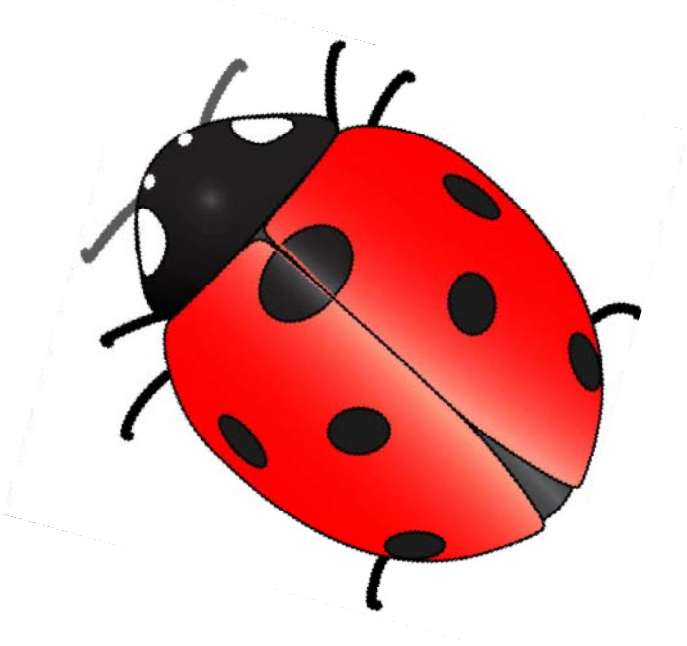
INSECT CONTROL – THE LATEST AND GREATEST

Diane Alston, Entomologist
Utah State University

Pesticide Safety Education & Recertification Workshop
Hurricane, UT
December 8th, 2011

IPM (Integrated Pest Management)

- Sustainable
  - Economic and Environmental
- Integrated Pest Management Strategies
  - Cultural (plant or site management)
  - Mechanical
  - Biological
  - Chemical
- Economic/Action Thresholds
  - Treat only when needed



Utah Pests Online Resources

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FACT SHEETS

UTAH PESTS fact sheet — UtahState University extension

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Lilac-Ash Borer

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Taun Beddes, Cache Co. Horticultural Agent
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What You Should Know

- Lilac-ash borer (*Podosesia syringae*), a clear-wing moth common in Utah, can be a destructive pest of many species of ash (*Fraxinus* spp.), privet (*Ligustrum* spp.), lilac (*Syringa* spp.), and related species.
- Adults emerge from host trees and lay eggs in the spring; larvae feed on wood within branches, overwinter in the heartwood, and emerge as adults the following spring.
- Diversifying species used in the landscape, maintaining optimum plant health, monitoring, and preventive sprays (if necessary) are the best methods for preventing infestations.
- Only preventive treatments exist. There are no insecticides registered that can eliminate borers once larvae are inside the plant.

Description, Biology, and Habits

The lilac-ash borer (*Podosesia syringae*), belongs to a group of insects known as the clear-winged moths. The wings of most sesiid moths in have at least partially transparent wings (devoid of the colored scales that coat most moth and butterfly wings). Many of them mimic bees or wasps and, unlike most moths, fly during the day.

Adult lilac-ash borers mimic the common paper wasp in color, size, shape, and flight habits (Fig. 1). Both the dark colored forewings and the transparent hind wings are narrow. The slender body is black in color with yellow banding on the abdomen. The wingspan varies from 1 to 1 1/8 inches. Females are somewhat larger than males.

Lilac-ash borers are generally distributed throughout the United States and Canada. They feed primarily in the trunks and larger limbs of lilac, ash, and privet, but occasionally attack related plants in the family Oleaceae. Significant damage in Utah has been reported from ash, primarily in European, blue, and green ash, and lilacs.

Figure. 1. Adult lilac-ash borer (*Podosesia syringae*)[1].

Depending on your location in Utah, adults may emerge from infested hosts as early as late March (usually late April) and continue until mid-July (Tab Females emit a pheromone (chemical communication signal), which attracts males for mating, with 14 days after emergence. Within an hour of mat females are able to lay the tan, elliptical eggs in crevices, and wounds in the bark. Eggs can be l singly or in clusters. A single female can lay abou eggs. Eggs hatch within 14 days, and the larvae tures) bore into the plant (Fig. 2).

Initial feeding occurs just beneath the bark and l tends into the sapwood. Larvae continue feeding sapwood as summer progresses. Their tunnels (ga ies) eventually turn upward and terminate just be the bark surface by the end of the season. Larva enlarge their galleries as they grow, frequently pu frass (sawdust-like excrement) out of the entranc Completed galleries may be over 12 inches long 1/3 inch wide. Full grown larvae are about 1 inch and white with a brown head. Mature larvae ov ter in the heartwood.

In spring, a larva will cut an emergence hole in th bark, leaving a thin flap of tissue over the hole. P (formation of a cocoon) occurs in the burrow. Wi

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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.

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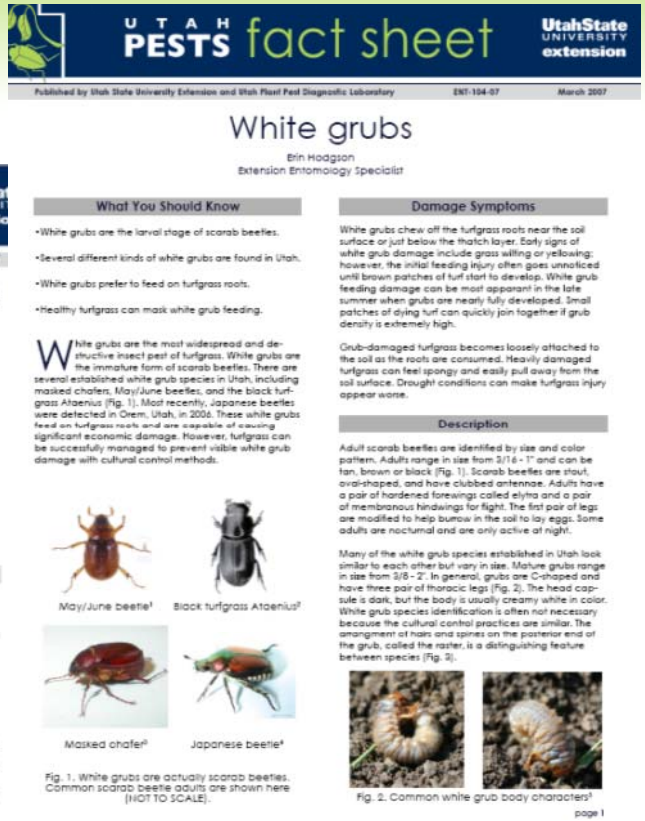

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White grubs

Erin Hodgson, Extension Entomology Specialist

What You Should Know

- White grubs are the larval stage of scarab beetles.
- Several different kinds of white grubs are found in Utah.
- White grubs prefer to feed on turfgrass roots.
- Healthy turfgrass can mask white grub feeding.

White grubs are the most widespread and destructive insect pest of turfgrass. White grubs are the immature form of scarab beetles. There are several established white grub species in Utah, including masked chafers, May/June beetles, and the black turfgrass Ataenius (Fig. 1). Most recently, Japanese beetles were detected in Orem, Utah, in 2006. These white grubs feed on turfgrass roots and are capable of causing significant economic damage. However, turfgrass can be successfully managed to prevent visible white grub damage with cultural control methods.

May/June beetle[1]

Black turfgrass Ataenius[2]

Masked chafer[3]

Japanese beetle[4]

Fig. 1. White grubs are actually scarab beetles. Common scarab beetle adults are shown here (NOT TO SCALE).

Damage Symptoms

White grubs chew off the turfgrass roots near the soil surface or just below the thatch layer. Early signs of white grub damage include grass wilting or yellowing; however, the initial feeding injury often goes unnoticed until brown patches of turf start to develop. White grub feeding damage can be most apparent in the late summer when grubs are nearly fully developed. Small patches of dying turf can quickly join together if grub density is extremely high.

Grub-damaged turfgrass becomes loosely attached to the soil as the roots are consumed. Heavily damaged turfgrass can feel spongy and easily pull away from the soil surface. Drought conditions can make turfgrass injury appear worse.

Description

Adult scarab beetles are identified by size and color pattern. Adults range in size from 3/16 - 1" and can be tan, brown or black (Fig. 1). Scarab beetles are stout, oval-shaped, and have clubbed antennae. Adults have a pair of hardened forewings called elytra and a pair of membranous hindwings for flight. The first pair of legs are modified to help burrow in the soil to lay eggs. Some adults are nocturnal and are only active at night.

Many of the white grub species established in Utah look similar to each other but vary in size. Mature grubs range in size from 3/8 - 2". In general, grubs are C-shaped and have three pair of thoracic legs (Fig. 2). The head capsule is dark, but the body is usually creamy white in color. White grub species identification is often not necessary because the cultural control practices are similar. The arrangment of hairs and spines on the posterior end of the grub, called the raster, is a distinguishing feature between species (Fig. 2).

Fig. 2. Common white grub body characters[5]

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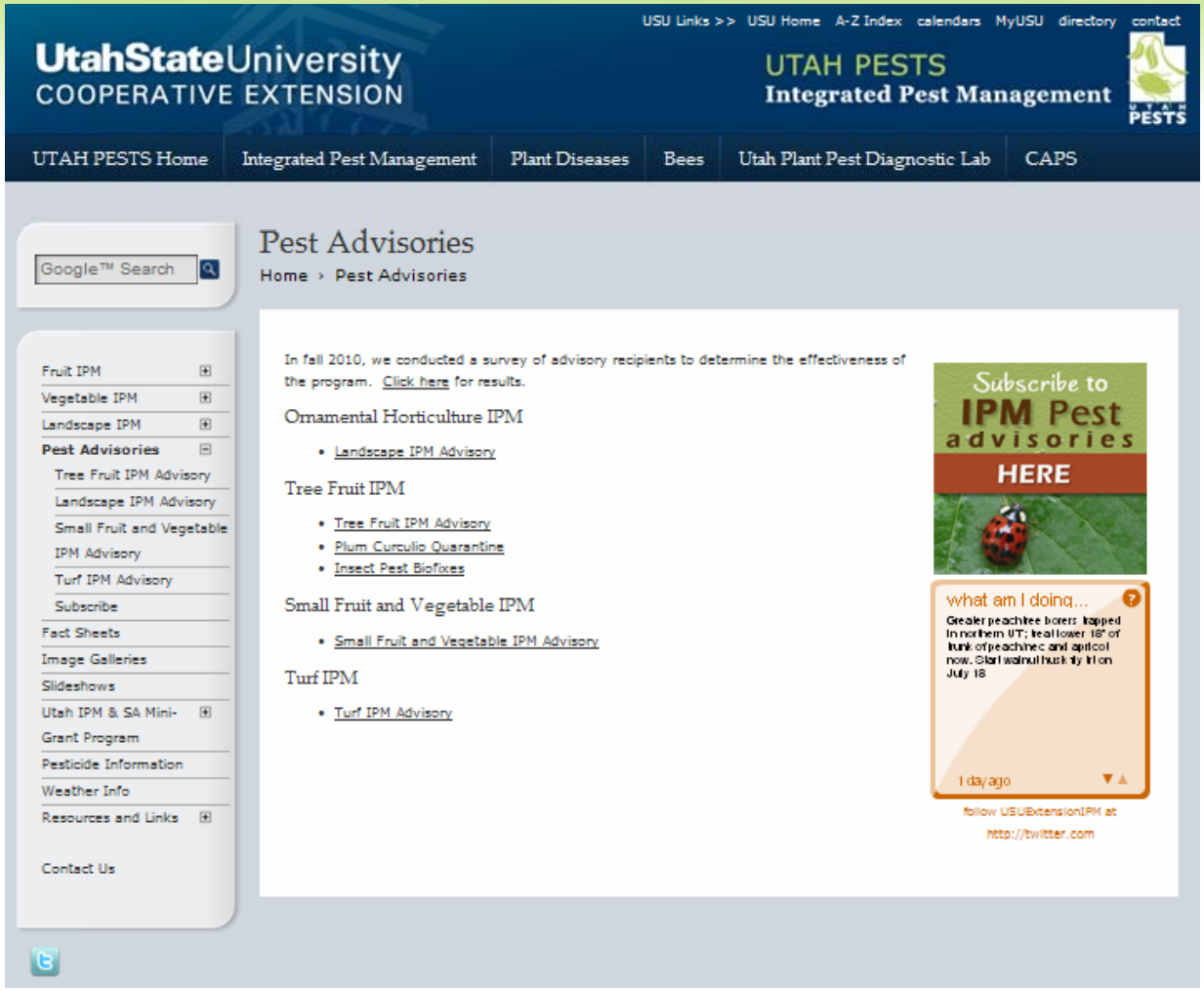
PEST ADVISORY

INTEGRATED PEST MANAGEMENT



utahpests.usu.edu/ipm

Free subscription

Timely info on pest activity

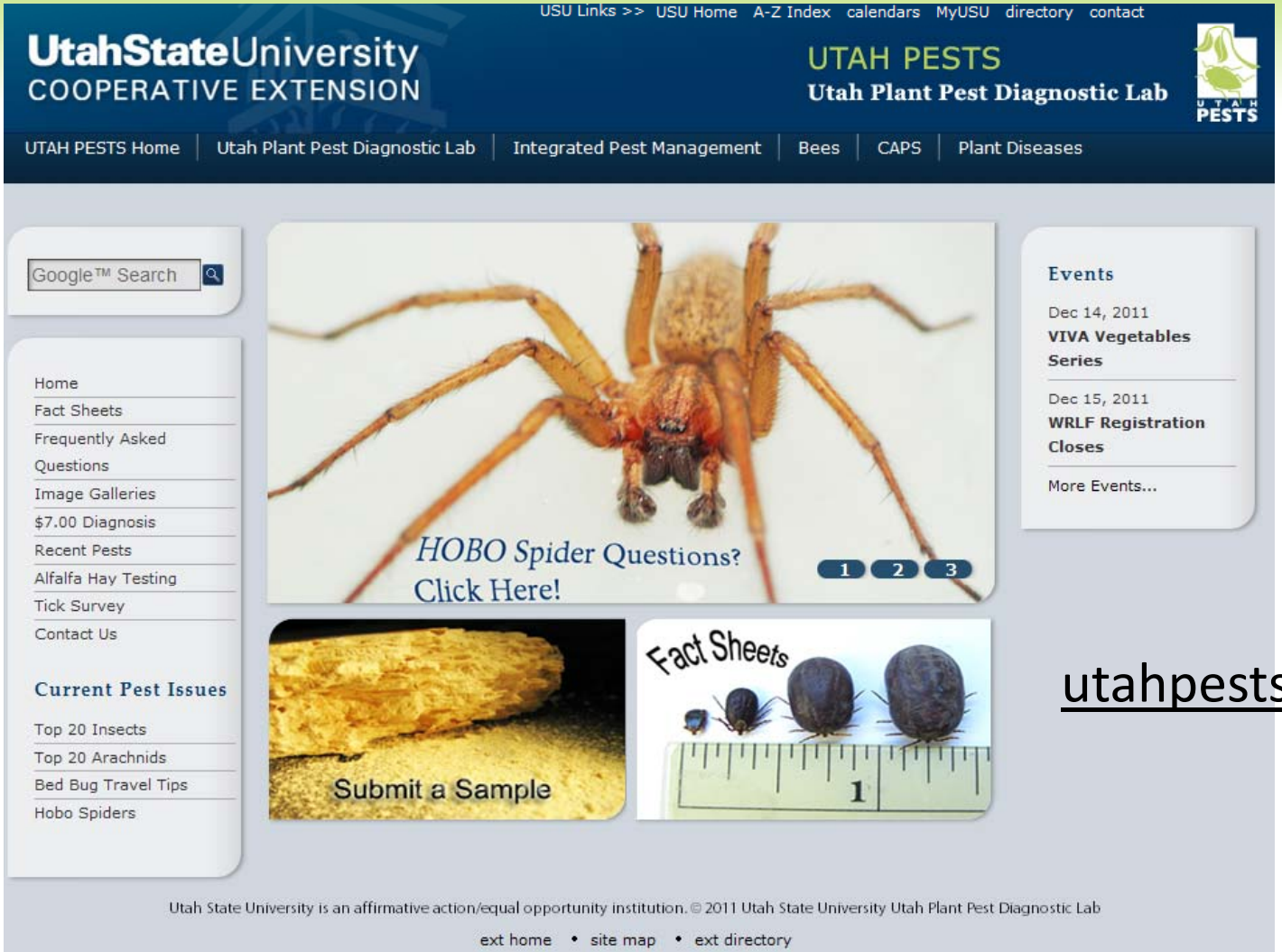
- -insects
- -mites
- -diseases
- -nutrient deficiencies
- -environmental stress

Lots of images!

IPM recommendations

Effective pesticides

Pest Diagnostics
Utah Plant Pest Diagnostic Lab



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Identification & Control of Common Arthropod Pests of SW Utah

Sucking Bugs

Aphids Scale

Leafhoppers

Squash Bug

APHIDS

Woolly ash aphid

Small, soft-bodied
Live in groups (colonies)
Winged & non-winged
“Tail pipes” (cornicles)

Rose aphid

Linden aphid

Symptoms:
Curled leaves & shoots
Sticky honeydew
Black sooty mold

Aphid Natural Control

Convergent Lady Beetle

Hover Fly

Green Lacewing

Aphid Mechanical Control

Stiff spray of water every 2-3 days until aphid numbers decline

Best if initiated before leaves are tightly curled

Prone to develop resistance to insecticides rapidly

Aphid Insecticides

- Dormant and Summer Horticultural Oils (many brands)
- Insecticidal Soap (many brands)
- Imidacloprid (Merit, Bayer Advanced, generics)
  - Systemic: local & upward mobile
  - Foliar spray, root drench, injection
- Flonicamid (Aria)
  - Antifeedant, Systemic
- Pymetrozine (Endeavor)
  - Antifeedant
- Malathion

Scale Insects

European Elm Scale

Soft Scales

Lecanium Scale

Oystershell Scale

Armored Scales

Black Pineleaf Scale

Scale Infestation Symptoms

Twigs & limbs encrusted in scale insect bodies

Chlorotic leaves

Necrotic spots on leaves & fruit

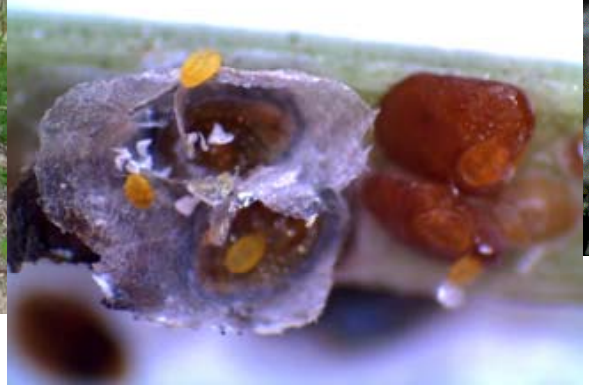
Limb dieback when scales are abundant

Soft Scales: honeydew (because feeding in tree phloem)

Scale Mechanical Control

- Prune out infested limbs
- Place sticky bands to trap the young “crawler” stage
  - Primarily a monitoring tool

Tangletrap & duct tape sticky band



Black pineleaf scale crawlers

San Jose scale crawlers

Scale Insecticides

- Dormant Oil Spray (2-4%)
  - Spring – at bud break – smothers overwintering scales
- Systemic soil drench or injection
  - Spring (May)
    - Soft Scales – imidacloprid (Merit, Bayer Advanced, others)
    - Armored Scales – dinotefuran (Safari)
- Target Crawlers
  - June to July (varies with species; sticky bands to monitor)
    - horticultural oil, insecticidal soap, carbaryl (Sevin), dinotefuran (Safari,) pyriproxyfen (Distance), buprofezin (Talus), azadirachtin (Azatin, Neem oil), synthetic pyrethroids (Tempo, Talstar, others), malathion

LEAFHOPPERS

Apple
Grape
Rose
Many others

White stippling on leaves
Nymphs on underside of leaves
Flying adults – “whiteflies”

Leafhopper Management

- Target mid- to large-sized nymphs (check undersides of leaves)
  - Adults difficult to kill – fly easily when disturbed
  - Older nymphs have wing pads
- horticultural oil, insecticidal soap
- kaolin clay (Surround) – repellent
- acetamiprid (Assail, Ortho)
- carbaryl (Sevin)
- malathion (many brands)
- imidacloprid (Merit, Bayer, many brands)
- dinotefuran (Safari) (ornamentals only)

Squash Bug

Eggs

Laid in clusters
Bronze to brick red
Underside of leaf
Near midrib

Nymphs

Green – gray body
Black appendages

Adult

Gray – brown body
Overwintering stage
Difficult to kill
Develops resistance easily

Mechanical – hand squishing
Summer-Fall vine clean-up

Squash Bug Insecticides

- kaolin clay (Surround) – repellent
  - Requires repeated applications
- azadirachtin (Azatin, neem oil) – antifeedant & repellent
- permethrin, gamma-cyhalothrin, esfenvalerate (synthetic pyrethroids) – contact (knock-down) killers
- carbaryl (Sevin) – contact & ingestion killer
- malathion (many brands) – contact & ingestion killer

Chewing Insects
Defoliators and Borers

Tobacco budworm

Tent caterpillar

Bark beetles

Flat- & Round-

Headed Borers

Tobacco Budworm

Petunia
Geranium
Others

Caterpillars chew holes in buds and flowers
"Flowers never open"

Bt – *Bacillus thuringiensis* (Dipel, Thuricide, others)
Spinosad (Success, Natural Guard, Entrust, others)
- must be ingested by the caterpillar to kill it

Western Tent Caterpillar

Spring and Summer
Nests of caterpillars
Feed at night
Defoliate trees and shrubs
Healthy trees will refoliate

Bt – *Bacillus thuringiensis* (Dipel, Thuricide, others)
spinosad (Success, Natural Guard, Entrust, others)
- must be ingested by the caterpillar to kill
imidacloprid (Merit, Admire, Bayer Advanced, others)
dinotefuran (Safari)
acetamiprid (Assail, Ortho Max)
chlorantraniliprole (Acelepryn)

Tree Borers


Lilac Ash Borer


UGA2107046


Western Ash Bark Beetle


Flatheaded Apple Borer


Aspen Borer


Locust Borer

Borer Insecticides

- Systemic trunk injections or soil drenches/injections
  - Merit, Admire, Safari, Acelepryn
    - Spring (May) – major flush of foliar growth
    - Variable control of flatheaded & roundheaded borers, bark beetles?
- Protective trunk sprays
  - Sevin, Permethrin, Bifenthrin, others
    - Timed with when adults are active; varies with borer species
    - Best for bark beetles

Mites

Spider mites

Blister mites

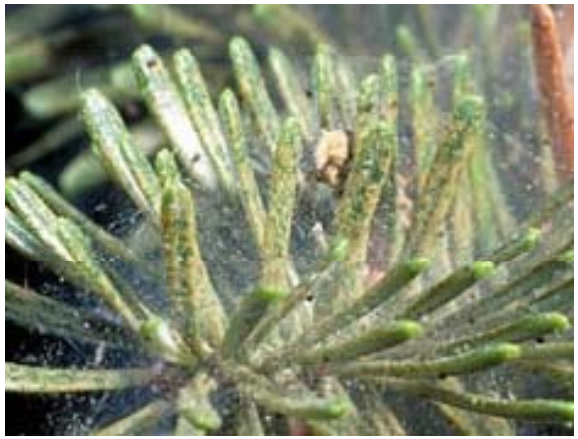
Rust mites

Spider Mites

Two Spotted Spider Mite

Honeylocust Spider Mite

Spruce Spider Mite



Symptoms:
White & chlorotic stippling
Webbing

Mite Mechanical Control

Stiff spray of water every 2-3 days
until mite numbers decline

Initiate as soon as you notice stippling

Monitor:
White beating tray
- look for tiny mites crawling on the tray
- leaves tend to look “dirty”

MITICIDES

- Horticultural Oil (1%)
- Insecticidal Soap
- Etoxazole (Tetrasan) – mite growth inhibitor
- Pyridazinone (Akari, Nexter, others) – reduces mite respiration
- Acequinocyl (Kanemite, Shuttle, others) – reduces mite respiration
- Bifenazate (Floramite, Acramite) – unknown MOA

Eriophyid Mites
Blister and Rust Mites

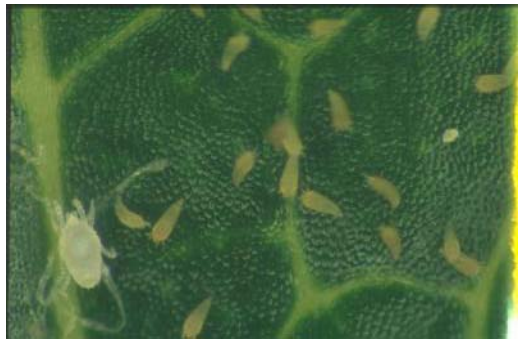
Pear and Apple
Others

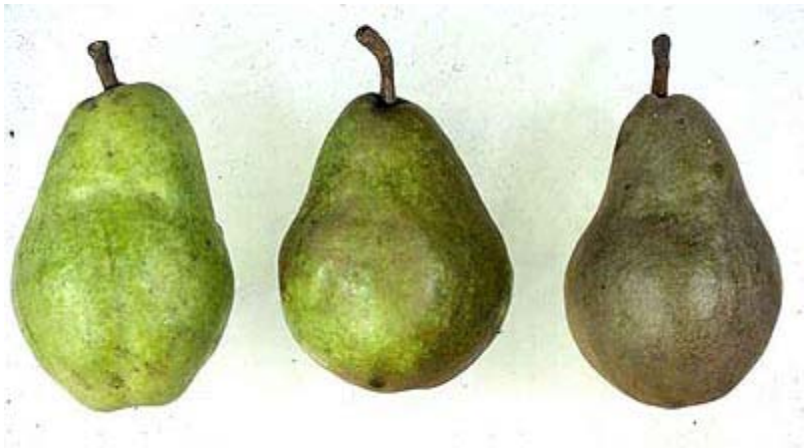
Leaf Blister Mites

Bumps or blisters on leaves – mites feed within blisters

Rust Mites

Russeting on fruit & leaves





Mites are tiny, worm-like
Need microscope to see them

Blister and Rust Mite Control

- Wettable sulfur* or carbaryl (Sevin)
  - In spring, at budbreak
  - In early fall, when leaves change color, but before they drop
- Target overwintering adults just before or after they seek shelter in buds

*Do not mix sulfur with dormant oil – cause foliage and flower burn

Turfgrass Insects
White Grubs

Cultural practices to prevent turfgrass insect problems – Keep the turf healthy!

- Apply fertilizer in the proper amounts and at the right time
- Irrigate deeply and infrequently
- Mow grass at a height of 1 ½ in or higher
- Select a well-adapted turf variety
- Amend soil with organic matter
- Aerate and de-thatch as needed

Which thatch layer is sustainable?

White Grubs

- Immature stage of scarab beetles
- Eat turfgrass roots
- 3 kinds established in UT
  - May/June beetle
  - Masked chafer
  - Black turfgrass Ataenius
  - Japanese beetle – Orem eradication program

May/June beetle

Black turfgrass Ataenius

Masked chafer

Japanese beetle

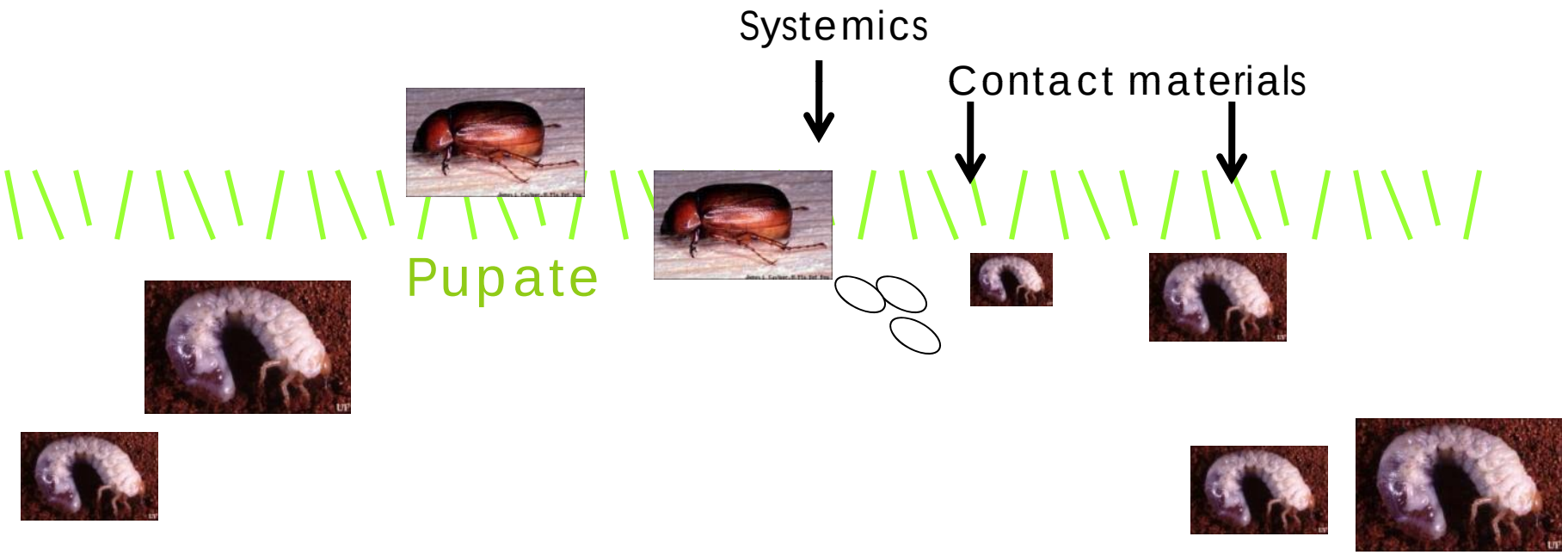
Not to scale!

White Grubs

- When mature, grubs range from 3/8 to 2 inches long
- C-shape when at rest
- 3-pairs of legs (obvious)
- Life cycle length
  - Several gens per yr – black turfgrass Ataenius
  - 1 gen per yr – masked chafer
  - 1 gen every 2-3 yr – May/June beetle
- Brown turf patches apparent in late summer
- Damaged turf feels “spongy”
- Turf pulls up easily from roots

White Grubs
1-3-year life cycle

Spring **Summer** **Fall/Winter**



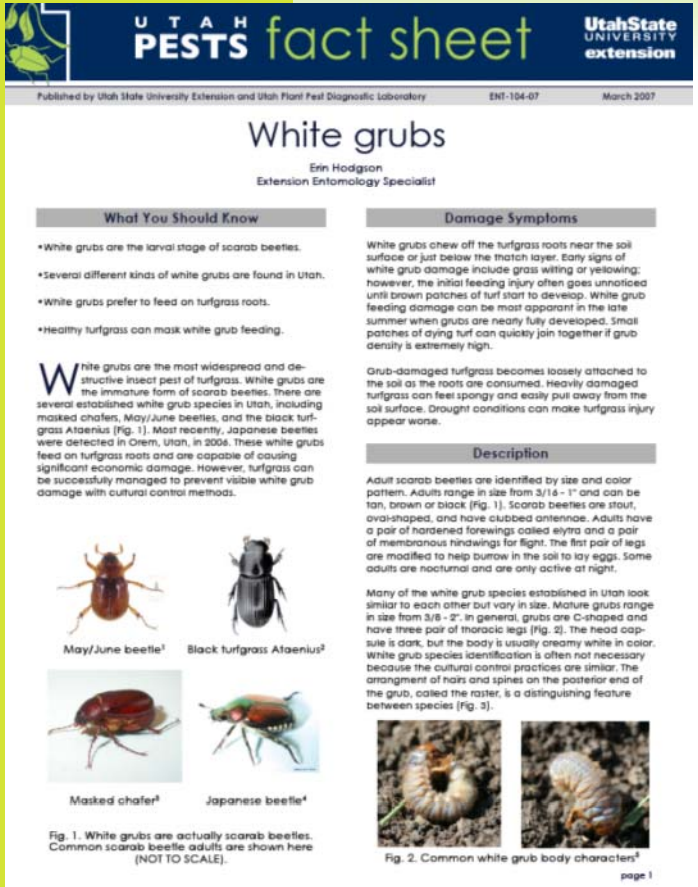
Can spend 1-2 years as 2nd to 3rd instar larva

2nd-3rd instars move 3” to 12” deep for winter

White Grub Management

- Apply systemic insecticides in early summer before eggs hatch to allow adequate time for plant up-take
  - Acelepryn (chlorantraniliprole)
  - Arena (clothianidin)
  - Merit (imidacloprid)
- Apply contact insecticides in mid summer through early fall before the grubs move deeper in the soil zone to spend the winter
  - Broad-spectrum
    - Dylox (trichlorfon)
    - Sevin (carbaryl)
  - Selective, reduced-risk
    - Concern (azadirachtin)
    - Mach 2 (halofenozide)

White Grub Management



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White grubs

Erin Hodgson
Extension Entomology Specialist

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- White grubs are the larval stage of scarab beetles.
- Several different kinds of white grubs are found in Utah.
- White grubs prefer to feed on turfgrass roots.
- Healthy turfgrass can mask white grub feeding.

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May/June beetle[1] Black turfgrass Ataenius[2]

Masked chafer[3] Japanese beetle[4]

Fig. 1. White grubs are actually scarab beetles. Common scarab beetle adults are shown here (NOT TO SCALE).

Damage Symptoms

White grubs chew off the turfgrass roots near the soil surface or just below the thatch layer. Early signs of white grub damage include grass wilting or yellowing; however, the initial feeding injury often goes unnoticed until brown patches of turf start to develop. White grub feeding damage can be most apparent in the late summer when grubs are nearly fully developed. Small patches of dying turf can quickly join together if grub density is extremely high.

Grub-damaged turfgrass becomes loosely attached to the soil as the roots are consumed. Heavily damaged turfgrass can feel spongy and easily pull away from the soil surface. Drought conditions can make turfgrass injury appear worse.

Description

Adult scarab beetles are identified by size and color pattern. Adults range in size from 3/16 - 1" and can be tan, brown or black (Fig. 1). Scarab beetles are stout, oval-shaped, and have clubbed antennae. Adults have a pair of hardened forewings called elytra and a pair of membranous hindwings for flight. The first pair of legs are modified to help burrow in the soil to lay eggs. Some adults are nocturnal and are only active at night.

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Fig. 2. Common white grub body characters[5]

page 1

- Before applying insecticides, reduce thatch layer to ≤ ½ in or aerate turf to increase penetration
- Apply ½ to ¾ in water to move insecticides into the root zone
- Repeat irrigation every 4-5 days to continue chemical movement into the soil
- Long-lasting clean-up of white grubs often requires several years of treatment

Look for this Slideshow and Others at utahpests.usu.edu