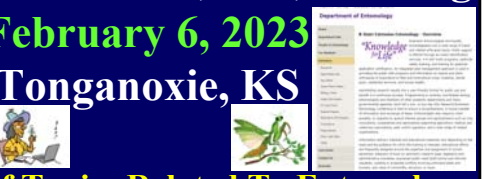
Rural Leavenworth, Inc., Meeting

February 6, 2023

Tonganoxie, KS



A Variety Of Topics Related To Entomology

Raymond A. Cloyd

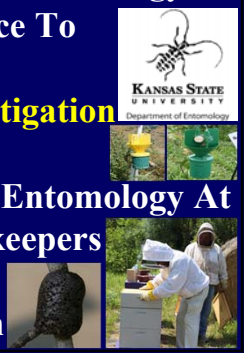
Professor and Extension Specialist in Horticultural Entomology/Plant Protection

Department of Entomology: Kansas State University; Manhattan, KS

Phone: 785-532-4750/785-236-9150 Email: rcloyd@ksu.edu

Overview Of Presentation

* How The Department Of Entomology At KSU Provides Assistance To Producers
* Japanese Beetle Adult Mitigation Using Traps
* How The Department Of Entomology At KSU Supports KS Beekeepers
* How Insects Overwinter
* Questions And Discussion



Raymond A. Cloyd

70% Extension And 30% Research

Responsibilities:

* Greenhouses
* Nurseries
* Turfgrass
* Landscapes
* Interiorscapes/Conservatories
* Christmas Trees
* Vegetables
* Fruits
* Hemp
* Pollinators

Kansas State University Extension Entomology Newsletter

For Agribusinesses, Applicators, Consultants, Extension Personnel & Homeowners

Department of Entomology
123 West Waters Hall
K-State Research and Extension
Manhattan, Kansas 66506
785-532-5891
http://blogs.k-state.edu/kansasbugs/
http://www.entomology.ksu.edu/extension

April 7, 2021 No. 3

Eastern Tent Caterpillar

The larvae (caterpillars) of the Eastern tent caterpillar, *Malacosoma americanum*, are emerging (eclosing) from their eggs and feeding on the leaves of trees and shrubs (Figure 1). After caterpillar's emerge from the eggs, they create a distinct white, silken nest (or tent) in the branch crotches of trees and shrubs

K-STATE Research and Extension

Insect and Mite Pests of Vegetable Gardens

Vegetable crops grown in the garden are susceptible to a diverse array of insect and mite pests. Therefore, it is important to properly identify and manage these pests, though the specific pests and type of damage can vary by crop and the time of year. This publication explains how to detect potential problems and how to identify pests in vegetable gardens based on the type of plant damage. A discussion of pest life cycles provides information that can be used to select appropriate plant protection strategies.

Identification and Plant Damage

Inspect plants regularly throughout the growing season checking for insect and mite pests and plant damage. Most pests that feed on vegetable plants have either chewing or sucking mouthparts, which produce different types of feeding damage. For example, insect pests with chewing mouthparts feed on plant parts including: leaves, stems, flowers, fruits, and roots and physically remove plant tissues while feeding. Insect and mite pests with sucking mouthparts feed on plant fluids causing stunting, wilting, leaf distortion, and leaf yellowing.

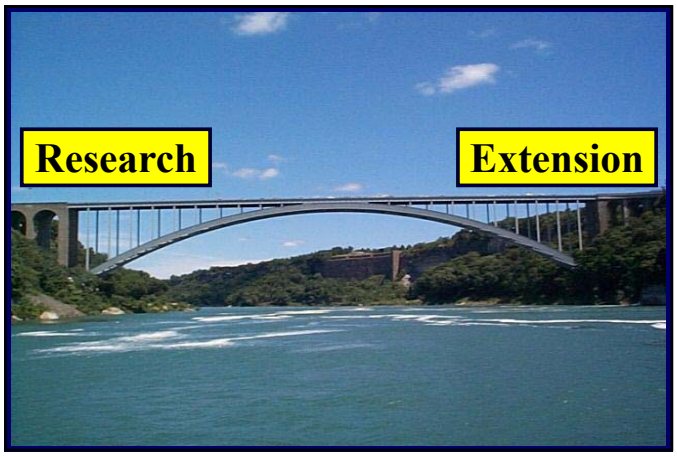
Some insect pests leave physical evidence of their feeding and development. For example, caterpillars produce fecal deposits or frass (Figure 1), whereas sucking insects such as aphids and leafhoppers produce a clear, sticky substance called honeydew (Figure 2). In addition, aphids leave behind molting skins (Figure 3) that can be mistaken for whiteflies. Although some insect pests such as beetles and caterpillars only feed at night, their damage and/or fecal deposits are visible during the day.

In addition to direct damage caused by insect and mite pests, a number of insect pests such as aphids, leafhoppers, thrips, and certain beetles cause indirect damage by transmitting diseases (e.g., fungi or viruses) when feeding or by creating wounds that allow for infection by disease-causing organisms.

Insect and Mite Pest Life Cycles

Knowing the life cycle of a given insect or mite pest and the life stage that may be present on plants at a particular time helps anticipate when pest problems are likely to occur during the growing season. In addition, it is important to understand the life cycle (egg to adult) and be able to identify the life stages (larva, nymph, and adult) that are most susceptible to plant protection strategies. Furthermore, knowing the time of year (spring and summer) insect and mite pests are feeding on plants and how insect and mite pests survive the winter (overwinter) is helpful in effectively managing pests in vegetable gardens.

Some insect pests feed early in the growing season (striped cucumber beetle), whereas other insect and mite pests feed later in the growing season (stink bugs and twospotted spider mite). Insect and mite pests can overwinter as eggs, larvae, nymphs, pupae, or adults depending on the specific insect or mite pest. The overwintering stage determines



Pines Grown As Christmas Trees Are Susceptible To A Number Of Insect Pests

Pine Tortoise Scale Red Nymphs (Crawlers)

Pine Tortoise Scale Infestations Can Ruin The Aesthetic Quality And Substantially Impact The Salability Of Christmas Trees

Research Project Collaborators (2021)

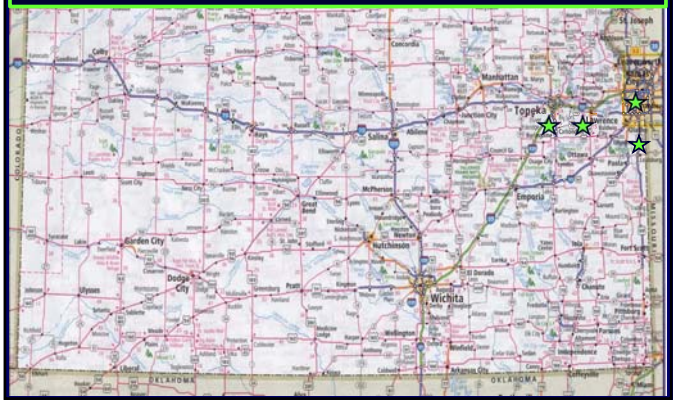
1. Country Christmas Trees (Wakarusa, KS: Eldon Clawson)

2. Prairie Elf Christmas Trees (Lawrence, KS: Kathy/Jeff Heeb)

3. Midland Holiday Pines (Shawnee, KS: Phil Wegman)

4. D & G Christmas Tree Farm (Louisburg, KS: Doug Eble)

Locations Of Four Collaborators Within Kansas

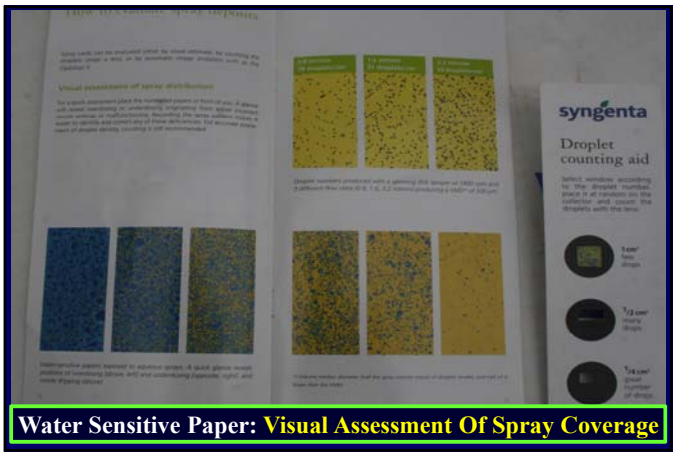


Pine Tortoise Scale Research Project

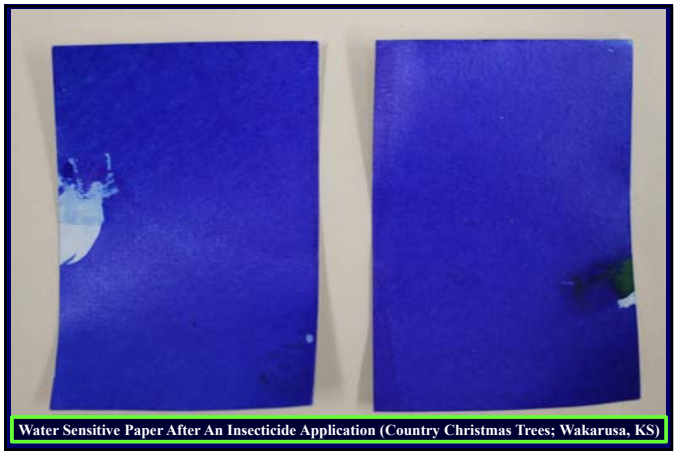
* Monitored Activity Of Pine Tortoise Scale Red Nymphs (Crawlers) From June Through November (June 8, 24, and 30; July 8 and 22; August 7; September 1; October 1; and November 1, 2021).
* Activity Of Red Nymphs (Crawlers) Determined Timing Of Insecticide Applications.

Monitoring Pine Tortoise Scale Nymphal Activity During The Growing Season

Water Sensitive Paper: Use To Determine Spray Coverage



Water Sensitive Paper: Visual Assessment Of Spray Coverage



Water Sensitive Paper After An Insecticide Application (Country Christmas Trees; Wakarusa, KS)

Timing Insecticide Applications When The Susceptible Life Stage (Red Nymphs Or Crawlers) Of Pine Tortoise Scale Was Active And Thorough Coverage Of All Plant Parts (Needles And Branches) Reduced Problems Later On In The Growing Season

Results Of Research Project

* No Live Pine Tortoise Scale Red Nymphs (Crawlers) Were Present From July 8 Through November 1, 2021.

* Monitoring Helped Time Insecticide Applications Accordingly And Water Sensitive Paper Provided An Assessment Of Coverage Associated With Insecticide Applications.

* All Christmas Trees From All Four Operations (Farms) Were Marketable For Sale.

"Hi Raymond. It has been a very rewarding experience working with you on the pine tortoise scale project. Thank you for your dedication to this matter and it is good to have it behind us…well for this year anyway???? You saved a lot of trees for us, thank you very much!!!!" (Kathy Heeb: Prairie Elf Christmas Trees; Lawrence, KS. November 2, 2021)

"Those of us who were part of the Pine Tortoise project are most grateful for all you did to educate us and help us save our Christmas trees!" (Phil Wegman: Midland Holiday Pines; Shawnee, KS. January 5, 2022)

Japanese Beetle, *Popillia japonica*, Adults

Japanese Beetle: Information

* Native of Japan.

* Introduced into the USA in 1916 (Riverton, NJ).

* Adults present during the summer (June-August).

* Feed on over 300 plant species.

* Adults are 1/3 to 1/2 of an inch long with white tufts of hair on the periphery of the abdomen. Metallic green with bronze or coppery-brown wing covers.

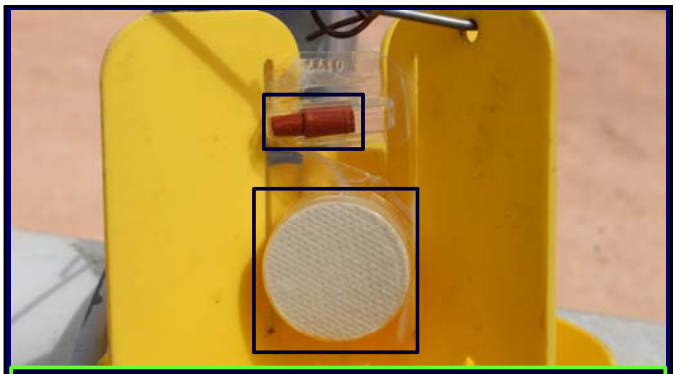
* Adults feed on leaves, flowers, and fruits.

* Adults live about 30 to 45 days.

* Active on warm sunny days, and feed on the upper leaf surface resulting in skeletonization.

Japanese Beetle Adult Trap

Japanese Beetle Adult Traps



Japanese Beetle Adult Trap: **Pheromone Lure (Male) And Attractant (Female)**

Japanese Beetle (Coleoptera: Scarabaeidae) Traps: Evaluation of Single and Multiple Arrangements for Reducing Defoliation in Urban Landscape

F. CARTER GORDON AND DANIEL A. POTTER

Department of Entomology, University of Kentucky, Lexington, Kentucky 40546-0091

J. Econ. Entomol. 79: 1381–1384 (1986)

ABSTRACT We determined in an earlier study that single Japanese beetle, *Popillia japonica* Newman, traps, used according to manufacturers' specifications, were ineffective for reducing defoliation of potted grape, *Vitis* sp., plants in urban landscape. In this study, we tested the hypothesis that single trap placements might be more effective for protecting a relatively less attractive host species, and evaluated five multiple trap arrangements (2–7 traps) for effectiveness in reducing defoliation of grape. Single traps, positioned 3.1 m upwind or 9.3 m downwind of pin oak, *Quercus palustris* L., trees, resulted in significantly greater defoliation than on trees without traps. None of the multiple trap arrangements reduced defoliation, and four of the five placements resulted in significantly greater damage than without traps. Use of single Japanese beetle traps or small scale multiple trap arrangements will not prevent or reduce defoliation of nearby plantings and will probably increase the damage inflicted upon both highly preferred and relatively less attractive hosts.

Mass trapping designs for organic control of the Japanese beetle, *Popillia japonica* (Coleoptera: Scarabaeidae)

Jaime C Piñero* and Austen P Dudenhoeffer

Abstract

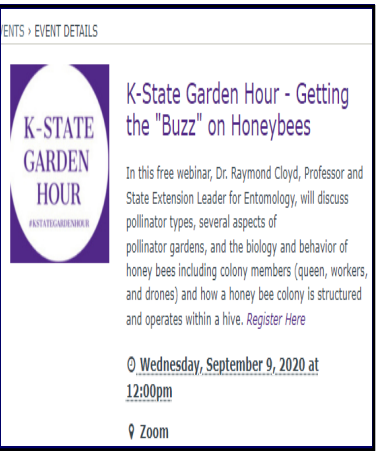
BACKGROUND: In some regions of North America, damage caused by the Japanese beetle, *Popillia japonica*, has been increasing as beetle populations continue to become established and expand. This poses a pest management challenge for crop farmers, in particular organic producers. From 2014 to 2016 we evaluated the ability of novel mass trapping systems to capture *P. japonica* in elderberry and blueberry orchards in Missouri, USA.

RESULTS: Across a 3-year period in two locations, the mass trapping systems collected 10.3 million *P. japonica* adults while season-long adult densities on crop plants were comparatively low (elderberry: 0.5–3.7 per plant; blueberry: 0.01–0.07 per plant). Damage by *P. japonica* averaged 6.8% per plant in elderberry and 0.12% in blueberry. In 2015 and 2016, large-capacity bins with increased ventilation captured similar beetle numbers as did 1.2-m-long mesh socks (single design used in 2014), and these two trap designs outperformed non-ventilated bins.

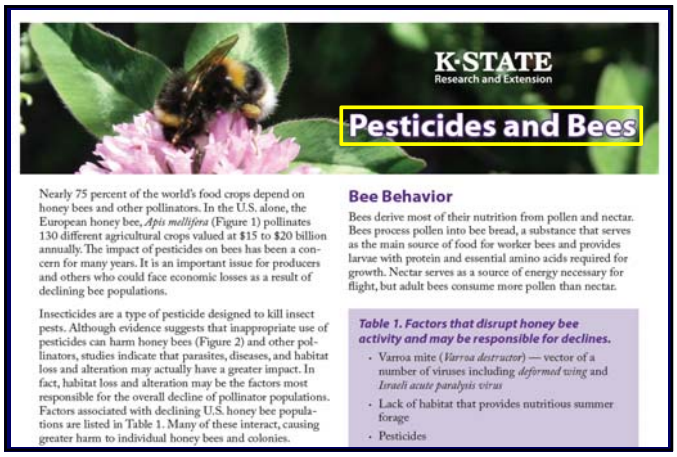
CONCLUSION: The mass trapping designs captured high numbers of adult *P. japonica*, while comparatively few adults and little damage to the foliage were recorded on plants. Mass trapping may provide effective alternative management options for *P. japonica* with less or no insecticides applied to the crop.

Brandon Taylor, owner of Taylor Family Orchard, has been placing Japanese beetle traps around his organically grown peaches and apples since 2018.

Konza Beekeepers Association And Northeastern Kansas Beekeepers Association



Keith Westervelt And I Working Honey Bee Hives



What Does Overwintering Mean?

Overwintering is a physiological condition of growth retardation or arrest that is primarily designed to overcome lower than optimum temperatures during winter (Mansingh 1971)

Insects Are Poikilothermic ("Cold-Blooded" Or Body Temperature Fluctuates With Environmental Temperature) And Have Variable Responses As Winter Approaches

1. Migration: movement over great distances
2. Diapause: physiological state of arrested growth and development
3. Dormancy: a seasonal period in the life cycle in which growth, development, and reproduction are suppressed

Fall Armyworm, *Spodoptera frugiperda*, Caterpillars

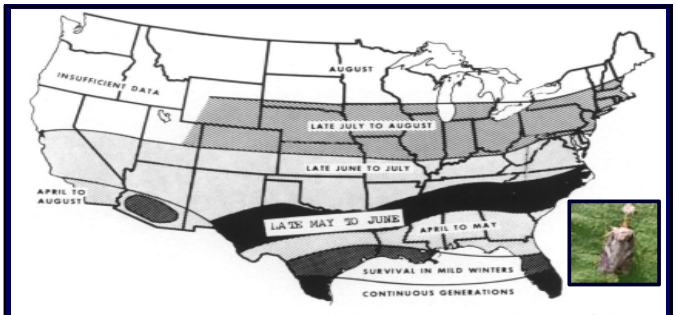


Fig. 1. Seasonal distribution of the fall armyworm in the United States.

Georgia stock as bait in sticky traps to estimate the FAW population on St. Croix, U.S. Virgin Islands. In 1978, Mitchell and Sparks[4] found that the FAW male population near Santa Cruz, Bolivia, responded to laboratory-reared FAW females from Florida and to the FAW sex pheromone, (*Z*)-9-dodecen-1-ol acetate, identified by Sekul and Sparks (1976) from Georgia stock; the data obtained were very similar to trapping responses observed in the U.S.

Abiotic Cues/Stimuli That Help Insect Pests Know When Winter Is Approaching

1. Photoperiod (Daylength)

2. Temperature

3. Moisture

* Interactions Between Photoperiod And Temperature

Factors That Influence The Effects Of Weather On Insect Pests

* Length (duration) of cold spells

* Snow depth (cover)

* Extremes in sudden temperature changes

Overwintering Strategies

Insect pests seek protected locations outside or inside that provide protection from repeated freezing and thawing

* Cracks and crevices in loose bark of woody plants, fallen leaves, and debris on ground

* Homes or structures

Cold Duration (5 To 6 Weeks) Contributes To Insect Pest Mortality.

Rapid Freezing And Thawing Cycles Are Detrimental To Insect Pests Because Of Expansion And Rupturing Of Cells.

However, Most Insect Pests Utilize Overwintering Sites (Soil Or Leaf Litter) To Provide Protection From The Cold Extremes Of Winter.

Freeze Tolerance: ability to tolerate the formation of ice in the body tissues and fluids. Insect pests convert 50% or more of their total body water into extracellular ice.

Freeze Intolerance (Avoidance): ability of insect pests to survive low temperatures by means of supercooling. Stop feeding and empty digestive system before winter to remove any substances that could contribute to the formation of ice crystals.

Supercooling: process of lowering the temperature of a liquid below the freezing point so the liquid does not become a solid.

Insect pests preserve liquids in their bodies at lower temperatures by reducing the body water content. This is accomplished by using compounds called cryoprotectants; such as, polyols and sugars, and glycerol (natural anti-freeze) that lower the temperature in which freezing occurs in the body.

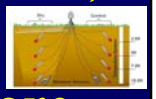
Cryoprotectants And Cryoprotection Associated With Freeze Tolerant Insect Pests

Most insect pests that overwinter based on freeze tolerance accumulate polyols and carbohydrates in which glycerol (natural anti-freeze) is the most common and abundant substance.

Many Insect Pests Overwinter Deep In The Soil Profile Where The Temperatures Are Higher

A Thick Snow Cover Acts As An 'Insulating Agent' That Enhances Survival. In Fact, The Soil Temperature Can Be 20 to 30°F Warmer Than The Ambient Air Temperature

<u>Cold Avoidance</u>: Grubs Move Deeper Into The Soil Profile, As The Soil Temperature Decreases, Where The Soil Temperature Is More Stable.



Grubs In The Soil Are Protected From Extremes In Temperature

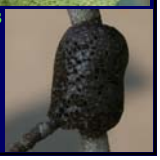
Insect Pests Can Overwinter As Eggs, Nymphs/Larvae, Pupae, Or Adults


* Eggs=aphids
* Larvae/Pupae=caterpillars and borers
* Adults=beetles and true bugs


How Do Insect Pests Overwinter?





* Bagworm=Eggs
* Aphids=Eggs
* Chinch Bugs=Adults
* Elm Leaf Beetle=Adults
* Fall Webworm=Pupae
* Cutworms=Larvae/Pupae
* Grasshoppers=Eggs
* Lace Bugs=Eggs/Adults
* Twospotted Spider Mite=Eggs/Adults
* Spruce Spider Mite=Eggs
* Japanese Beetle=Larvae/Pupae
* Leafhoppers=Adults/Eggs
* Eastern Tent Caterpillar=Eggs

How Do Scale Insect Pests Overwinter?

Scales are insect pests that appear as bumps on a log, resembling outgrowths or galls on host plants. Scales feed on a wide range of plants (trees and shrubs) and can cause serious plant damage if not managed. Scales can be host-specific or feed on many plant species. Scales disperse as first-instar nymphs or crawlers by wind, birds, or insects, and can spread when plant leaves are touching. In general, the abundance and distribution of scale populations within a landscape is associated with the availability of susceptible plants. This fact sheet provides information on biology, scale types, plant damage, and offers strategies for managing specific types of scales.

Table 1. Common name and scientific name of soft or bark scales that feed on trees and shrubs.

Common Name	Scientific Name
Cottony maple scale	*Pulvinaria innumerabilis*
European elm scale	*Gossyparia spuria*
European fruit lecanium scale	*Parthenolecanium corni*
Fletcher scale	*Parthenolecanium fletcheri*
Magnolia scale	*Neolecanium cornuparvum*
Oak kermes scale	*Kermes pubescens*
Pine tortoise scale	*Toumeyella parvicornis*
Tuliptree scale	*Toumeyella liriodendri*

Table 3. Common name, scientific name, scale type (hard or soft), and overwintering life stages of scales.

Common Name	Scientific Name	Scale Type	Overwintering Life Stage
Euonymus scale	*Unaspis euonymi*	Hard	Fertilized female
Gloomy scale	*Melanaspis tenebricosa*	Hard	Fertilized female
Juniper scale	*Carulaspis juniperi*	Hard	Fertilized female
Obscure scale	*Melanaspis obscura*	Hard	Second instar nymph on bark
Oystershell scale	*Lepidosaphes ulmi*	Hard	Eggs underneath covering of dead female
Pine needle scale	*Chionaspis pinifoliae*	Hard	Eggs underneath covering of dead female
San Jose scale	*Quadraspidiotus perniciosus*	Hard	Second instar nymph
Cottony maple scale	*Pulvinaria innumerabilis*	Soft	Second instar female nymph on twigs or branches
European elm scale	*Gossyparia spuria*	Soft	Second instar nymph in bark crevices
European fruit lecanium scale	*Parthenolecanium corni*	Soft	Second instar nymph
Fletcher scale	*Parthenolecanium fletcheri*	Soft	Second instar nymph on leaves and shoots
Magnolia scale	*Neolecanium cornuparvum*	Soft	Nymph on twigs or branches
Oak kermes scale	*Kermes pubescens*	Soft	First instar nymph on branches
Pine tortoise scale	*Toumeyella parvicornis*	Soft	Fertilized female on twigs
Tuliptree scale	*Toumeyella liriodendri*	Soft	Second instar nymph on twigs and branches

Dormant Oil

Dormant oil applications target overwintering immatures or females (e.g. euonymus scale, obscure scale, and cottony maple scale). Applications are less effective against scales that overwinter as eggs (e.g. pine needle and oystershell scale).

Illinois Department of Public Health

Prevention & Control

Occasional Invaders

Occasional invaders are insects and other arthropods that sporadically enter structures, sometimes in large numbers. If you've been invaded by pests that are not covered in our other fact sheets, chances are you'll find the information here.

By far the most common problem with occasional invaders is that they become an annoying nuisance. Some can bite, pinch, secrete foul odors, damage plants, stain indoor furnishings, and damage fabrics. Even after they are dead, the problem may continue. The bodies of dead insects can attract other pests that feed on them, and the bodies, shed skins, secretions and feces of insects can cause allergic responses and trigger asthma.

Whether they're insects, mites or arthropods, occasional invaders typically live and reproduce outdoors. They invade structures when conditions indoors are better for them than outdoor conditions. It is important to know the conditions that prompt invasions of unwanted pests. Altering environmental conditions can make structures inhospitable for pests, and is an important component of integrated pest management.

COMMON OCCASIONAL INVADERS

Insects (And Mites) That Enter Homes Or Structures To Overwinter

* Asian Ladybird Beetle

* Box Elder Bug

* Elm Leaf Beetle

* Cluster Flies

* Clover Mites

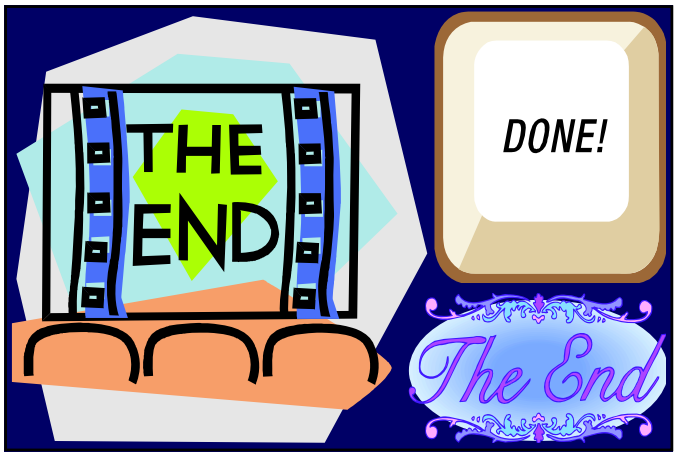
* Brown Marmorated Stink Bug

Summary: How Insect Pests Overwinter

1. Insect pests can overwinter in various life stages—eggs, larvae/nymphs, pupae, and/or adults.
2. Insect pests avoid cold temperatures by means of freeze tolerance or freeze avoidance.
3. Snow cover acts as an 'insulating agent' providing protection from aboveground winter temperatures.
4. Dormant oils are effective, in general, against insect (and mite) pests that overwinter as larvae/nymphs and eggs located on plants (trees and shrubs).

Thank You For Your Attention!

I Hope You All Learned Something!


THE END
DONE!
The End


PEST CONTROL
What?
Which?
Where?
Any Questions?
How?
When?
Why?