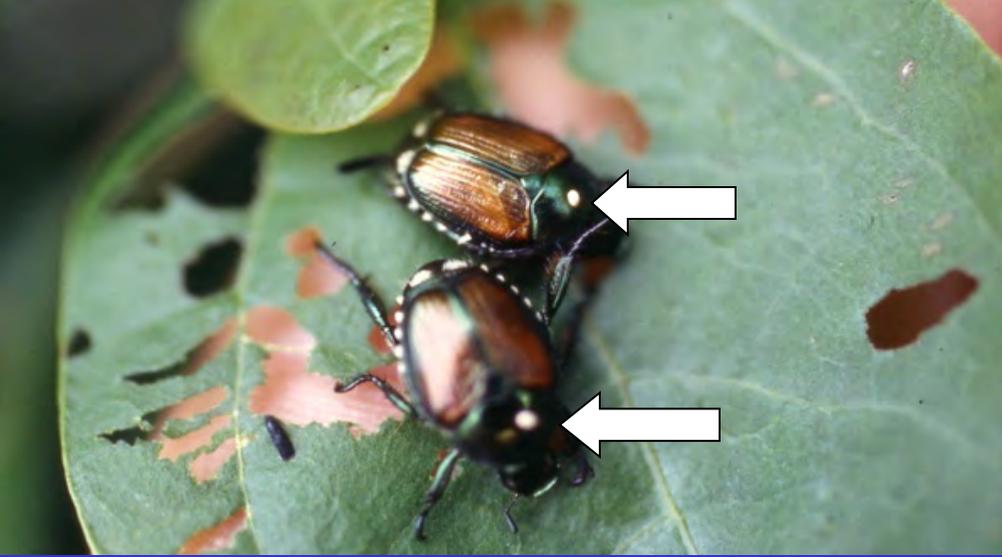
- Usually have narrow or extremely specific host range.
- Females actively search for hosts to lay egg(s) on or in.
- Each host produces one or more new parasites.



**Wasp inserting egg into an aphid**



**“Aphid Mummies”**



**Eggs of the Winsome fly parasite**

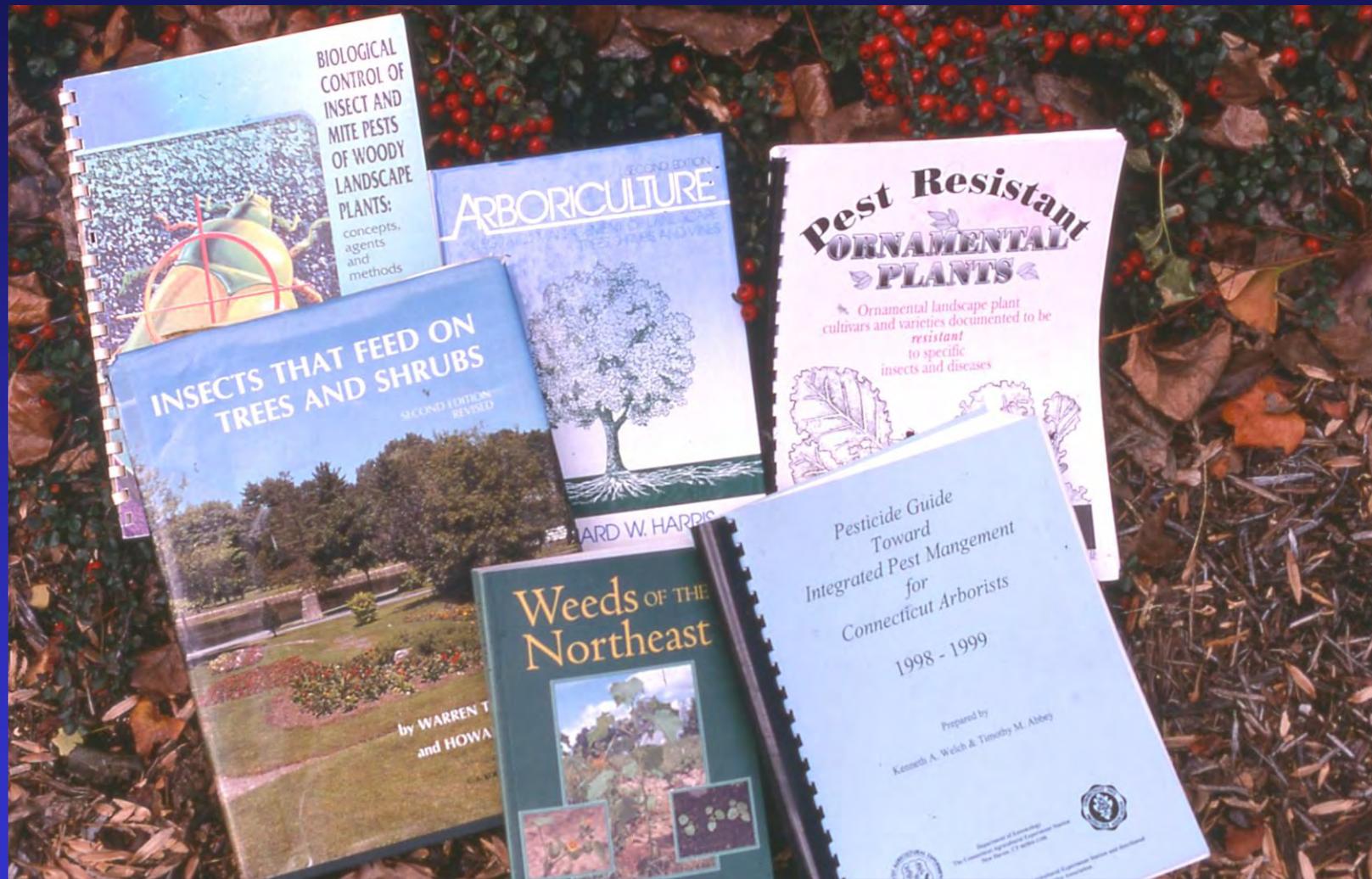
# **Integrated Pest Management**

- An approach that uses biological, chemical, cultural, physical and regulatory tactics to manage pest problems while minimizing risks to human health and the environment and maintaining healthy plants.**
- This approach is based on science and economics.**
- Knowledgeable employees needed – train employees and keep them updated.**
- Involve employees and clients in program design – communicate!**

# Steps in an IPM Program

- **Prevention**
  - **landscape design (include flowering plants)**
  - **reducing plant stress**
- **Monitor & ID**
  - **regular monitoring and correct identification**
- **Threshold**
- **Take Action**
  - **pesticide use only when absolutely necessary**
- **Evaluate Action**
- **Keep Good Records**

# Reference Material

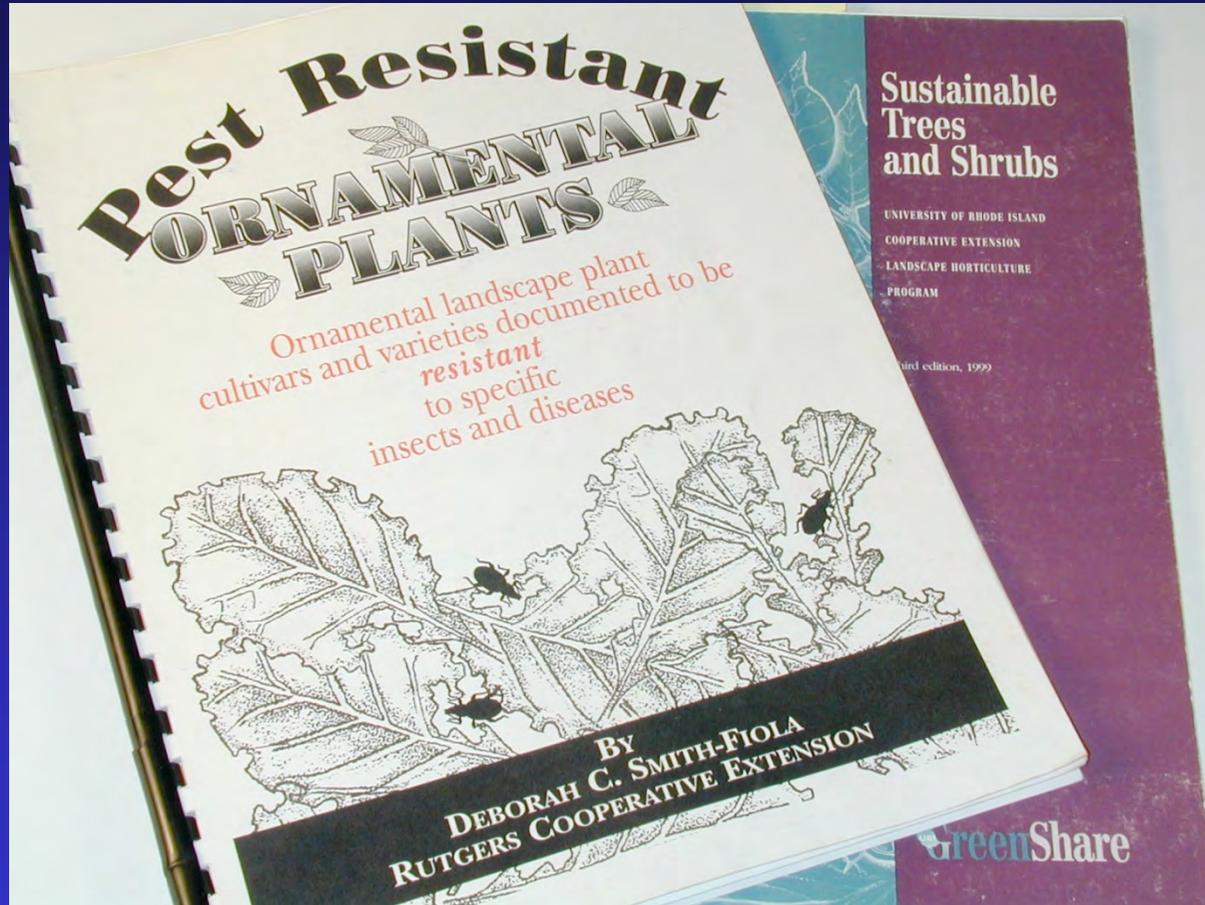


# PREVENTION

- **Select the proper plant for the location**
  - **Growing space**
  - **Climate (hardiness zones)**
  - **Soil characteristics**
  - **Aesthetics**
  - **Light requirement**



# Resistant Plants



Cary Award Plants, 'Bringing Nature Home'

# Proper Planting – starts with selection

Select high quality plant material



Root-bound

# Proper Planting



**Root flare is too deep**



**Too much mulch**

# Proper Aftercare

Treegator Drip Irrigation Bag



# Protect plants during construction.



# Monitoring

- **Basic tools:**

- 10 to 20X handlens, binoculars
- Pruners, saw, knife
- Clipboard to hold scouting forms, etc.
- Monitoring traps (sticky cards, pheromone traps)
- pH meter
- Growing degree day meter
- Indicator plant bloom list



# Monitoring

- Plant tapping
  - Aphids
  - Spider mites
  - Beneficials



# Sticky Cards



Birch Leafminer Adults

Holly Leafminer Adults



# Pheromone Trap

(For monitoring, not reducing pest populations)



# Observations

- Are insects present?
- Are they causing the damage that is seen?



# Is this damage from an insect pest?



# CORRECT IDENTIFICATION

- Essential to applying correct management techniques
- Different pests can cause the same symptoms
  - ie. stippling – aphids, lacebugs, spider mites

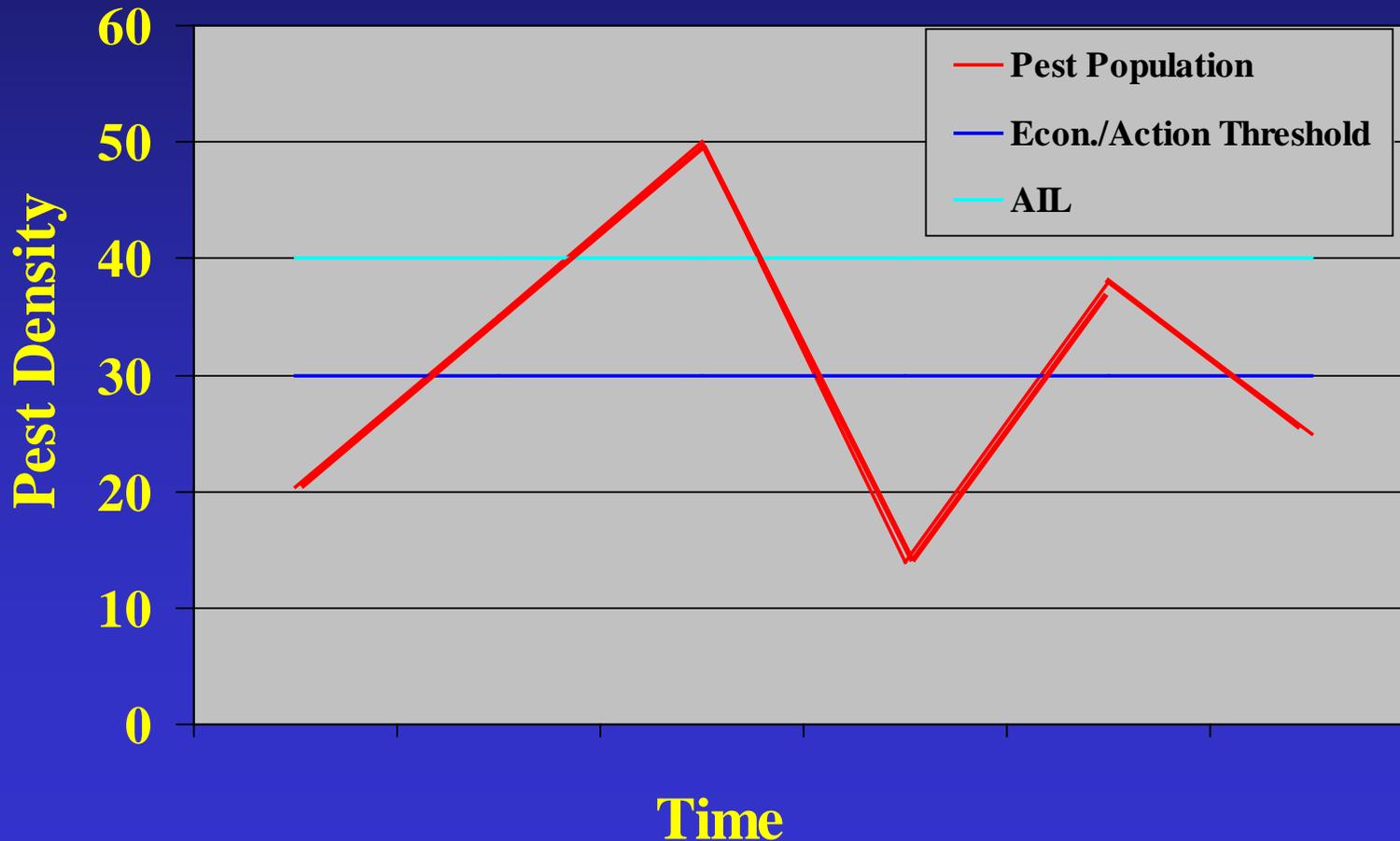
# Simplify – Key Pests, Key Locations

- **Pest:** is it “key” because of the potential damage, or because it is an annual problem?
- **Location:** a highly visible location, or maybe it is a specimen tree or one with sentimental/historical value.



# Thresholds

## Economic / Aesthetic Injury Level



# Take Action when Threshold is Reached

Application of beneficials

- predators, parasites, pathogens

Cultural – stop overhead watering to lessen foliar diseases

- prune off egg masses

Chemical control agents

- organically acceptable
- emergency use synthetics

## RESOURCE GUIDE FOR ORGANIC INSECT AND DISEASE MANAGEMENT

### INTRODUCTION

#### CROP MANAGEMENT PRACTICES

Brassicas  
Cucurbits  
Lettuce  
Solanaceous Crops  
Sweet Corn

#### MATERIAL FACT SHEETS

*Bacillus subtilis*  
*Bacillus thuringiensis*  
*Beauveria bassiana*  
Bicarbonate (Potassium and Sodium)  
*Coniothyrium minitans*  
Copper Products  
Kaolin Clay  
Neem  
Oils  
Pyrethrum  
Rotenone  
Soap (Pesticidal)  
Spinosad

#### APPENDICES

Plant Resistance to Insects & Diseases  
Habitats for Beneficial Insects  
Trap Cropping and Insect Control

## INTRODUCTION

### ABOUT THE AUTHORS:

**Brian Caldwell** is the Farm Education Coordinator for the Northeast Organic Farming Association of New York. He participated in this project as part of the Northeast Organic Network (NEON). He also is an organic apple grower and former extension educator in central New York.

**Emily Brown Rosen** is a consultant and the former Policy Director for the Organic Materials Review Institute, a non-profit organization that provides technical services to certification agencies and reviews products for compliance with organic regulations. She has been an active participant in the development of national organic standards and serves as an advisor to several organic certification agencies.

**Dr. Eric Sideman** has been the Director of Technical Services, Maine Organic Farmers and Gardeners Association since 1986. Dr. Sideman provides technical support for farmers and gardeners, serves as staff scientist for MOFGA, plans and produces educational events for MOFGA and Cooperative Extension, and serves on various agricultural committees for the Maine Department of Agriculture.

**Dr. Anthony M. Shelton** has been a Professor of Entomology at Cornell since 1979. His work focuses on insect ecology and management of insect pests of vegetables. He has published over 300 articles on pest management. [More on Dr. Anthony M. Shelton](#)

**Dr. Christine D. Smart** has been an Assistant Professor of Plant Pathology at Cornell since 2003. She studies induced resistance in plants against pathogens, and the biology and control of vegetable diseases. [More on Dr. Christine D. Smart](#)

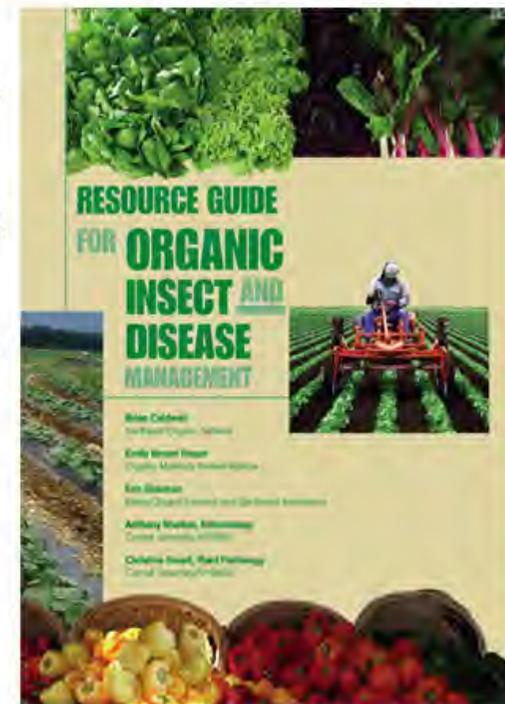
### WHY THIS GUIDE?

The number of farmers and the acreage dedicated to organic farming has been increasing steadily in the past ten years, as organic food sales have increased approximately 20% annually. The USDA's Economic Research Service found that the northeastern United States has a large percentage of organic vegetable growers compared to other regions, with six northeast states ranking in the top 20 for percentage of organic vegetable acreage in 2001.

Organic farmers rely primarily on preventive, cultural and integrated methods of pest and disease management. However, there are a number of materials available for use that can complement and support organic management. This guide was developed to provide a useful and scientifically accurate reference for organic farmers and agricultural professionals searching for information on best practices, available materials and perhaps most importantly, the efficacy of materials that are permitted for use in organic systems. Many products available to organic farmers have not been tested extensively, and current research has not been summarized or made widely available to the general producer. A major objective of this guide has been to review recent literature for published trials on material efficacy in order to provide reliable information that can be used by farmers to effectively manage pests. Additionally, a goal was to identify what materials have shown promise but need more research.

### WHO SHOULD USE THIS GUIDE?

Organic farmers and farmers in transition to organic production, extension professionals, and farm advisors who want accurate information based on published research.



# Types of Natural Enemies

- **Pathogens (nematodes, fungi, bacteria, viruses)**
  - Host must directly contact microorganism.
  - May produce very large number of progeny.



Michael Klein Horticultural Insects Research Lab, OARDC, Wooster, OH

# Viability of Biological Controls

- Conservation vs. Augmentation
- Where to get beneficials: [carolg@ipmlabs.com](mailto:carolg@ipmlabs.com)
  - IPM Labs: [www.ipmlabs.com](http://www.ipmlabs.com)  
315.497.2063
  - The Green Spot: [www.greenmethods.com](http://www.greenmethods.com)  
603.942.8925
  - Hart Seed Co. [www.hartseed.com](http://www.hartseed.com)  
800.326.HART

# Chemical Control Options

- Insecticidal soap, horticultural oil
- Spinosad (Conserve SC)
- *Bacillus thuringiensis* (Bt products)
- Azadirachtin (neem oil)
- Surround (kaolin)
- Pyrethrum
- Rotenone – NO MORE
- [http://www.omri.org/sites/default/files/opl\\_pdf/crops\\_category.pdf](http://www.omri.org/sites/default/files/opl_pdf/crops_category.pdf) (pages 27 – 37)
- Synthetic products only when absolutely necessary
  - pyrethroids to protect against borers (Onyx, Scimitar)
  - imidacloprid (Merit) for hemlock woolly adelgid

# Evaluate

- Did the treatment kill the pest?
- Where there any off target effects?
- Any plant phytotoxicity?



# EXAMPLE PESTS

## Mouthparts: Feeding Damage

- Chewing

- Sucking

Photos: JHC



# Insect Feeding

- Chewing mouthparts
  - defoliators



# Eastern Tent Caterpillar



Forest Tent – keyhole pattern

# Winter Moth



[www.umassgreeninfo.org/fact\\_sheets/defoliators/winter\\_moth.pdf](http://www.umassgreeninfo.org/fact_sheets/defoliators/winter_moth.pdf)

# Sawflies

## European pine sawfly

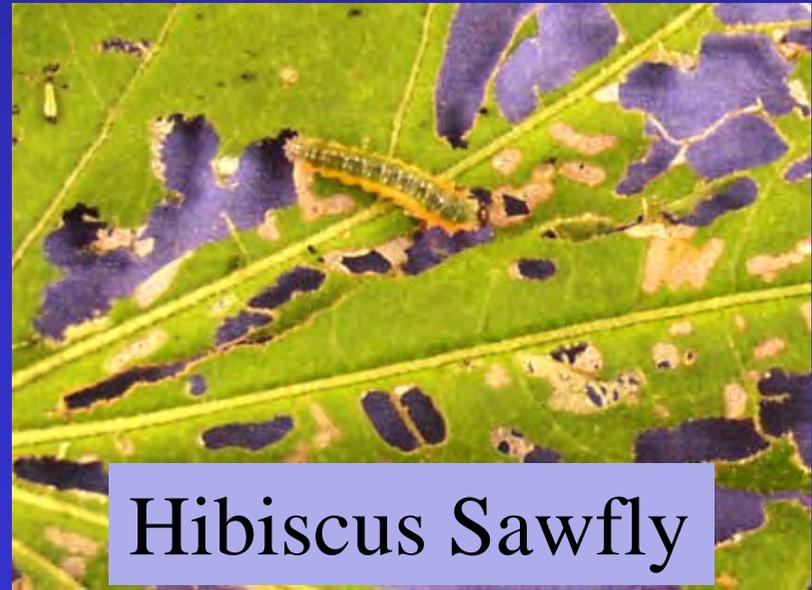


Dogwood  
Sawfly

08.29



Redheaded pine sawfly



Hibiscus Sawfly

# Leafminers



Larvae

UGA0907027



UGA1296079



# Leaf Feeding Beetles



Viburnum Leaf Beetle



# White Pine Weevil

Spot treatment

Other borers



# Black Vine Weevil



# Black vine weevil cont.

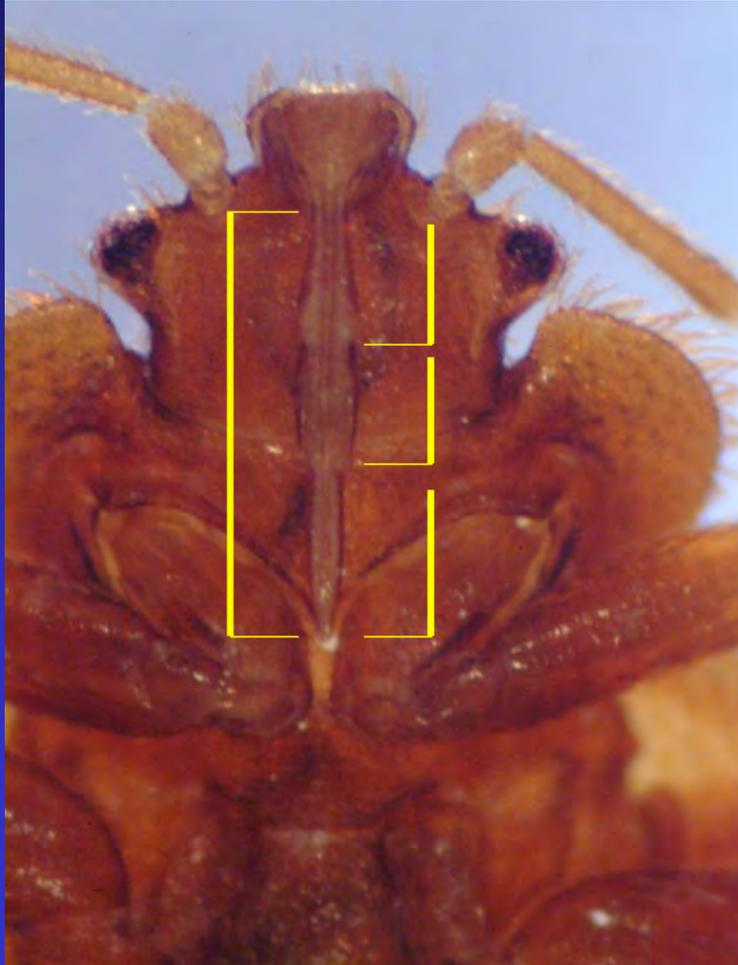


Larvae infected with  
insect pathogenic nematodes



# Insect Feeding

- Piercing/sucking mouthparts (sap feeding)



# Piercing-Sucking Insects

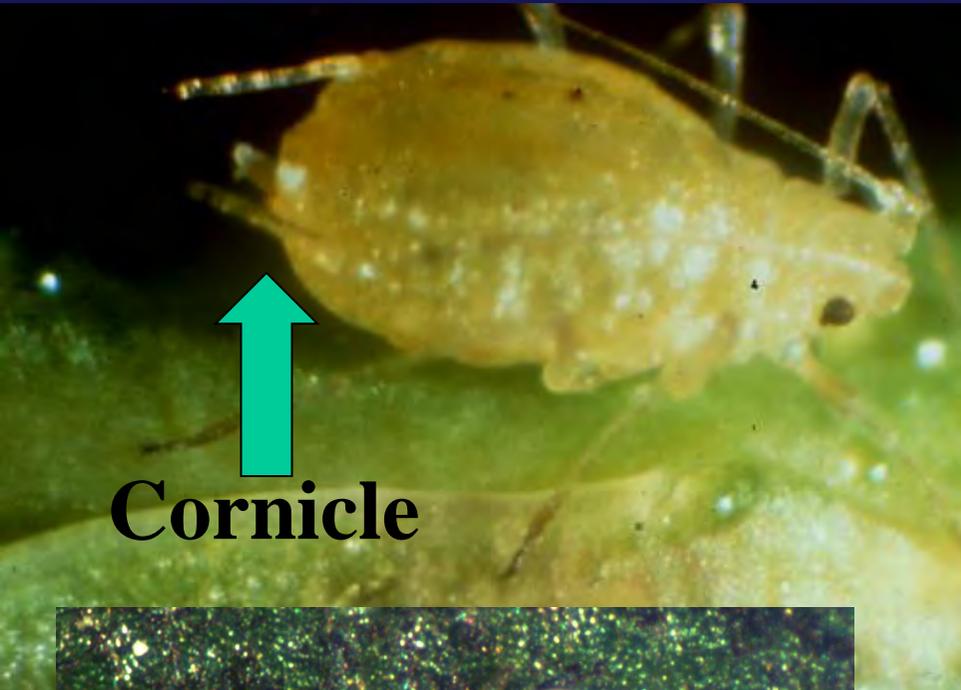


# Ants tending aphids for honeydew



Photo: JHC

# Aphids



Cornicle



Shed skins (exoskeletons)



Tuliptree aphid



Sooty Mold

# Hemlock Woolly Adelgid



# Two Other Bugs to Know



**Brown Marmorated (CAES)**



Western Conifer Seedbug

# Oystershell Scale

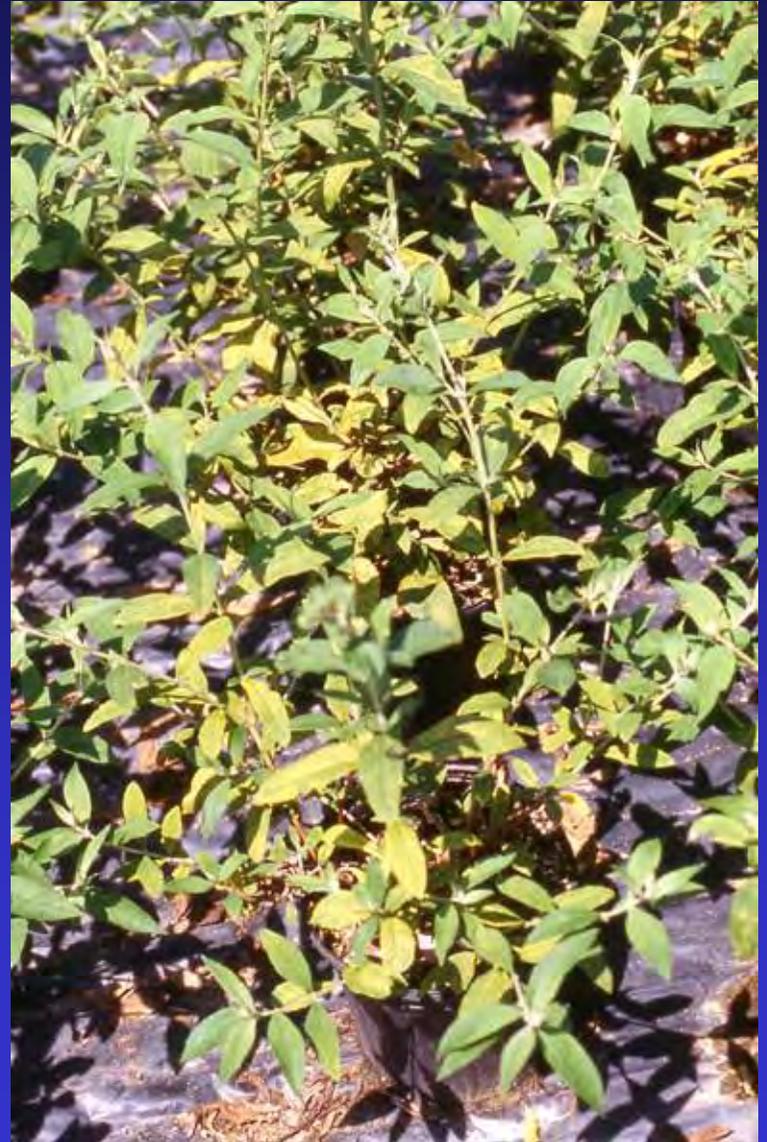


**Crawlers**

# Spruce Spider Mites



# Twospotted Spider Mites



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- Other Damage Agents**  
| [Invasive Plants](#) | [Parasitic Plants](#) | [Human](#) | [Animal](#) |

#### Trees, Plants, and Stand Types

- Trees**  
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#### People, Places and Scenes

### Random Image



**southern pine coneworm**  
Photo by [R. Scott Cameron](#)

### Statistics

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# Rose Hiskes

- [Rose.Hiskes@ct.gov](mailto:Rose.Hiskes@ct.gov)
- 203-974-8600, 860-683-4977
- Call or email anytime!

