Insect Traps and Monitoring Techniques in the Landscape and Garden

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Utah State University

Turf and Landscape Maintenance Workshop
January 11, 2016

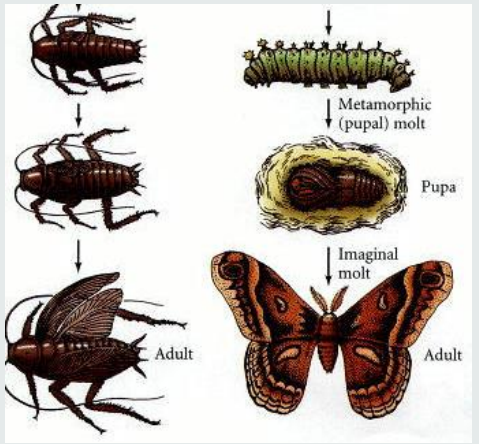

Pesticide Free
Promoting a safe and healthy comm
Pesticide Free Naturally
TAKE THE PLEDGE for a Pesticide-Free Lawn
CRD
Pesticide Free
IPM ACCREDITED
ipm
IPM STAR CERTIFIED
NO PESTICIDES
I LOVE MY FAMILY AND THE ENVIRONMENT MORE THAN MY LAWN.
Pesticide Free
Healthy Places People Pets
PESTICIDE FREE ZONE
Pesticide Free Nova Scotia
GREEN SHIELD CERTIFIED
Pest control. Peace of mind.
PESTICIDE FREE
This area SAFE FOR CHILDREN pets and other living things
NATURE WORKS

Integrated Pest Management (IPM)

- Sustainable
  - Economics, Environment, and Society
- Integrate Strategies
  - Cultural (plant & site management)
  - Mechanical (barriers, disruption, traps)
  - Biological (natural enemies)
  - Chemical (conventional, organic & bio-pesticides)
- Monitor pest numbers/injury
  - Treat only when needed

Why Monitor?

- provides early warning of potential pest problems
  - → when or whether to treat
- determines which life stage is active
- provides immediate feedback about whether pest control activities are working



Knowledge of pest/host ID and Biology

Knowledge of pest/host ID and Biology

Types of Insect Traps

Objectives:

1. Monitor: determine numbers of insects or their location
2. Manage: reduce insect populations

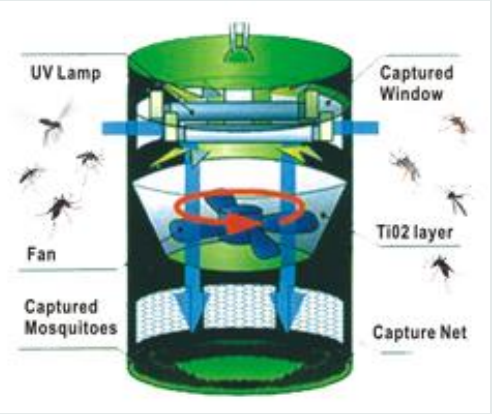
Requirements and Characteristics of Insect Traps

- Insects must be able to move to the trap (trap stationary)
- Trap must hold the insects after capture
- Advantages of traps:
  - Can capture insects 24/7
  - Can be left in place for a period of time
  - Often require low maintenance
  - Often low cost, or can be homemade
  - Usually low toxicity
- Disadvantages of traps:
  - Provide only a relative measure of abundance (not absolute)
  - Stationary – only provide a sample for the selected location
  - Some only attract one sex (pheromone traps) or the winged portion of the population (aphid suction traps)
  - Don't believe all you read in trap advertisements (try on a small scale first)

Japanese beetle trap

Visual Traps

- light, color, contrast, shape



Light Traps
(UV light: white, blacklight)

Color Traps
(bright colors reflect UV)

Contrast and Shape Traps
(mimic habitat or host)

Bait Traps

- chemical (odor) cues
- insect antennae, mouthparts, and sometimes legs are covered with chemo-receptors
  - insects live in a "chemical world"
- foods, attractive plant odors (kairomones), pheromone mimics (communication)

Fruit juice + Yeast
European paper wasp

Apple Cider Vinegar
Spotted wing drosophila

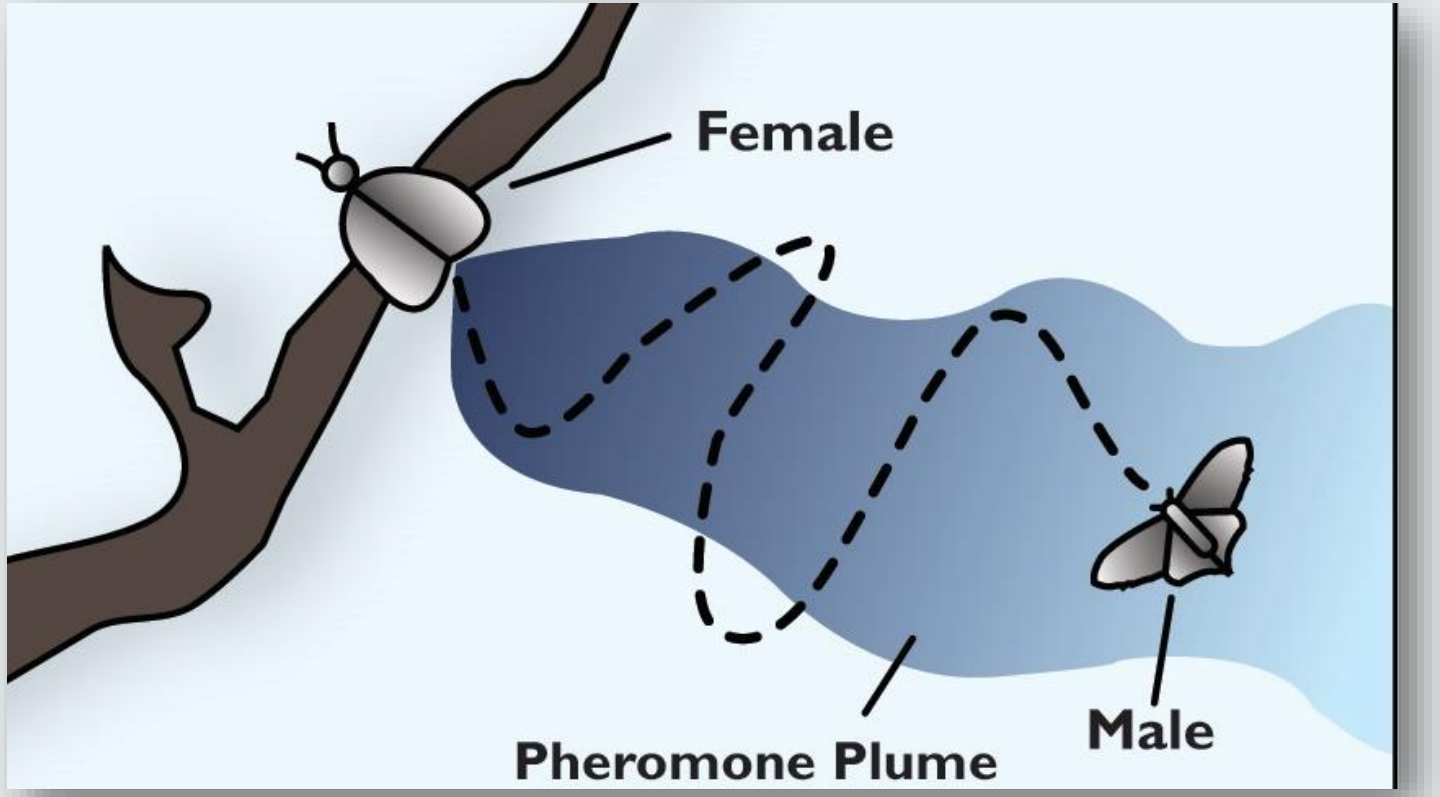
Spinosad + Bait
Fruit flies

Pheromone + Floral lure
Japanese beetle

Sex Pheromone
Many pest moths

Pheromones for Monitoring

Communication within a species



Passive Traps

- intercept insects in their habitat (indoors and outdoors)
- often combined with other attractants (light, color)

Spider sticky trap/glue boards

Window pane trap

Pan of soapy water + light
Brown marmorated stink bug

Pitfall trap
Ground crawling insects
Turf billbugs

Insect Monitoring

in landscapes and gardens

Traps

Thrips

Lilac-Ash Borer

Snails, Slugs

Cherry Fruit Fly
Walnut Husk Fly

Codling Moth, Peachtree Borer

Scale Insects, Spider Mites

European Paper Wasp

Lawn Billbugs

Essential Insect Monitoring Supplies

Hand lens (10-30 × magnification)

Beating Tray and Padded Stick

Sweep Net

Appropriate traps & lures

Pruners, knife, trowel
Vials, plastic bags & containers

Record-keeping

How to Monitor

steps in an effective monitoring program

Monitoring Steps

1. **Site inspection**
2. Plant evaluation
3. Pest detection
4. Treatment evaluation
5. Record-keeping

Site Inspection Sleuth

Monitoring – Site Inspection

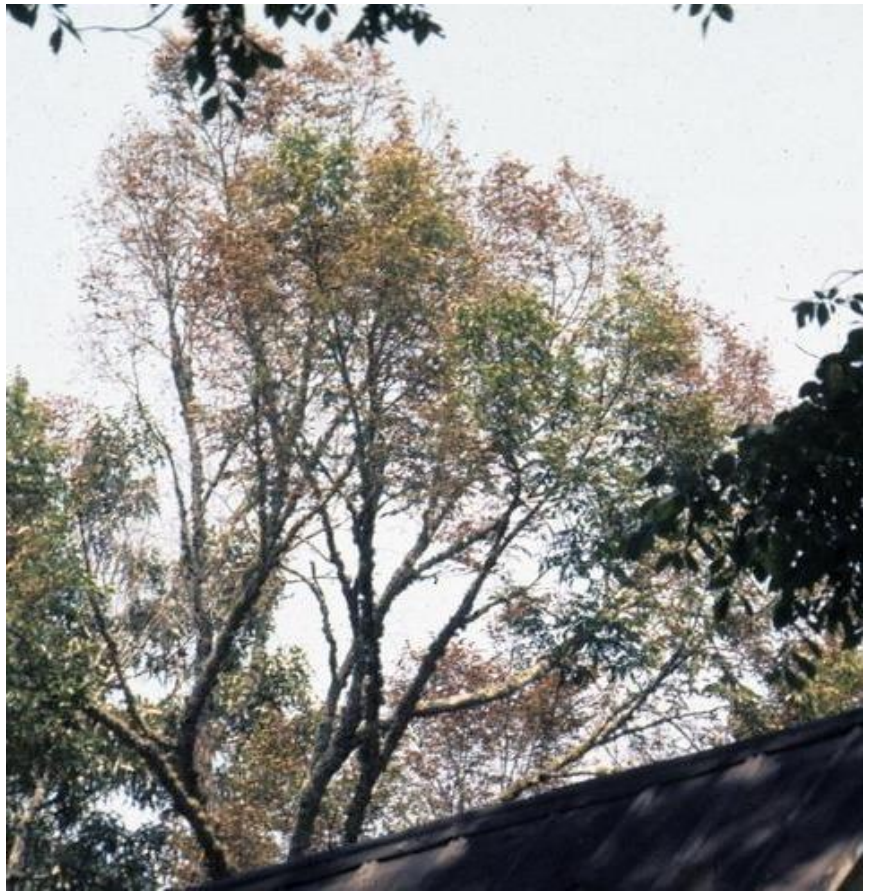
- Location:
  - Structures: adjacent buildings, walkways, roads, air conditioning
  - Exposure
- Signs of construction/digging
- History of tree care
- Weather patterns
  - -10 degrees F
- Chemical applications: deicing salts, herbicides, stains, etc.

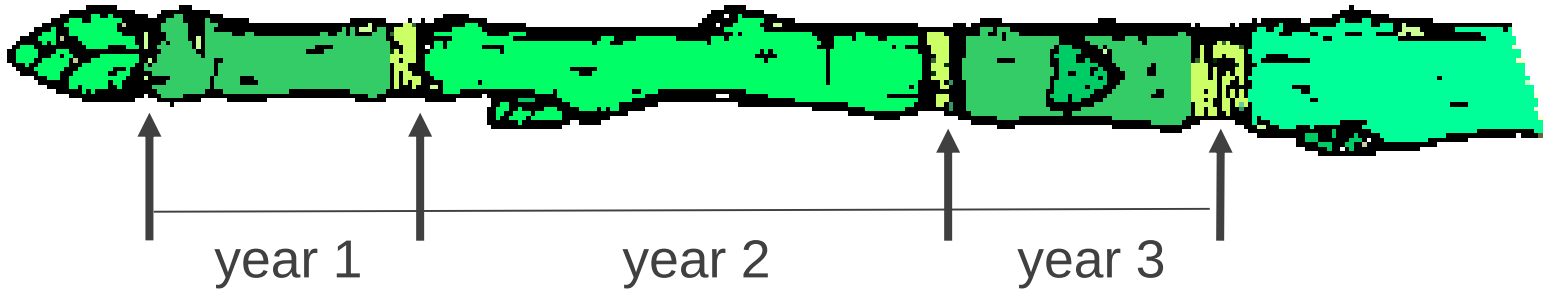
Monitoring Steps

1. Site inspection
2. **Plant evaluation**
3. Pest detection
4. Treatment evaluation
5. Record-keeping

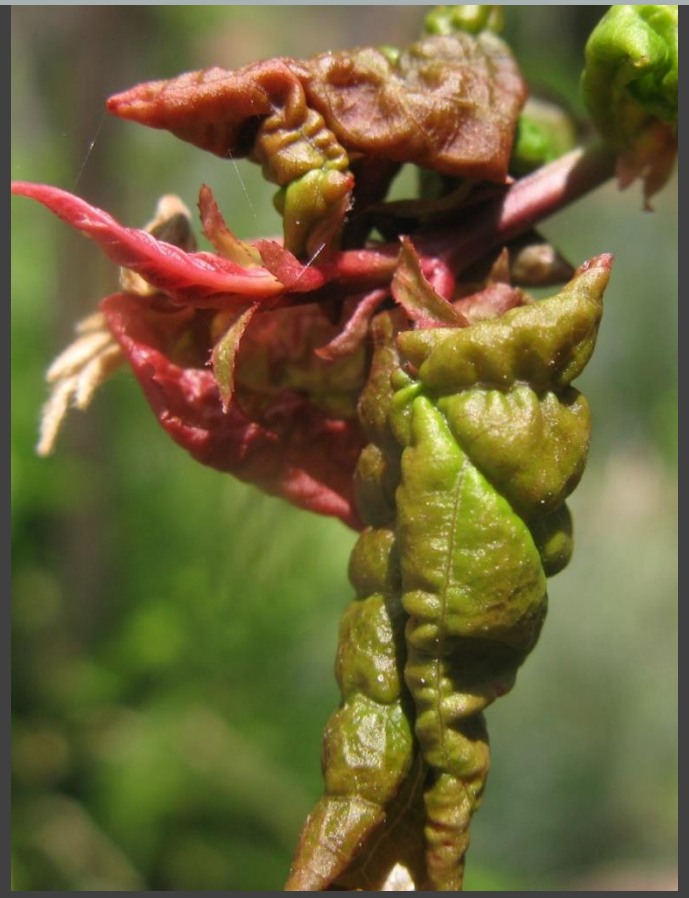
Inspector
"Plant Evaluator"

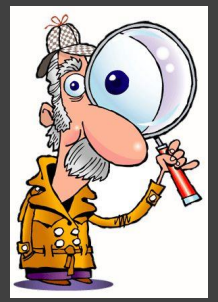
Monitoring – Plant Evaluation - Identification





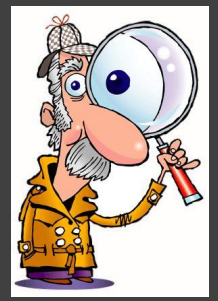
Monitoring – Plant Evaluation – Symptoms





Monitoring – Plant Evaluation – Symptoms

Monitoring – Plant Evaluation – Symptoms



Monitoring – Plant Evaluation – Patterns

Monitoring Steps

1. Site inspection
2. Plant evaluation
3. **Detection of pests and beneficials**
4. Treatment evaluation
5. Record-keeping

Pest Detective

Aphid Monitoring

- use beating tray
- look for curling leaves, honeydew
- use hand lens to inspect leaves; look for aphids and predators

PLANT BUGS

honeylocust plant bug

honeylocust plant bug

ash plant bug

sycamore plant bug

Plant Bug Monitoring

- damage often not seen until population is high
- use beating tray starting in early spring to look for adults and nymphs
- examine undersides of leaves for activity

SPIDER MITES

two-spotted spider mite

spruce spider mite damage on fir

two-spotted spider mite damage

spruce spider mite eggs

Spider Mite Monitoring

- shake branches over white cloth tray or paper to look for small, dislodged mites

- for two-spotted spider mite, examine foliage of lowest branches first in late spring to early summer

CANKERWORM

Cankerworm Monitoring

- during dormancy, look for egg masses
- shake branches above a cloth tray to look for newly emerged larvae in April as leaves begin emerging
- look for early feeding on the newest growth

EUROPEAN PINE SHOOT MOTH

European Pine Shoot Moth Monitoring

- look for damage (dead buds, gummosis); cut open buds to look for live larvae

- hang pheromone traps in early July near trees to time application

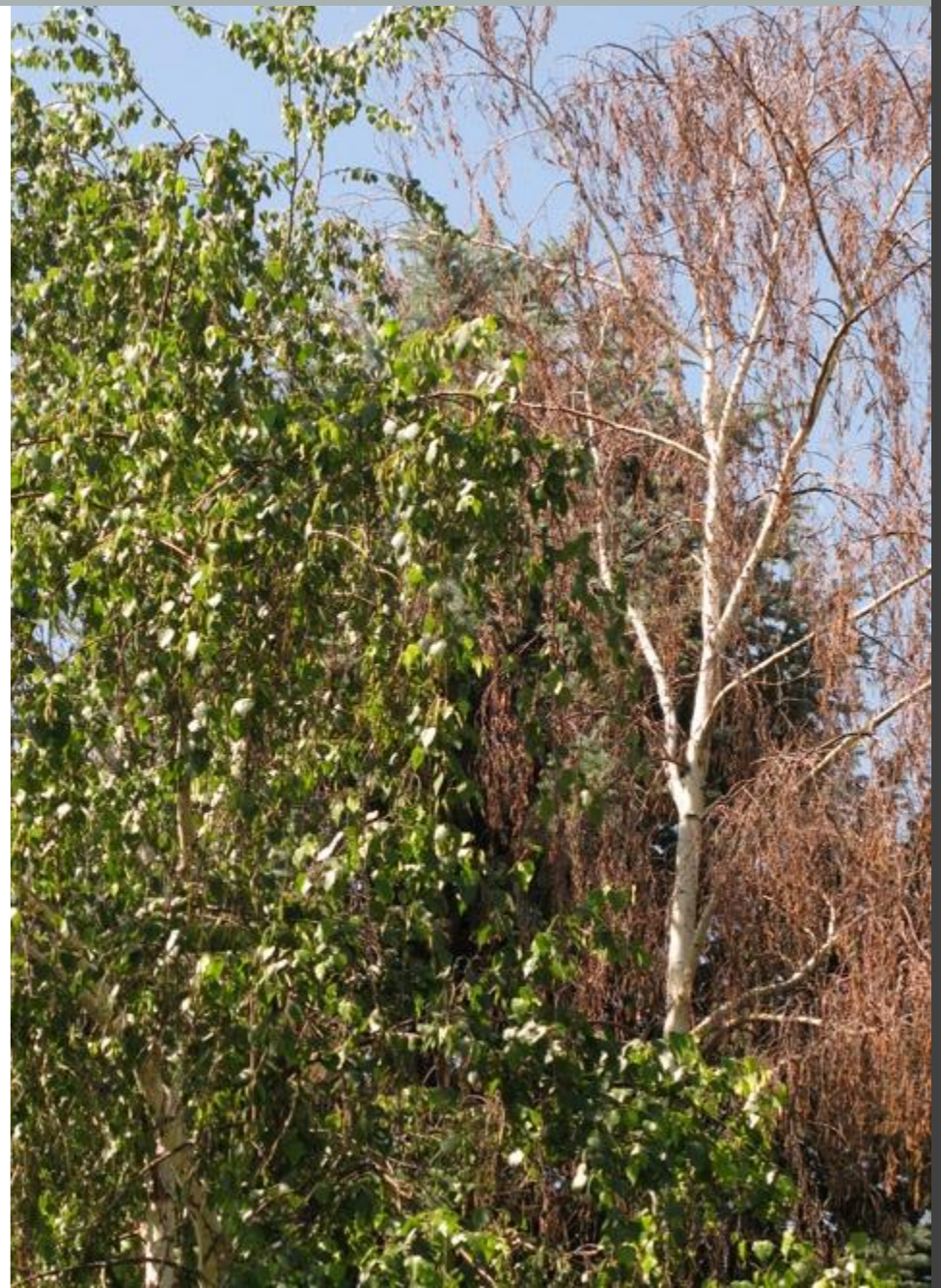
Tree Borer Monitoring

- examine general health of tree
- look for uniquely-shaped exit holes
  - D-shaped or large oval
  - small, ‘shothole’
  - pinprick





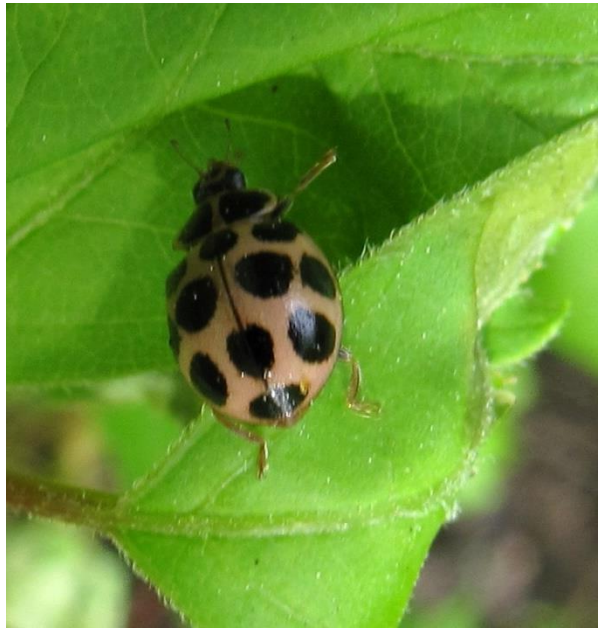
TREE BORERS




BioLure
Scenturion
SUTERRA

Monitoring Beneficial Insects

Lady Beetles






Lacewings

Syrphid Fly/Hover Fly

Minute Pirate Bug

Predatory Mites

Typhlodromus
Western predatory mite

Balustium mite

Phytoseiulus
mite

Parasitoids (Wasps, flies)

Parasitoids (Wasps, flies)

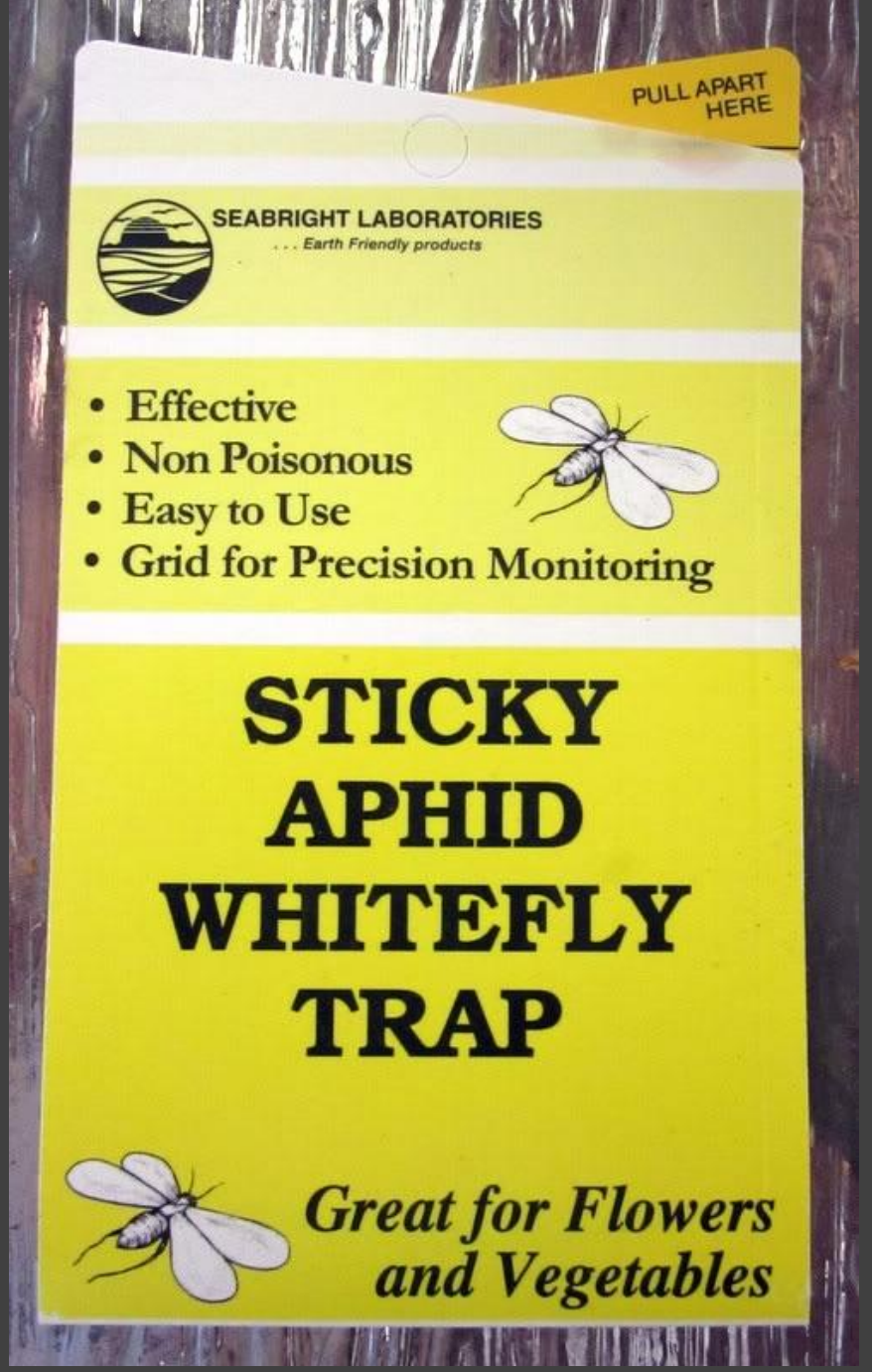
Parasitoids

Aphid Parasitoids

Monitoring Steps

1. Site inspection
2. Plant evaluation
3. **Pest detection**
   - Insects
     - **Techniques**
     - **Using degree days**
4. Treatment evaluation
5. Record-keeping

"Snoop Dog" Entomologist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SEABRIGHT LABORATORIES
. . . Earth Friendly products
• Effective
• Non Poisonous
• Easy to Use
• Grid for Precision Monitoring
STICKY APHID WHITEFLY TRAP
Great for Flowers and Vegetables


BioLure
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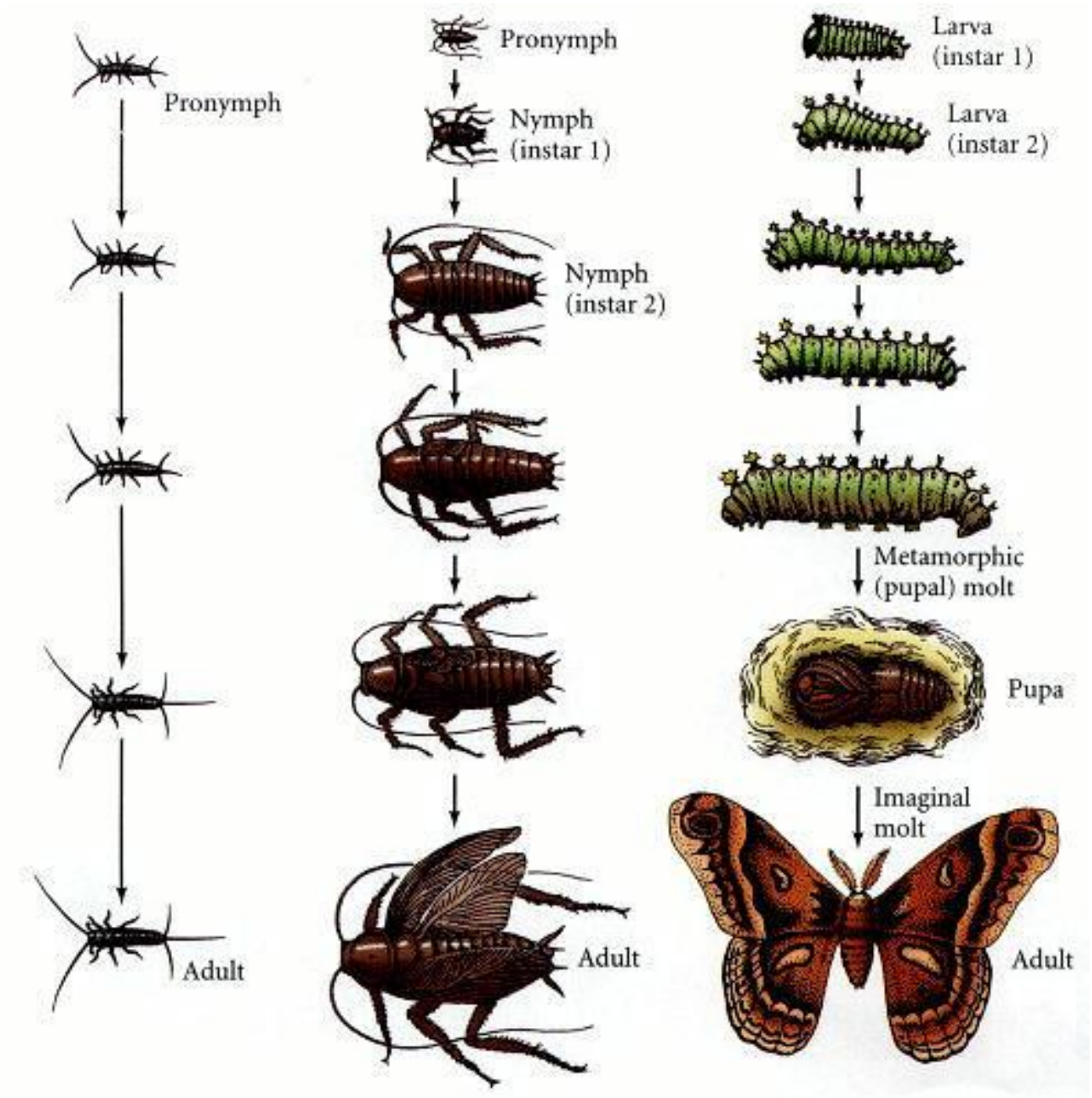
Unsure of Identification?

Send samples to your county Extension office, or to the Utah Plant Pest Diagnostic Lab (UPPDL) in Logan:

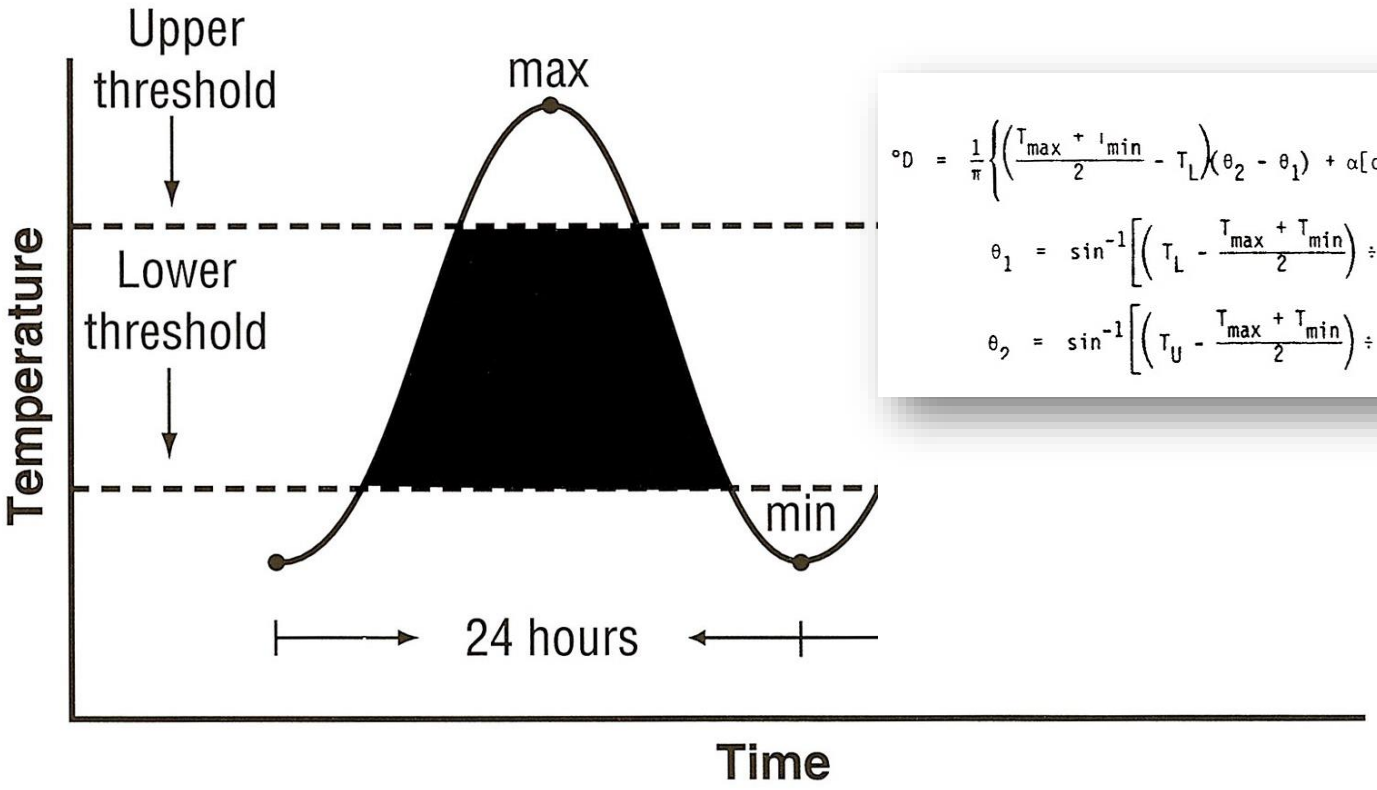
utahpests.usu.edu/uppdl

Pest detection and evaluation – Insect Development



Pest detection and evaluation – Degree Days

Degree days are a measurement of heat units over time



$$^{\circ}D = \frac{1}{\pi}\left\{\left(\frac{T_{max} + T_{min}}{2} - T_L\right)(\theta_2 - \theta_1) + \alpha[\cos(\theta_1) - \cos(\theta_2)] + (T_U - T_L)\left(\frac{\pi}{2} - \theta_2\right)\right\}$$

$$\theta_1 = \sin^{-1}\left[\left(T_L - \frac{T_{max} + T_{min}}{2}\right) \div \alpha\right]$$

$$\theta_2 = \sin^{-1}\left[\left(T_U - \frac{T_{max} + T_{min}}{2}\right) \div \alpha\right]$$

Pest detection and evaluation – Degree Days

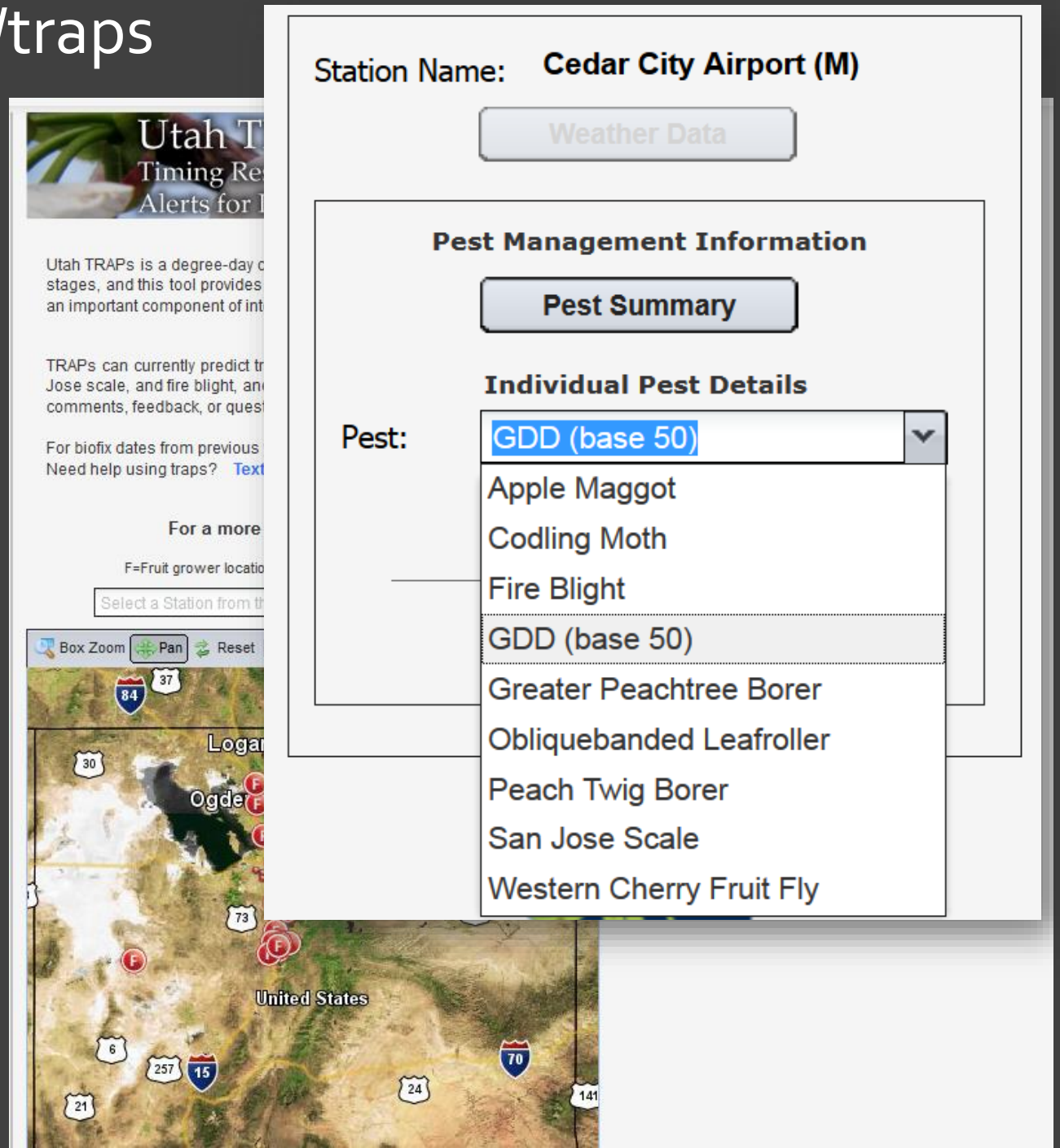
For example, 30 DD on March 1 + 32 DD on March 2 + 10 DD on March 3 = 72 DD by March 4

Insect Event	Degree Days	2007	2011	2013
cankerworm	150	April 9	May 11	May 4
lilac borer	324	May 7	June 5	May 20
black pineleaf scale	1068	June 21	July 15	June 29

climate.usu.edu/traps

Utah TRAPs

Temperature
Resource &
Alerts for
Pests



Station Name: **Cedar City Airport**

Date Range: 03-01-2013 - 11-08-2013

Degree Day Results for: GDD (base 50)

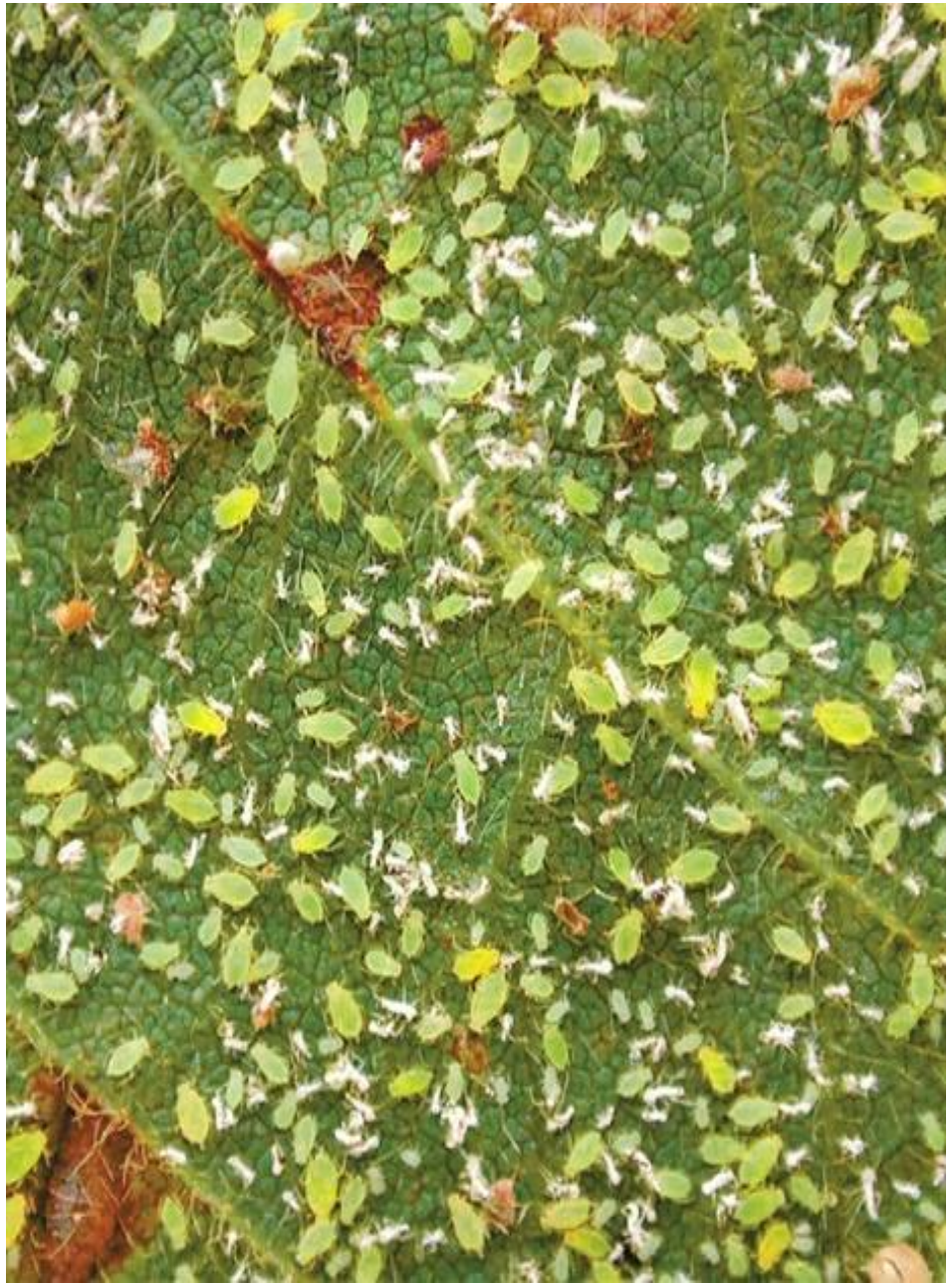
Date	Min °F	Max °F	Degree Days	Source	Common Name	Life Stage
05-22-2013	52	90	954			
--			937		Northern Catalpa	Full bloom
05-23-2013	51	86	972			
05-24-2013	50	87	990			
05-25-2013	49	88	1008			
05-26-2013	49	86	1026			
--			1019		Elderberry	Full bloom
05-27-2013	51	87	1045			
--			1029		European elm scale	Crawlers active
05-28-2013	55	84	1065			
--			1050		Euonymus scale	Crawlers active
05-29-2013	54	82	1083			
--			1068		Black pineleaf scale	Crawlers active
05-30-2013	60	89	1107			
05-31-2013	61	87	1131			
06-01-2013	63	93	1157			

Monitoring Categories

1. Site inspection
2. Plant evaluation
3. Pest detection
4. **Treatment evaluation**
5. Record-keeping

Effectiveness Assessor

Monitoring – Treatment Evaluation



Spruce Spider Mite:
Treat if average of 10 or more mites are found per beat sample.

Aphids: Treat if more than 50 aphids per leaf per leaf exist.

Elm Leaf Beetle: Treat when there are more than 2 egg masses per branch.

Monitoring Steps

1. Site inspection
2. Plant evaluation
3. Pest detection
4. Treatment evaluation
5. **Record-keeping**

Note-Taker

Monitoring – Record-Keeping

Landscape Monitoring

Date 6/15

Name of Person Monitoring Marion Murray

Describe location of appropriate category:

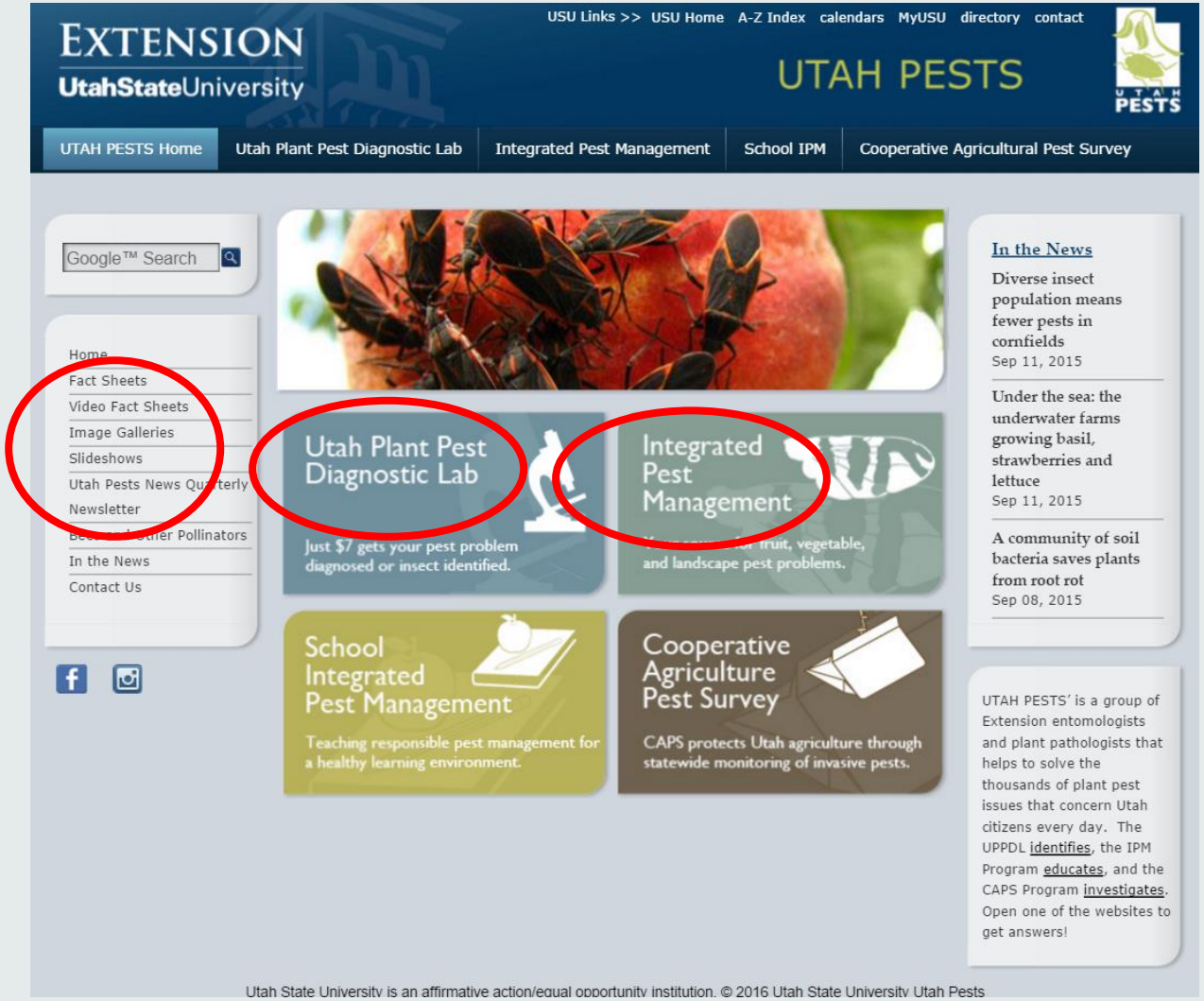
Ornamental beds _____ Fence Lines _____
Sport turf _____ Paved Areas _____
Ornamental turf _____ Trees Client backyard
Playground _____ Other _____

Name of Plant	Condition* of Plant Excellent Fair Good Poor	Name of Pest (If any are present)	Abundance* of Pests Plant Damage Few Common Abundant Innumerable		Presence of Natural Enemies	Management Activities	Comments
Blue Spruce	Good	Cooley Spruce Gall Aphid	Common	Common	None	Pruned 80% of Galls out of tree	Continue monitoring
			EXAMPLE				

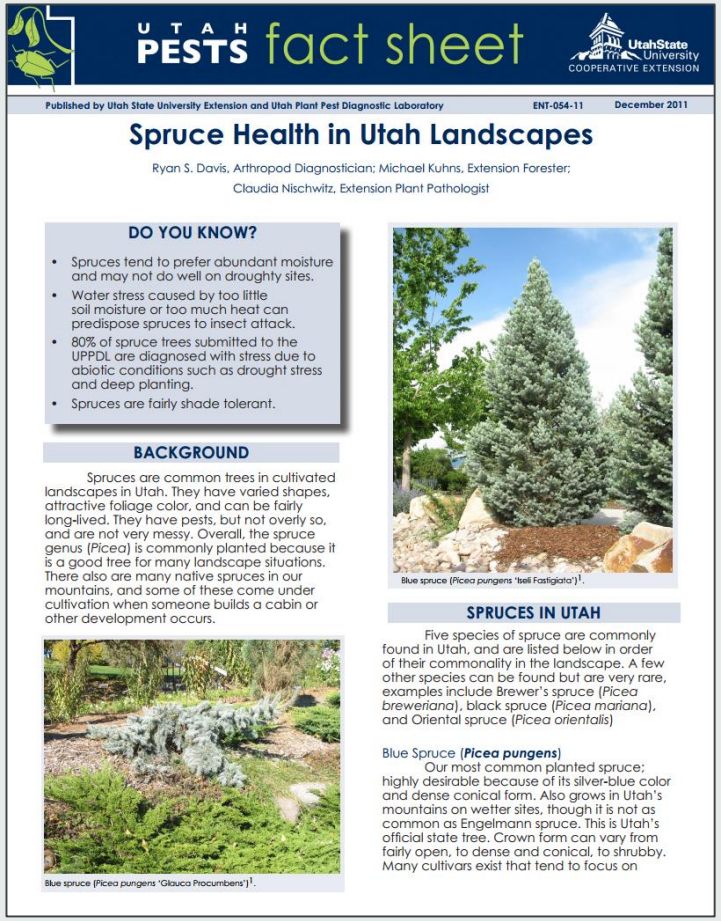
Utah Pests Online Resources

Utah Pests Online Resources

www.utahpests.usu.edu



Fact Sheets: over 200 fact sheets on pests of ornamentals, turf, fruits, vegetables, field crops, health-related, nuisance, stored products, structural, etc.



UTAH PESTS fact sheet

UtahState University COOPERATIVE EXTENSION

Published by Utah State University Extension and Utah Plant Pest Diagnostic Laboratory ENT-054-11 December 2011

Spruce Health in Utah Landscapes

Ryan S. Davis, Arthropod Diagnostician; Michael Kuhns, Extension Forester; Claudia Nischwitz, Extension Plant Pathologist

DO YOU KNOW?

- Spruces tend to prefer abundant moisture and may not do well on droughty sites.
- Water stress caused by too little soil moisture or too much heat can predispose spruces to insect attack.
- 80% of spruce trees submitted to the UPPDL are diagnosed with stress due to abiotic conditions such as drought stress and deep planting.
- Spruces are fairly shade tolerant.

BACKGROUND

Spruces are common trees in cultivated landscapes in Utah. They have varied shapes, attractive foliage color, and can be fairly long-lived. They have pests, but not overly so, and are not very messy. Overall, the spruce genus (*Picea*) is commonly planted because it is a good tree for many landscape situations. There also are many native spruces in our mountains, and some of these come under cultivation when someone builds a cabin or other development occurs.

Blue spruce (*Picea pungens* 'Glauca Procumbens')[1].

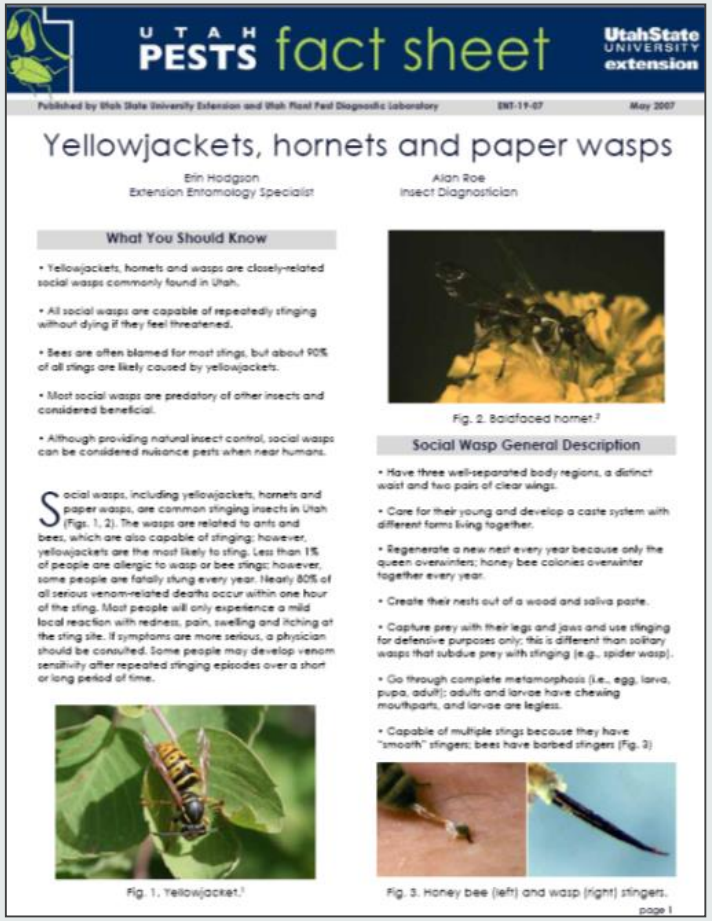
Blue spruce (*Picea pungens* 'Iseli Fastigiata')[1].

SPRUCES IN UTAH

Five species of spruce are commonly found in Utah, and are listed below in order of their commonality in the landscape. A few other species can be found but are very rare, examples include Brewer's spruce (*Picea breweriana*), black spruce (*Picea mariana*), and Oriental spruce (*Picea orientalis*)

Blue Spruce (***Picea pungens***)

Our most common planted spruce; highly desirable because of its silver-blue color and dense conical form. Also grows in Utah's mountains on wetter sites, though it is not as common as Engelmann spruce. This is Utah's official state tree. Crown form can vary from fairly open, to dense and conical, to shrubby. Many cultivars exist that tend to focus on



UTAH PESTS fact sheet

UtahState University extension

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Yellowjackets, hornets and paper wasps

Erin Hodgson, Extension Entomology Specialist; Alan Roe, Insect Diagnostician

What You Should Know

- Yellowjackets, hornets and wasps are closely-related social wasps commonly found in Utah.
- All social wasps are capable of repeatedly stinging without dying if they feel threatened.
- Bees are often blamed for most stings, but about 90% of all stings are likely caused by yellowjackets.
- Most social wasps are predatory of other insects and considered beneficial.
- Although providing natural insect control, social wasps can be considered nuisance pests when near humans.

Social wasps, including yellowjackets, hornets and paper wasps, are common stinging insects in Utah (Figs. 1, 2). The wasps are related to ants and bees, which are also capable of stinging; however, yellowjackets are the most likely to sting. Less than 1% of people are allergic to wasp or bee stings; however, some people are fatally stung every year. Nearly 80% of all serious venom-related deaths occur within one hour of the sting. Most people will only experience a mild local reaction with redness, pain, swelling and itching at the sting site. If symptoms are more serious, a physician should be consulted. Some people may develop venom sensitivity after repeated stinging episodes over a short or long period of time.

Fig. 1. Yellowjacket.[1]

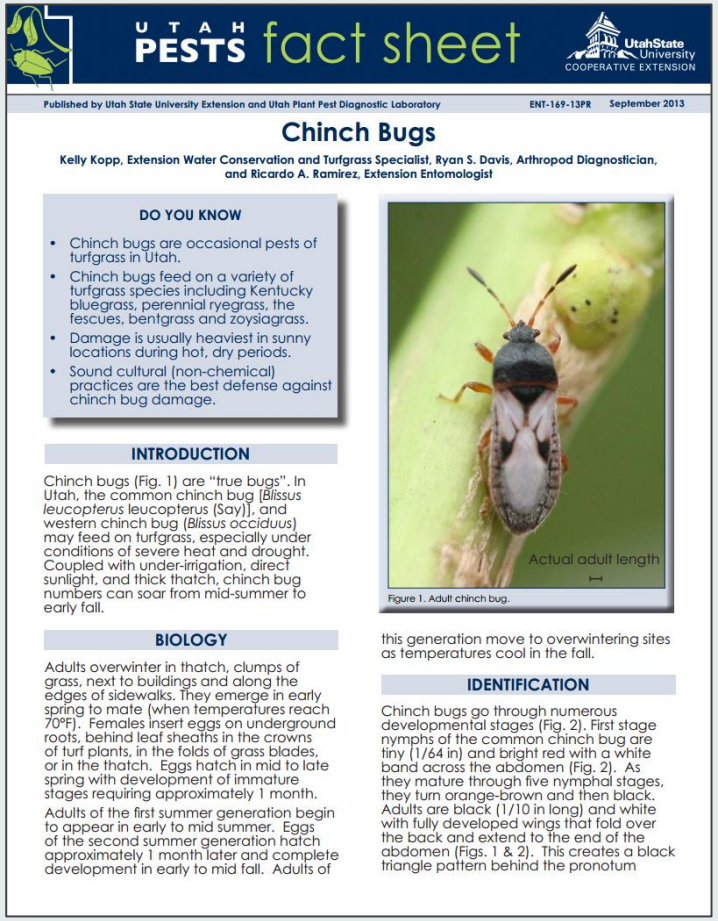
Fig. 2. Baldfaced hornet.[2]

Social Wasp General Description

- Have three well-separated body regions, a distinct waist and two pairs of clear wings.
- Care for their young and develop a caste system with different forms living together.
- Regenerate a new nest every year because only the queen overwinters; honey bee colonies overwinter together every year.
- Create their nests out of a wood and saliva paste.
- Capture prey with their legs and jaws and use stinging for defensive purposes only; this is different than solitary wasps that subdue prey with stinging (e.g., spider wasp).
- Go through complete metamorphosis (i.e., egg, larva, pupa, adult); adults and larvae have chewing mouthparts, and larvae are legless.
- Capable of multiple stings because they have "smooth" stingers; bees have barbed stingers (Fig. 3)

Fig. 3. Honey bee (left) and wasp (right) stingers.

page 1



UTAH PESTS fact sheet

UtahState University COOPERATIVE EXTENSION

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Chinch Bugs

Kelly Kopp, Extension Water Conservation and Turfgrass Specialist, Ryan S. Davis, Arthropod Diagnostician, and Ricardo A. Ramirez, Extension Entomologist

DO YOU KNOW

- Chinch bugs are occasional pests of turfgrass in Utah.
- Chinch bugs feed on a variety of turfgrass species including Kentucky bluegrass, perennial ryegrass, the fescues, bentgrass and zoysiagrass.
- Damage is usually heaviest in sunny locations during hot, dry periods.
- Sound cultural (non-chemical) practices are the best defense against chinch bug damage.

INTRODUCTION

Chinch bugs (Fig. 1) are "true bugs". In Utah, the common chinch bug (*Blissus leucopterus* leucopterus (Say)), and western chinch bug (*Blissus occiduus*) may feed on turfgrass, especially under conditions of severe heat and drought. Coupled with under-irrigation, direct sunlight, and thick thatch, chinch bug numbers can soar from mid-summer to early fall.

BIOLOGY

Adults overwinter in thatch, clumps of grass, next to buildings and along the edges of sidewalks. They emerge in early spring to mate (when temperatures reach 70°F). Females insert eggs on underground roots, behind leaf sheaths in the crowns of turf plants, in the folds of grass blades, or in the thatch. Eggs hatch in mid to late spring with development of immature stages requiring approximately 1 month.

Adults of the first summer generation begin to appear in early to mid summer. Eggs of the second summer generation hatch approximately 1 month later and complete development in early to mid fall. Adults of this generation move to overwintering sites as temperatures cool in the fall.

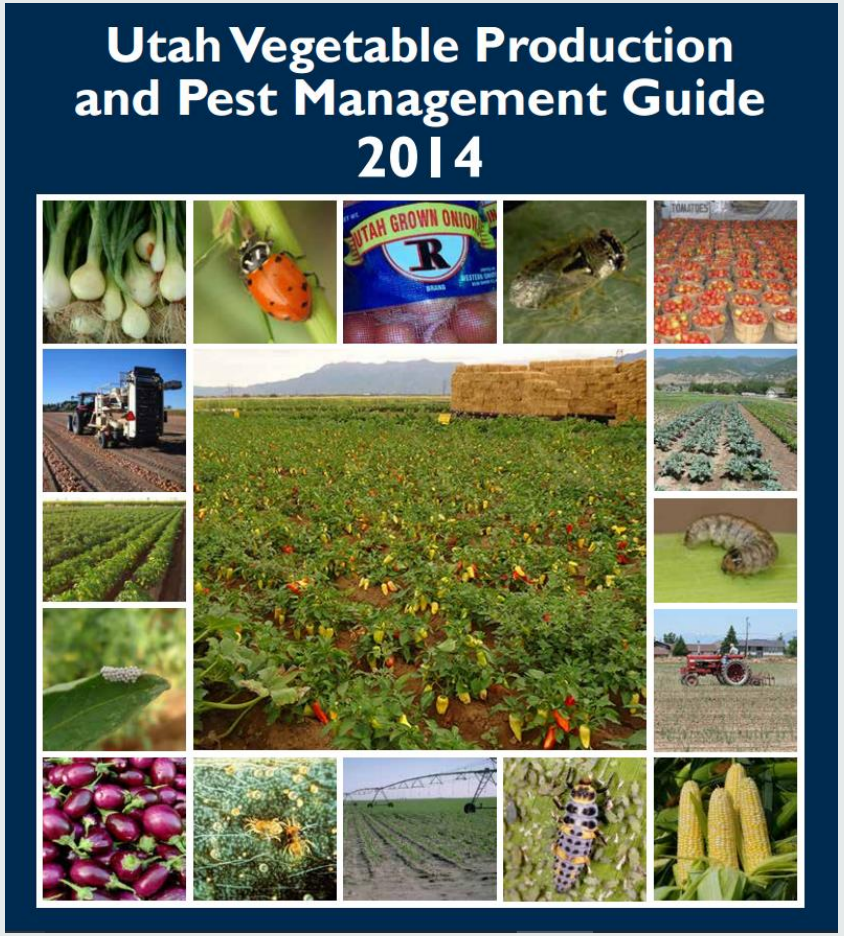
Actual adult length

Figure 1. Adult chinch bug.

IDENTIFICATION

Chinch bugs go through numerous developmental stages (Fig. 2). First stage nymphs of the common chinch bug are tiny (1/64 in) and bright red with a white band across the abdomen (Fig. 2). As they mature through five nymphal stages, they turn orange-brown and then black. Adults are black (1/10 in long) and white with fully developed wings that fold over the back and extend to the end of the abdomen (Figs. 1 & 2). This creates a black triangle pattern behind the pronotum

Guides


Utah Vegetable Production and Pest Management Guide 2014
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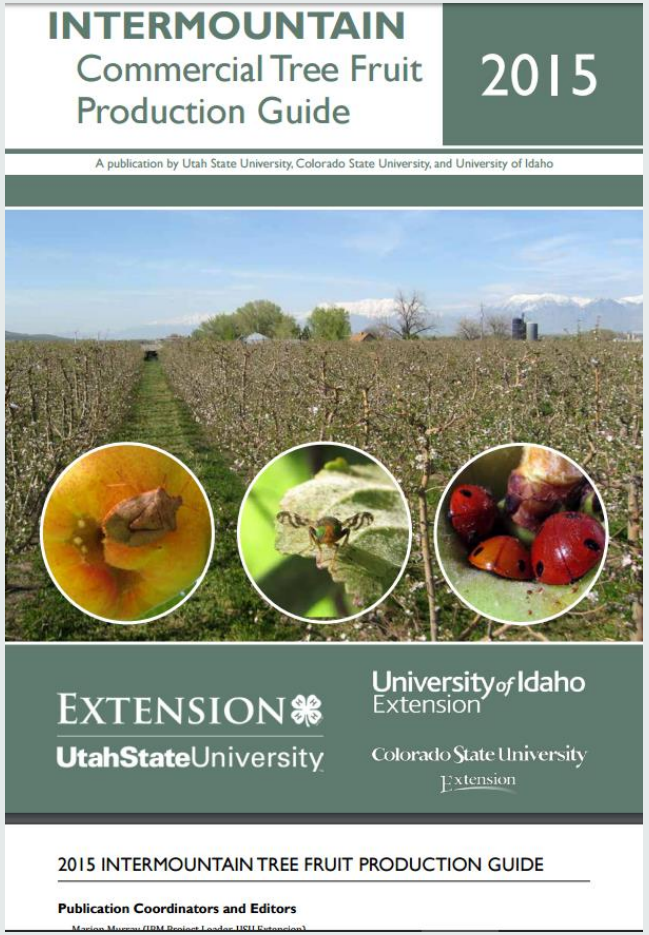
INTERMOUNTAIN
Commercial Tree Fruit Production Guide
2015
A publication by Utah State University, Colorado State University, and University of Idaho
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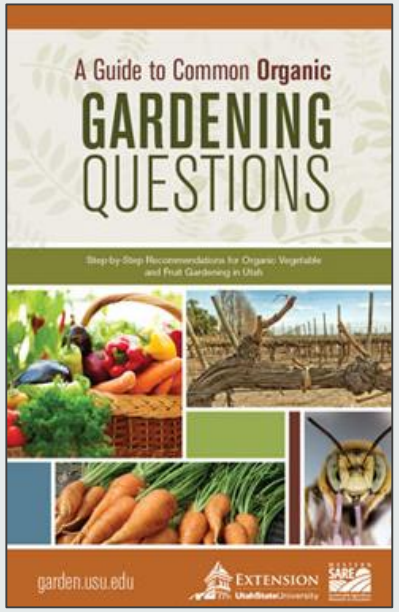
A Guide to Common Organic
GARDENING
QUESTIONS
garden.usu.edu
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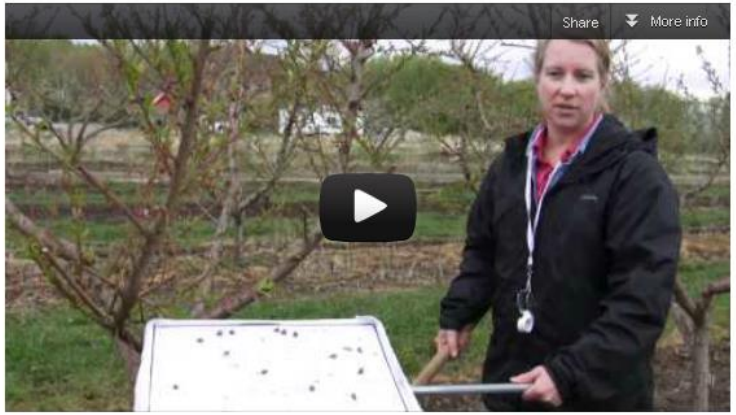
UtahStateUniversity

Video Fact Sheets

Paper Wasp Traps
Entomologist Diane Alston discusses the difference between native paper wasps and European paper wasps, and how to make your own traps to combat them.

Billbug Identification and Detection in Turf
Entomologist Ricardo Ramirez discusses the identifying characteristics of billbugs in turf, and demonstrates how to detect the damaging larval stage.

Using a Beating Tray
A beating tray is a large cloth frame that is used to catch insects that fall from a shaken branch. It is helpful for monitoring a large area, such as an orchard, quickly.

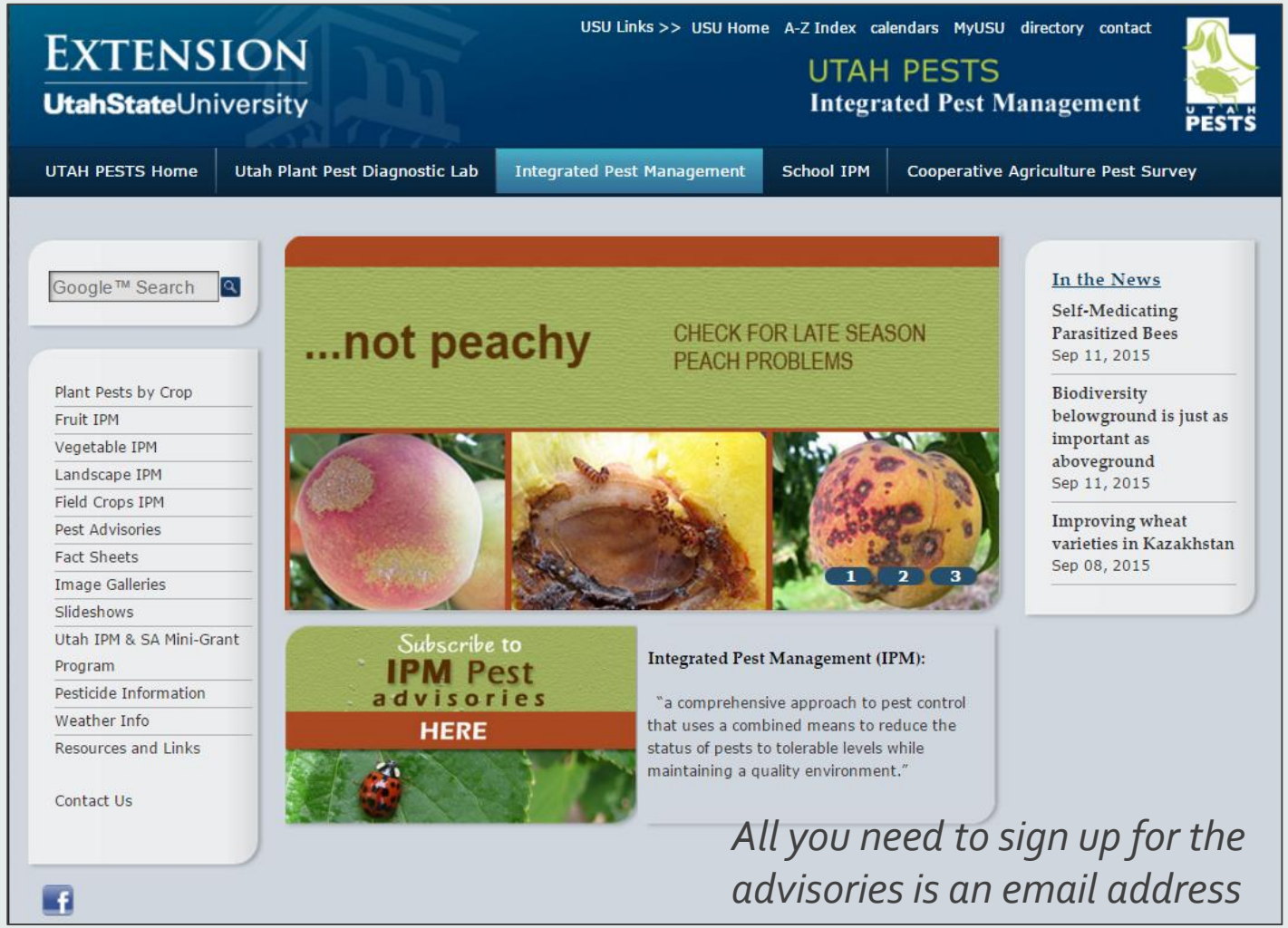


Tips for avoiding bed bugs while traveling.
Entomologist Ryan Davis discusses safe travel techniques to avoid falling prey to bed bugs, and how to minimize the chances of bringing bed bugs back to the home.

IPM Advisories:

ornamentals, turf, fruits, vegetables

www.utahpests.usu.edu/ipm



All you need to sign up for the advisories is an email address

Free subscription

Timely info on pest activity

- -insects
- -mites
- -diseases
- -nutrient deficiencies
- -environmental stress

Lots of images!

IPM recommendations

Effective pesticides

IPM Advisories (2015 Examples)

EXTENSION
UtahStateUniversity

Landscape IPM Advisory

UTAH PESTS

Weekly Pest Update for Woody Ornamentals, Utah State University Extension, **April 29, 2015**

What's In Bloom

(Salt Lake City area)

Blackhaw viburnum: first bloom
Crabapple: end bloom
Lilac: bloom - end bloom
Redbud: end bloom
Redtwig dogwood: first bloom
Japanese flowering cherry: bloom
Kwanzan cherry: full to end bloom
Quince: end bloom
Serviceberry: full bloom

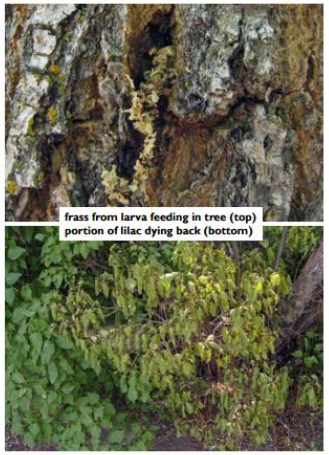
Insect/Disease Information

DECIDUOUS TREES

Lilac-Ash Borer

Hosts: lilac and ash; occasionally privet and mountain-ash

- ***treat susceptible trunks now until mid-July***



frass from larva feeding in tree (top)
portion of lilac dying back (bottom)

Lilac-ash borer adults have just started to emerge and females are laying eggs on the bark of ash trees and lilac. Green and white ash (*Fraxinus*) are the most susceptible. Sometimes, mountain-ash (*Sorbus*) and privet are attacked.

Lilac-ash borer does not directly kill trees, but repeated infestations can cause branch dieback and can leave trees susceptible to breakage in storms. Infested trees will have round exit holes on the bark, sawdust-like frass near the holes or at the base of the tree, and rough, swollen, cracked bark, mostly near branch crotches.

This insect overwinters as a larva inside the host plant and pupates in spring, emerging as an adult moth, usually in early to mid May. Emergence and egg-laying continues for about 6 to 8 weeks.

Treatment:

Healthy plants are able to withstand minor infestations, while stressed plants are more susceptible to attack and failure, so give trees optimal water and fertilizer, and prune properly.

Insecticides target the adults. Small trees can be treated by the home gardener, but in order to get thorough coverage on large trees, treatments should be made by a licensed pesticide applicator.

Residential options: Hi-Yield Permethrin, Spectracide Triazicide (lambda-cyhalothrin)

Commercial options: Acelepryn (chlorantraniliprole), permethrin (Astro, Covert, Waylay), or Onyx (bifenthrin)

UtahState UNIVERSITY extension

Turfgrass IPM Advisory

UTAH PESTS

Seasonal Turfgrass Pest Update, Utah State University Extension, Winter 2014

Turfgrass Management

At this time of year, your thoughts may be turning to the potential effects of winter conditions on your turf. "Winterkill" is the general term describing turf loss that may occur as a result of winter conditions. This issue will discuss the actual causes of winterkill and how they may be prevented.

News/What to Watch For

During winter, most turfgrass diseases and insects are relatively inactive. However, one disease complex, the snow molds, may be at work despite recent low temperatures.

Focus on: Winterkill

When turfgrasses die over the winter months, it may generally be described as "winterkill" (Figs. 1 and 2). The term covers a multitude of actual causes of turfgrass death in the winter, which may include snow mold, low temperatures, ice sheets, dessication and crown hydration.

Crown Hydration

Crown hydration is of most concern during the warmer days of late winter or early spring when there is the potential for a day or two of warm daytime temperatures followed by a hard freeze. Turfgrass plants may start to take up water as temperatures warm and then re-freeze rapidly. As a result, ice crystals may form in the crown of the plant, rupturing cells and causing death.

Of the commonly-used cool-season turfgrass species, annual bluegrass and creeping bentgrass are most susceptible to crown hydration problems, though annual bluegrass is the more susceptible of the two because it emerges from dormancy earlier.

Dessication

During the winter when turfgrass plants are dormant or semi-dormant, drying of the leaves or plants (dessication) may cause death. Dessication is typically only a factor on elevated or extremely exposed or windy sites, and areas where surface runoff is rapid.

Figure 1. Winterkill symptoms in turfgrass.

EXTENSION
UtahStateUniversity

Tree Fruit IPM Advisory

UTAH PESTS

Orchard Pest Update, Utah State University Extension, **October 5, 2015**

JUST THE BASICS: Current Treatments

GENERAL

- Clean up fallen fruit to reduce pest pressure for next year.
- Mow tall weeds around trees/install barrier or wire to reduce rodent problems and deer rubbing.
- Make sure all new plantings get white tree paint or tree wrap (base of tree to scaffold limbs) from December through early April, to prevent sun scald.
- Give trees a good watering before the ground freezes.
- Do not do any pruning now; wait until winter (apples) or early spring (peaches).

APPLE & PEAR

- Apply lime-sulfur when the first leaves start turning color to control *blister mites*.
- To reduce *codling moth* for next year, remove bins and debris from the orchard after harvest and remove fruit on the ground or left on the tree.

PEACH/NECTARINE

- Prevent new *coryneum blight* (shothole) infections this fall by applying copper to trees when 50% of leaves have fallen.

Insect and Disease Information

: *information for residential settings* : *information for commercial orchards*

APPLE & PEAR

Blister Mites

Hosts: apple, pear

Blister mites cause early fall color change and leaf drop (shown here on apple).

Blister mites and other eriophyid mites can be treated now, and no later than just before leaf drop. They are more of an aesthetic problem, and do not harm the health of the tree. In fact, they serve as a food source for early emerging predatory mites in the spring. In turn, the predatory mites will take care of the harmful spider mites that are active during summer.

Blister mite spots on pear turn black by mid to late season.

If treatment is desired, options include:

- 1.5-2% oil, thoroughly covering the bottoms of the leaves
- Sevin (carbaryl), alone or with 1% oil
- lime-sulfur (only at this time of year, you can mix with oil, but not on drought-stressed trees)

Blister mites belong to a group of mites called eriophyid mites (air-ee-oh-FYE-id). They are so small that they are invisible to the naked eye, but their feeding can cause visible symptoms.

continued on next page

Pest Diagnostics

Utah Plant Pest Diagnostic Lab

www.utahpests.usu.edu/uppdl

Sample Submission

Two articles on insect traps and exclusion in Utah Pests News (online)

ENTOMOLOGY NEWS AND INFORMATION

Arthropod Traps for the Home, Garden, and Agriculture

This is the first in a two-part series on common methods to trap and exclude insects and their relatives. This article will focus on ways to attract and trap arthropods for both monitoring and management purposes. The next issue will cover common exclusion devices to keep arthropods out of buildings and away from plants.

To successfully use traps, there are two basic requirements: the arthropods must move, and the trap must hold them after capture. An advantage in using traps is that they can be set in place and left to catch arthropods 24/7 for a period of time. Traps can be attractive or passive. Attractive traps rely on visual and/or chemical cues; passive traps intercept arthropods as they move about.

Visual Traps

A blacklight trap attracts a variety of night-flying insects that are visually attracted to short wavelengths, including moths.

Light, color, contrast, and shape are common visual attractants used in insect traps. Light traps are used to detect and monitor populations of moths, mosquitoes, and other insects, including the invasive brown marmorated stink bug. Because many insects are attracted to short wavelengths, or ultraviolet light, traps that include a blacklight lamp are useful in attracting a spectrum of insects, especially noctuid moths (e.g., corn earworm, cutworm, armyworm). For mosquitoes, the addition of dry ice and a fan or suction increases the trap's effectiveness. A downside of blacklight traps is a lack of selectivity; if used for monitoring specific insects, the bi-catch (non-target insects) can flood the trap and make it difficult and time-consuming to identify the insects of interest. Blacklight traps can also attract beneficial and aquatic insects important as biocontrol agents and food for wildlife, respectively. The "bug zapper"-style of trap is an example of a light trap used for insect population reduction. After many years of availability, the effectiveness of bug zappers in reducing mosquito and other pest insect populations is still hotly debated.

White, yellow, and blue-colored traps can be visually attractive to insects. Why? Light, bright colors reflect more ultraviolet light, which is attractive to insects. Instead of seeing green color reflected from the leaves of plants as humans do, insects see hues of yellow and blue. The color of reflected light that humans see as yellow (wavelength 500-600 nm) is a major component of light reflected from plant surfaces, especially from new growth. Sticky cards colored yellow, blue, and white can be used to attract and kill flying insects, such as thrips, whiteflies, aphids, and fruit flies. Colored sticky cards can be used to monitor and reduce populations of insects in greenhouses, indoor plantscapes, and some horticultural crops. But all things seem to have their downsides; these colors are also attractive to pollinators. For example, to avoid trapping honey bees in orchard insect pheromone traps, the use of orange versus white colored delta traps decreases pollinator kill. Insects do not see the color orange.

Contrast and shape can also be visually attractive to insects. For example, the brown marmorated stink bug and many tree-attacking beetles are attracted to a black column-shaped trap. The tall, dark shape of the trap simulates the contrast of a tree trunk against daylight. Typically odor lures are added to draw the insects into the trap container once they climb onto or fly into the trap base. The Manitoba trap utilizes a large, dark sphere suspended under a transparent cone for collection of biting flies. The Manitoba trap, and its many variations, mimic moving livestock to the flies.

Bait Traps

Bait traps rely on an insect's sense of smell for attraction. Food, attractive host plant odors (called kairomones), and mimics of insect pheromones (chemicals used for

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Vol. 7 Summer 2013

ENTOMOLOGY NEWS AND INFORMATION

Barriers and Exclusion Techniques for Arthropods

This is the second article in a two-part series on trapping and excluding arthropod pests. The first article appeared in the Summer 2013 issue of Utah Pests News, and focused on common methods to attract and trap arthropods (insects, spiders, mites, and relatives) for monitoring and management. This article will cover common techniques to keep arthropods away from plants and out of buildings.

Barriers can be physical or chemical in nature. Use of arthropod barriers can be a good fit for home gardens, buildings, and small-scale agricultural settings. The time and labor required to install and maintain barriers can limit their use for large-scale pest management.

Physical Barriers - Exclusion from Plants

Placing barriers over or around plants can be highly effective in reducing injury from some arthropod pests. In many cases, barriers are best suited for use during the seedling, bloom, or fruiting stages when plants are most susceptible to pest damage. Using barriers during targeted, limited time periods will reduce the amount of labor to maintain the barriers.

- **Sticky barriers** can be placed as a band around a trunk, limb, or stem to exclude climbing insects and mites. Example pests include earwigs, spider mites, ants, codling moth, elm leaf beetle, and others. Sticky adhesives, such as Tangletrap, can be purchased or made by mixing one part petroleum jelly and one part household detergent. For tree trunks, apply the adhesive on a surface, such as duct tape, to protect the bark. Remove accumulated insects and debris from bands and add fresh adhesive added as needed.

- **Shields** (6-inch diameter) made from tar paper or foam rubber can be placed on the soil around seedlings in the cabbage family, bean, pea, corn, beets, and tomato to prevent egg-laying by the cabbage and seedcorn maggot flies. Shields can also serve as hiding places for predatory ground beetles that will eat maggot eggs and larvae, as well as other pest insects in the garden.
- A ¼ inch thick layer of **diatomaceous earth** or crushed egg shells placed around vegetable and ornamental plants (4-6 inch diameter circle) can deter crawling pests, such as caterpillars, earwigs, snails, and slugs. These "mine fields" of sharp shards tear holes in the outer protective body layer, causing them to desiccate.
- **Cutworm collars** can reduce losses to vegetable seedlings from caterpillars in the cutworm family. Collars can be constructed from metal, plastic, foil, cardboard, or other sturdy and flexible materials. They should be at least 4 inches tall, and placed securely into the soil to about 1 inch depth. The top edge of the collar can be bent outwards to enhance its effectiveness in preventing cutworms from crawling over the top.

- **Bagging fruit** to exclude codling moth, peach twig borer, yellow jackets, European paper wasp, and other pests can be highly effective. Fruit clusters must be thinned to a single fruit and bags applied before the target insect is active. Nylon mesh fruit bags are available from horticultural suppliers or can be homemade.

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for your attention…

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