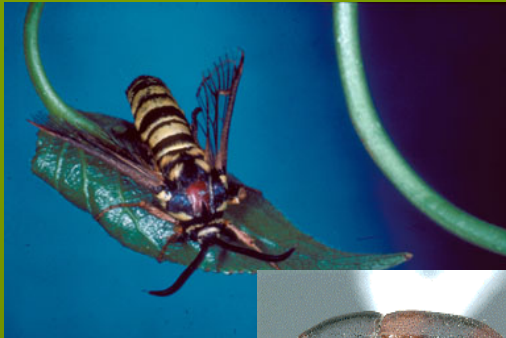


Management of Direct and Indirect Insect Pests of Trees and Shrubs



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UCFC ISA Pesticide Applicators Workshop

October 5, 2006

Integrated Pest Management (IPM)

- Plan ahead (use preventive strategies where possible)
- Use multiple pest management tools
 - Cultural
 - Mechanical
 - Biological
 - Chemical
- Treat only if needed (thresholds)
- Environmentally and economically sound



Major IPM Strategies for Landscape Pests

- Plant selection & planting site selection
- Irrigation - design for plant needs - prevent stress!!!
 - Amount & application method
 - Group plants with similar needs
- Plant nutrition - prevent stress !!!
- Preventive controls for chronic pests
 - Sanitation
 - Traps, exclusion barriers
 - Oil sprays



Ips-killed spruce trees in Garland, UT cemetery

Major IPM Strategies for Landscape Pests

- For "indirect pests"
 - Aphids, Scale, Leaf feeders
 - Exposed feeders
 - Use "soft" (selective) controls
 - Natural biological control is more prevalent
- For "direct pests"
 - Tree borers, Fruit feeders
 - Hidden feeders
 - Target / Timing for susceptible life stage(s) is critical
 - Maintain active residues for critical period
 - Remove "sources"



Elm leaf beetle



Roundheaded borer larva

Traps and Physical Barriers

- **Traps**

- Yellow jacket wasps, slugs, spiders



- **Sticky bands**

- Trees and shrubs



Biological Control

- How can you make it work?
- Outdoor landscapes - Conservation of natural enemies
 - Avoid toxic chemicals
 - Maintain a diverse plant environment (avoid monocultures)
 - Cultivate plants that provide nectar & pollen
 - Tolerate some herbivorous



Parasitic wasp that attacks caterpillars



Big-eyed bug nymph feeding

Beneficial Insects & Mites

Cast of Characters



Parasitic wasps & flies

Predaceous true bugs & beetles



Syrphid (Hover) Fly



Lacewing



Common Aphid Predators



Lady Beetles



Predaceous Mites

Common Direct Insect Pests of Woody Ornamentals

■ Insect Borers

■ Trunk and limb borers

- Roundheaded & Flatheaded Beetles,
Clearwing Moths

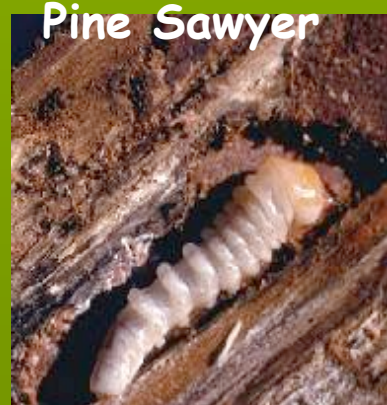
- Bark Beetles - Ips, Banded Elm Bark
Beetle



Longhorned Beetles/Roundheaded Borers (Cerambycidae)



Aspen borer



Pine Sawyer



- Poplar
- Cottonwood
- Locust
- Ash
- Fruit trees
- Pine



Locust borer

Most only attack stressed trees

Tunnel through cambium and into inner wood

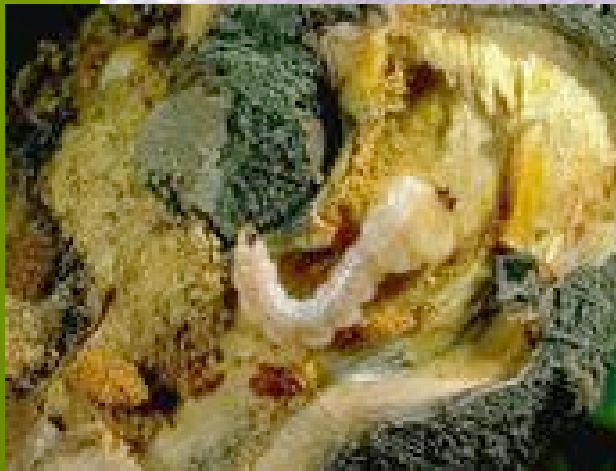
Metallic Wood Boring Beetles/ Flatheaded Borers (Buprestidae)



Bronze
Birch
Borer



Apple
Flatheaded
Borer



Birch
Beech
Fruit trees
Maple



Exit Holes in Bark

D-shaped exit
holes



Most only attack stressed trees
Feed just under bark in cambium - girdle trunk

Clearwing Moth Borers (Sesiidae)

Lilac Ash Borer



Western Poplar Clearwing



Ash

Lilac

Cottonwood

Poplar

Willow

Prunus



Greater Peachtree Borer

Will attack healthy trees
Tunnel into inner wood

Timing of Adult Tree Borer Activity

- **Adult flight periods for northern Utah**
 - Ash/Lilac borer - May 1 - late June
 - Bronze birch borer - late May - June
 - Aspen borer - May-July
 - Peachtree (Crown) borer - late June - August
 - Poplar-and-Willow borer - July - Sept.
 - Locust borer - August - Sept.
 - Shothole borer - June and late Sept.

Insecticides for Preventive Trunk Sprays

■ Contact:

- carbaryl (Sevin), endosulfan (Thionex), pyrethroids (permethrin, bifenthrin)

■ Systemic (translocation activity):

- Taken up by roots & moved throughout plant through xylem & phloem
- Can also act as a local systemic
 - imidacloprid (Merit, Marathon, Bayer Advanced Garden Tree & Shrub Insect Control)

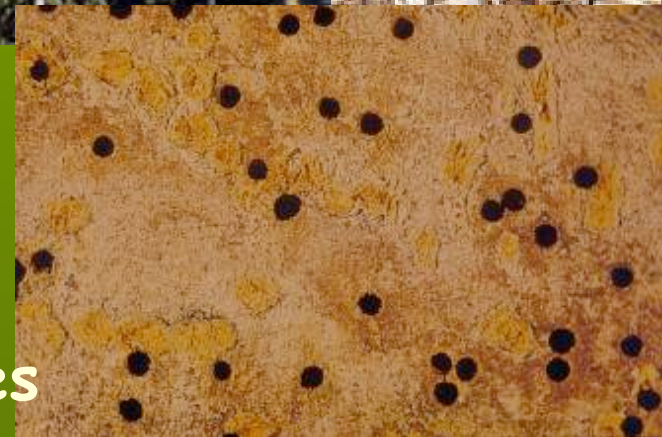
Imidacloprid

- **Merit, Marathon, Bayer Advanced Garden Tree & Shrub Insect Control**
 - Soil drench, soil injection, foliar
 - Soil: translocation delay of up to 60 days or longer
 - N containing fertilizer may enhance uptake
 - Target insects: soft-bodied pests on leaves and limbs (aphids, adelgids, leafminers, leaf beetles, mealybugs, psyllids, scale); white grub larvae; roundheaded borers (suppressive), flatheaded borers (control)
 - Clearwing moth larvae are not on the label

Considerations for Using Systemics

- ▣ Long-lasting activity
- ▣ Reduced degradation by UV & water
- ▣ Minimize plant surface residues
- ▣ Minimize human exposure
- ▣ Application can be more convenient
- ▣ Delayed uptake & availability

Bark Beetles (Scolytidae)



Spruce
Pine
Fir
Prunus
Elm

Attack old or stressed trees
& seemingly healthy trees

Ips Bark Beetles

- ▣ *Ips pilifrons* - spruce
- ▣ *Ips pini* - pine
- ▣ *Ips confusus* - pinyon pine
- ▣ *Ips paraconfusus* - pine, spruce



1/8-3/8" long
Spines on rear

Ips Facts



- ▣ Bark beetle family (Scolytidae)
- ▣ Adults colonize & reproduce in conductive (cambial) tissues
- ▣ Construct tunnels (galleries) to lay eggs & feed
- ▣ 6-8 wk life cycle; up to 5 generations per year
- ▣ Attack trees under stress
- ▣ Attack smaller diameter limbs at tops of trees first

Trees at Risk for Ips Attack

- **Stressed trees:**
 - Drought-stressed, trees in dry sites
 - Newly transplanted
 - Root injuries from construction or other
 - Crowded trees
- **Trees surrounded by breeding populations of Ips**
 - Slash (piles of prunings)
 - Stacks of green or infested wood



Management of Ips in the Landscape

- **Maintain tree vigor, avoid stress (proper watering, planting site, avoid injuries)**
 - 2-4" water every 2-6 weeks
 - Avoid planting in very dry sites
- **Remove & dispose of infested material**
 - Dispose 2-3 miles away from hosts
- **Remove and treat infested material**
 - Chip and spread to dry
 - Burn
 - Remove all bark

Management of Ips in the Landscape

▣ Apply preventive insecticide or apply to “lightly” infested trees:

- Carbaryl (Sevin): flowable, 2% ai solution
- Permethrin (Astro, Dragnet)
- Treat in spring before beetle flight (April) or treat in fall (late Sep to Oct)
- 12-18 months protection (carbaryl)
- High-pressure sprayer (≥ 250 psi) for large trees

Banded Elm Bark Beetle



Scolytus schevyrewi



Elm

Prunus

Willow

Russian Olive

Attacking American elm trees

May vector the Dutch Elm Disease fungus

Giant California Prionus



Photo Courtesy Shawn Steffan
Utah State University Extension

- Adult flight peaks in mid-July

Prionus Larvae



Crown & Root Injury



Prunus (Sweet Cherry)

Apple

Willow

Cottonwood

Photo Courtesy Shawa Steffan
Utah State University Extension

Common Indirect Insect Pests of Woody Ornamentals

▣ Sucking (Soft-Bodied) Insects

- ▣ Aphids

- ▣ Scale

- ▣ "New" mealybug on honeylocust & redbud

- ▣ Cooley spruce gall adelgid

- ▣ Spider mites

▣ Chewing Insects

- ▣ Lilac root weevil

Aphids

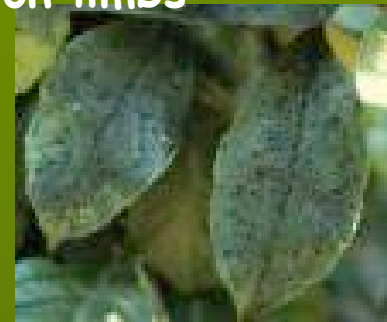
- Suck sap from phloem tubes in leaves and stems
- Curl leaves, produce sticky honeydew that promotes growth of black sooty mold, reduce plant vigor at high densities
- Populations increase rapidly, low numbers can be tolerated
- Only control if honeydew is a nuisance problem or distortion of leaves is severe and aphid



Apple aphid curls leaves



Giant willow aphid feeds on limbs



Sooty mold

Aphid Biology

Alternate hosts

Woody overwintering
host



Aphid eggs
on tree limbs

Woody or
herbaceous
summer host



Only females,
bear young live
Continual, overlapping
generations

Fruit tree aphids

plum, peach, rosy apple,
cherry

Spirea

Dogwood

Woolly elm

Woolly alder

Honeysuckle

Rose

Woolly maple

Poplar

Ash

Cottonwood

Aphid Biology

Single host

Produce overwintering eggs
in colder climates



Birch aphid



Cinara conifer
aphid

Apple

Birch

Poplar

Cottonwood

Walnut

Conifers

Sycamore

Maple

Pecan

Hackberry

Elm

Aphid Management

- ▣ Delayed Dormant Spray:
Dormant oil + Pyrethroid (at bud break) - targets eggs
- ▣ Spring and Summer control:
hard spray of water,
horticultural oil, insecticidal soap, imidacloprid (systemic),
Conserve, Aria, azadirachtin,
Orthene, pyrethroids, others
- ▣ Biological control: lady beetles,
lacewings, syrphid flies,



Syrphid fly larva



Lacewing larva



Aphid mummies

Insecticide Resistance Management

- ▣ Rotate chemical classes / modes of action
 - ▣ Within a generation
 - ▣ Between generations within a season



Aphid giving birth
to live nymph

Scale Insects

- Soft scales feed in phloem, produce sticky honeydew
- Armored scales feed on mesophyll of plant cells, do not produce honeydew
- Multiple years of scale feeding can kill limbs;



European fruit lecanium scale



San Jose scale & injury

Scale Biology

- ▣ 1-2 generations per summer
- ▣ Overwinter as eggs or young nymphs
- ▣ Females are sessile
- ▣ Males have wings
- ▣ "Crawler" stage is the best target for



Oystershell scale female surrounded by crawlers

Scale Management

- ▣ Delayed Dormant Control is effective for soft scales & some armored scales: Dormant oil + Pyrethroid (at first bud break)
- ▣ Use sticky tape in late spring to early summer to time a spray for "crawlers"
- ▣ Soft scales: Merit (systemic), Precision, Flagship, horticultural oil, insecticidal soap
- ▣ Armored scales: pyrethroids or



Oystershell scale



Pine needle scale

"New" Mealybug



Honeylocust
Redbud



Davis and Utah Counties



Photos by JayDee Gunnell, USU Extension

Cooley Spruce Gall Adelgid

- Form galls on new growth of spruce; also attack Douglas fir - cause needle swelling, necrosis and shedding
- Adults lay eggs on new "candle" growth in spring; young feeding at base of needles form the galls
- 2-year alternating life



Cut-open gall showing chambers with adelgids



Old gall that adelgids have vacated

Cooley Spruce Gall Adelgid Management

- ▣ Insecticide treatment at egg hatch: **Merit, Thionex, permethrin**
- ▣ Check the base of new needles for woolly nymphs
- ▣ **Avoid planting spruce and Doug fir together**
- ▣ **Prune off green/purple galls**



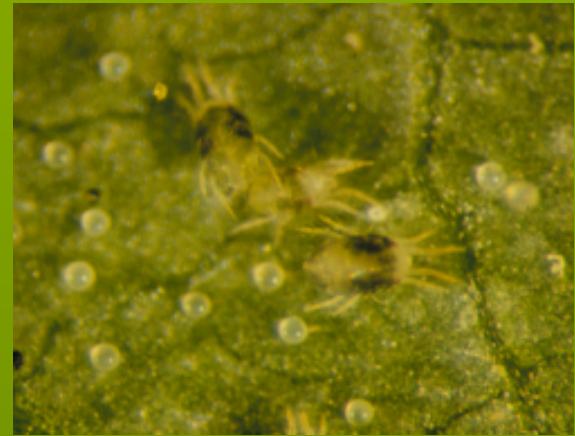
Aggregation of nymphs
at base of needles



Young gall

Spider Mites

- Very small size; infested plants appear “dirty”; produce webbing, suck sap (remove chlorophyll); leaf speckling
- When severe, cause bronzing or silvering of leaves; populations build quickly in hot weather
- Feed on many species of



Two spotted spider mites



Leaf bronzing
“Mite burn”

Spider Mite Management

- ▣ Biological control: **Predaceous mites**
- ▣ Soft Controls: **pressurized stream of water, horticultural oils, insecticidal soap**
- ▣ New miticides:
 - ▣ Acequinocyl (Kanemite, Shuttle)
 - ▣ Bifenazate (Floramite)
 - ▣ Pyridazinone (Akari, Nexter, Sanmite)
 - ▣ Chlorfenapyr (Pylon)



Spruce spider mite



Predaceous mite feeding on spider mite

Lilac Root Weevil

Otiorhynchus meridionalis

- Common hosts: lilac, peony, dogwood, yew, privet, cotoneaster, arbovitae, spruce, others
- Adults chew irregular notches in leaf edges - target with foliar insecticide (Orthene, Merit, Sevin, Azadirachtin, Pyrethroids) - in late spring with first leaf notching
- Larvae feed on roots - target with soil insecticide (Merit), insect-parasitic nematodes,



Adult & leaf notching



Needle notching on spruce



Larvae feeding on crown & roots

New Invasive Insect Pest to Utah



Mating pair of adults



Japanese Beetle Trap



Adult feeding injury to Virginia Creeper

Utah State University **Utah Pest Factsheet**
 Extension Entomology Specialist

Japanese Beetle

Edin Hodgson, Extension Entomology Specialist | Diane Allison, Extension Entomology Specialist

What You Should Know

- Japanese beetle was initially detected in Orem, Utah, in July 2006.
- Adults have a broad host range (over 300 plant species) and can cause significant damage.
- Invasive grubs prefer to feed on turfgrass roots and spend about 10 months of the year under the soil surface.
- Homeowners can successfully manage Japanese beetle with proactive cultural practices, biological control and reduced risk insecticides.

The Japanese beetle, *Popillia japonica* Newman, can be a highly destructive pest to ornamentals, trees, shrubs and turfgrass. First discovered in the eastern United States in 1916, the Japanese beetle has threatened agriculture and horticulture by slowly moving south and west. In 2006, a small population of adult Japanese beetles was detected in Orem, Utah. The invasive pest is especially harmful because the adults and immature grubs feed on plants and can cause significant damage when in high numbers. Together, the adults and grubs feed on more than several hundred plant species; some of the most susceptible plants are grown in Utah. Adult beetles feed on the upper leaf surface, removing the soft tissue of the leaf and leaving a strong aggregation pheromone that attracts additional beetles to a potential food source (Fig. 1).

Damage Symptoms

Feeding damage by Japanese beetle adults is commonly seen on roses or skeletonized leaves (Fig. 1). Adults are highly attracted to roses, apple, stonefruits (peach, plum, cherry), basswood/lindean, willow, elm, grape, birch, Japanese and Norway maples, pin oak, horse chestnut, and sycamore.

Without actively looking for grubs under the soil surface, grubs often go unnoticed until September, when large patches of turf are destroyed. Evidence of grub damage begins as localized discolored patches, but can enlarge and coalesce in just a few weeks. In some cases, heavily damaged turfgrass can feel spongy and be easily pulled away from the soil surface. Drought conditions can make turfgrass injury worse than in a healthy lawn.

Description

Adults are oval, metallic green with bronze-colored wings, and are about 1 1/2" long (Fig. 2). Males are slightly smaller than females. Adults have six white tufts of hair along each side of the body (Fig. 2). Grubs are creamy white, C-shaped, and 1" long when fully grown (Fig. 2). Adults are found clustered together on plants and grubs can be clumped under the soil of turfgrass.

Fig. 1. Adult Japanese beetle feeding

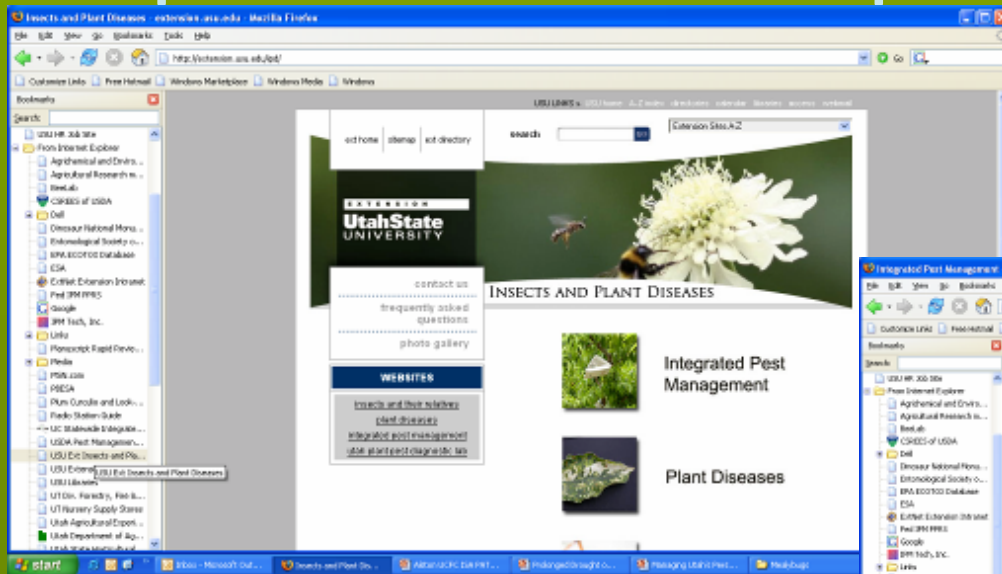
Fig. 2. Japanese beetle life stages

First detection in Utah:
July 2006 in Orem

Wide host range:
Shade & Fruit trees, Roses

USU Extension Pest Management Slideshows

<http://extension.usu.edu/ipd>



One-stop shopping for Utah pest management information



<http://extension.usu.edu/ipm>