

Common Insect Pests of Northern Utah



Diane Alston
Entomologist

Utah State University Extension
2006 Plant Pest Diagnostic Training

Lecture Topics

1. Resources on the Internet
2. Introduction to insects
3. Integrated Pest Management (IPM)
4. Natural enemies
5. Diagnosis & management of common insect problems in the home yard:
 - Ornamentals
 - Vegetables
 - Fruit

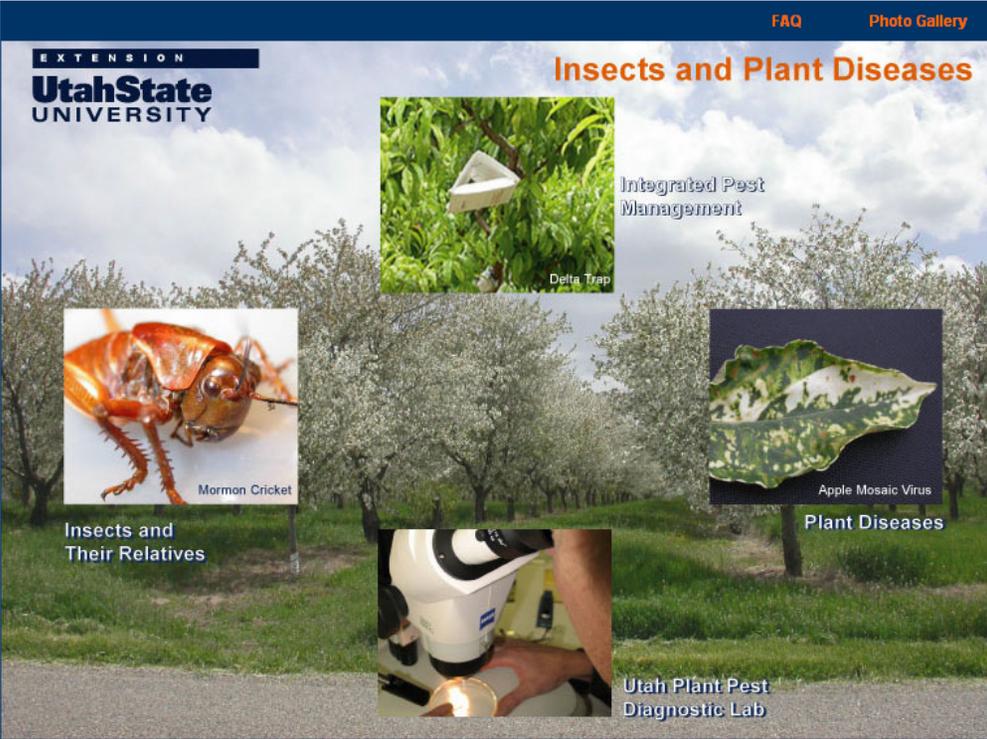
Pest Management Resources on the Web

- Pest fact sheets & photos
- Pest management recommendations
- Answers to frequently asked pest questions
- Pesticide information
- Utah Plant Pest Diagnostic Lab (how to submit plant and pest samples)
- Outreach education slideshows

Pest Management Resources on the Web "Insects and Plant Diseases"

Utah Plant Pest Diagnostic Lab

One-stop shopping for Utah pest management information



The screenshot shows a web browser window with the URL <http://extension.usu.edu/cooperative/ipd/>. The page features a blue header with the Utah State University logo and the title "Insects and Plant Diseases". Navigation links for "FAQ" and "Photo Gallery" are visible. The main content area includes several image-based links: a "Mormon Cricket" (labeled "Insects and Their Relatives"), a "Delta Trap" (labeled "Integrated Pest Management"), and "Apple Mosaic Virus" (labeled "Plant Diseases"). A "Utah Plant Pest Diagnostic Lab" link is also present at the bottom right of the main content area.

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

Pest Management Resources on the Web

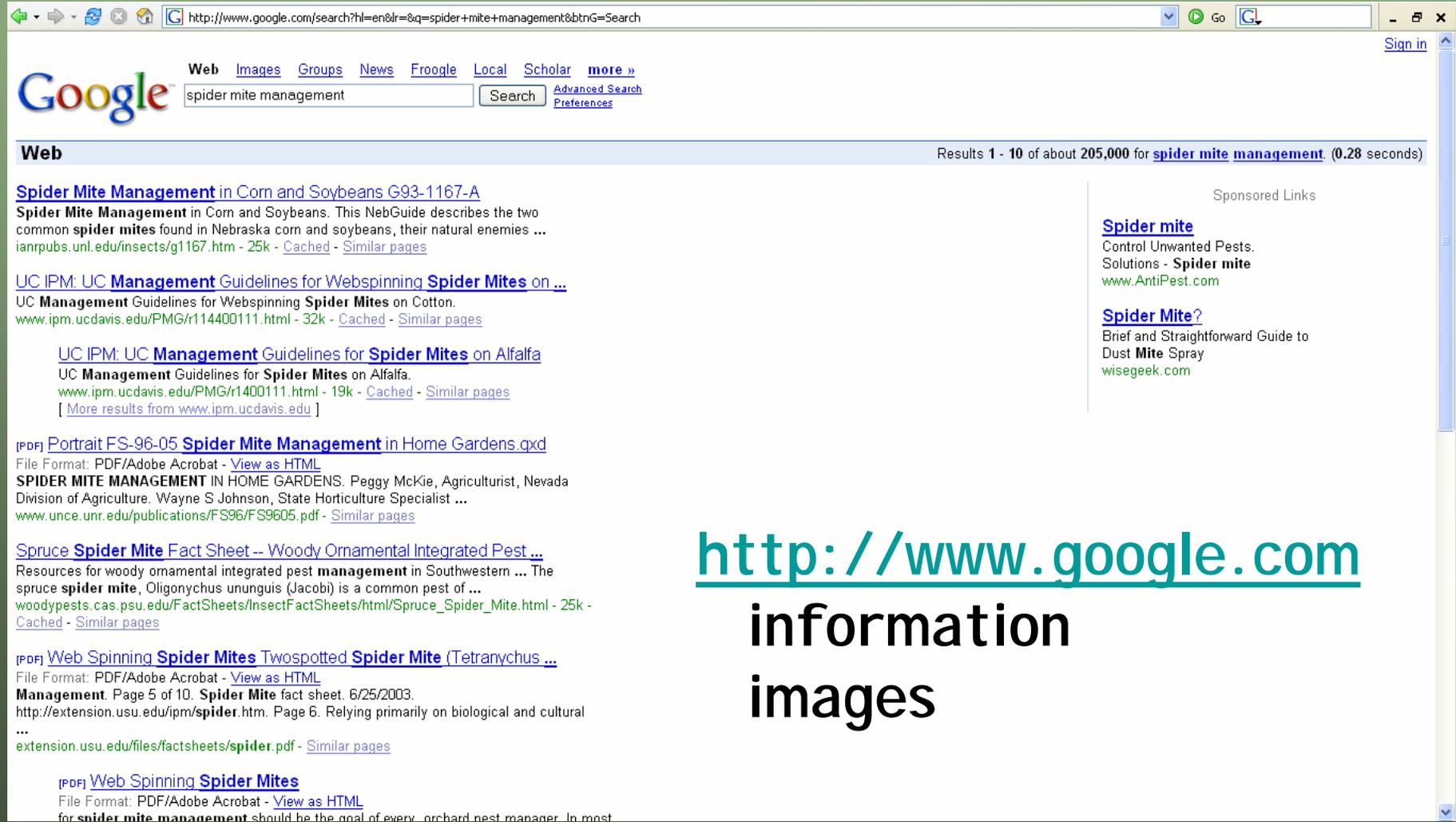
“USU Extension Publications”

USU
Cooperative
Extension
Publications
Home Gardening
Agriculture
Natural Resources

EXTENSION
Utah State UNIVERSITY
COOPERATIVE EXTENSION
CONTINUING EDUCATION
COOPERATIVE EXTENSION
CONFERENCE SERVICES
PRACTICAL SOLUTIONS for a COMPLEX WORLD
Extension Search Search ALL SEARCH Home > Cooperative Extension
[text version] [En Español]
Cooperative Extension
INDEX
PUBLICATIONS
ASK A SPECIALIST
COUNTY OFFICES
EXTENSIÓN EN ESPAÑOL
SOLUTIONS
4-H & Youth
Agriculture
Community Development
Disability
Disaster
Diversity
Family Resources
Food & Nutrition
Home Gardening
Natural Resources
PRACTICAL SOLUTIONS FOR A COMPLEX WORLD.
Utah State University Cooperative Extension delivers research-based education and information to Utahns regardless of how close or far they live from campus. Educational programs that address agriculture, community and economic development, 4-H and youth, natural resources, and family, food and nutrition, are delivered via a variety of methods and are offered through a federal, state and county partnership. Utah State Cooperative Extension has offices that reach every county and in a very real sense "extends" the university to you.
Follow the links to the left to begin.
COPYRIGHT 2001-2004 UTAH STATE UNIVERSITY, LOGAN UT 84322. (435) 797-1000

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

Search for Information on the Web "Google Search Engine"



The screenshot shows a Google search results page for the query "spider mite management". The browser address bar displays the URL: <http://www.google.com/search?hl=en&lr=&q=spider+mite+management&btnG=Search>. The search bar contains the text "spider mite management" and a "Search" button. The page shows search results for "spider mite management" with approximately 205,000 results found in 0.28 seconds. The results are listed under the "Web" category. The first result is "Spider Mite Management in Corn and Soybeans G93-1167-A" from ianrpubs.unl.edu/insects/g1167.htm. Other results include "UC IPM: UC Management Guidelines for Webspinning Spider Mites on ..." from www.ipm.ucdavis.edu/PMG/r114400111.html, "UC IPM: UC Management Guidelines for Spider Mites on Alfalfa" from www.ipm.ucdavis.edu/PMG/r1400111.html, "Portrait FS-96-05 Spider Mite Management in Home Gardens.qxd" from www.unce.unr.edu/publications/FS96/FS9605.pdf, "Spruce Spider Mite Fact Sheet -- Woody Ornamental Integrated Pest ..." from woodypests.cas.psu.edu/FactSheets/InsectFactSheets/html/Spruce_Spider_Mite.html, and "Web Spinning Spider Mites Twospotted Spider Mite (Tetranychus ...)" from extension.usu.edu/ipm/spider.htm. A "Sponsored Links" section on the right side of the page lists "Spider mite" from www.AntiPest.com and "Spider Mite?" from wisegeek.com.

<http://www.google.com>
information
images

What is an insect?



Insects:

6 legs

3 body regions

Antennae

Flight - adults

Insect Relatives:

Spiders (Arachnids)

Mites (Acari)

Centipedes

Millipedes



Arthropods



Non-Arthropods
Snails and Slugs

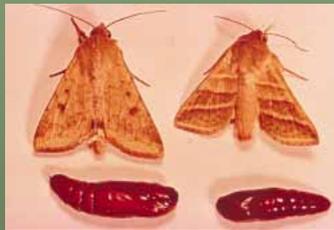


Most insects are not pests

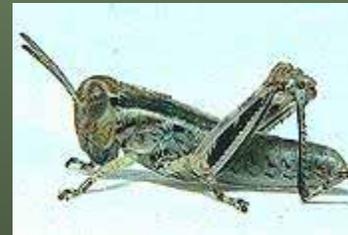


Insect Life Cycles

Complete Metamorphosis



Incomplete Metamorphosis



Insect Plant-Feeding Types

Chewing



Piercing-Sucking



Borers



Gall Formers

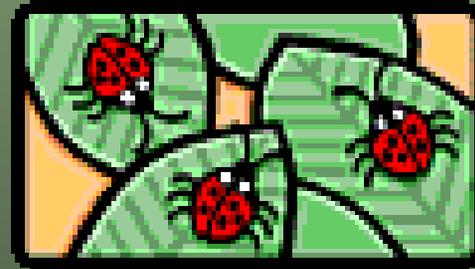


Diagnosis



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, economically, and socially sound



IPM Strategies

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



Ips-killed spruce trees in Garland, UT cemetery

IPM Strategies

■ For “secondary pests”

- Aphids, Scale, Leaf feeders
- Exposed feeders
- Use “soft” (selective) controls
- Natural biological control is more prevalent

■ For “primary pests”

- Tree borers, Fruit feeders
- Hidden feeders
- Target / Timing for susceptible life stage(s) is critical
- Maintain active residues for critical period

■ Conserve natural enemies by avoiding toxic, broad-spectrum insecticides



Elm leaf beetle



Codling moth injury to apple

Traps and Physical Barriers

■ Traps

- Yellow jacket wasps, slugs, spiders



■ Sticky bands

- Trees and shrubs



Biological Control

- How can I 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 insects



Parasitic wasp that attacks caterpillars



Big-eyed bug nymph feeding on an insect egg

Beneficial Insects & Mites

Cast of Characters



Parasitic wasps & flies



Predaceous true bugs & beetles



Lacewing

Common Aphid Predators



Syrphid Fly



Lady Beetle



Predaceous Mites

Ornamental Insect Pests

Chewing Injury



Strawberry Root Weevil



- Common hosts: lilac, peony, dogwood, yew, privet, cotoneaster, arbovitae, others
- Plants can tolerate some injury
- Adults chew irregular notches in leaf edges - target with foliar insecticide (Orthene, Merit, Sevin, Talstar) - in spring when leaf-notching first appears
- Larvae feed on crown & roots - target with soil insecticide (Merit), insect-feeding nematodes, or fungus



European Earwig

- Primarily feed on decaying organic matter (saprophytic)
- Feed on young, tender plants; chew holes in flower petals, fruits; nuisance pest
- Adults are also predators; nocturnal
- Cultural & mechanical controls: avoid overuse of mulch and damp debris where they hide during the day; place and remove rolled newspaper; attractant traps: tuna can with bacon grease
- Chemicals: permethrin; target young in nests
- Tanglefoot on base of trunks, stems



Tobacco Budworm

- Caterpillar larvae feed on buds of ornamental flowers (geranium, petunia, snapdragon, nicotiana, etc.)
- Easy to kill small larvae – hand-picking, Bt (*Bacillus thuringiensis*; Dipel, Thuricide), spinosad (Conserve, Success), permethrin, Neem oil, Orthene



Grasshoppers

- Young (nymphs) & adults chew holes in leaves, completely consuming foliage
- Move into yards from nearby rangeland, grassy areas, undeveloped lots
- Treat borders of property when young grasshoppers are first seen moving in
- Young are much easier to kill than adults
- Insecticidal baits: wheat bran + insecticide (carbaryl) - effective on young & adults
- Malathion, Sevin, Permethrin - most effective on young
- *Nosema locustae* (No-Lo-Bait) - natural pathogen of grasshoppers - treat young



Snails & Slugs

- Eat large irregular holes in leaves & fruit
- Susceptible to dry conditions
- Cultural controls: do not over irrigate, avoid excessive mulch & debris which provide moist habitats
- Chemicals: baits (iron phosphate), commercial & home-made traps (low sided dishes with water + yeast)



Major Turf Insect Pests

- Surface / Thatch Feeders (leaf, stem):

- Armyworm
- Cutworm
- Sod webworm
- Mites

- Surface / Crown Feeders (burrow into stem, crown):

- Billbug
- Subterranean webworm

- Subsurface (root):

- May & June beetles



White Grubs

May and June Beetles (*Phyllophaga*)
Black Turfgrass Ataenius (*Ataenius*)

- Scarab beetle family
- C-shaped white larvae
 - Brown head, legs
 - Eat roots
 - Turf “roll-back”
- 1-3 year life cycle



James L. Castner, U. Fla. Ent. Dep.



UF

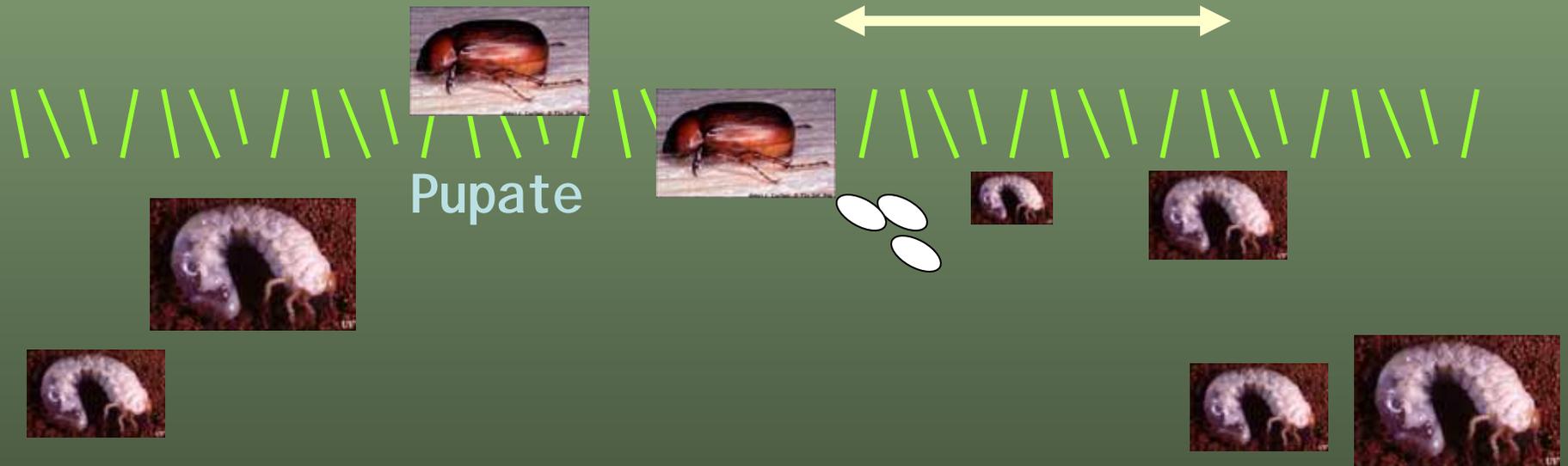
White Grubs

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 Control

- Target small larvae (late spring-early summer)
- Target larvae before they dig deep for the winter (late summer to early fall)
- Threshold: 3-4 grubs/sq ft
- Irrigate to move chemicals to grubs in the upper root zone
 - Imidacloprid (Merit™)
 - Halofenozide (Mach 2™)
 - Carbaryl (Sevin™)
 - Trichlorfon (Dylox™)
 - Beneficial Nematodes - *Heterorhabditis bacteriophora* (Cruiser™), *Steinernema carpocapsae* (Scanmask™)
 - Fungus - *Beauveria bassiana* (Botanigard™, Naturalis™)



Billbugs (*Sphenophorus* spp.)

- Bluegrass & Denver Billbugs
- Weevil beetle family (snout)
 - Burrow in stems, crown
 - Small, legless larvae
 - Blades break at crown
 - Sawdust like frass
- 1 year life cycle



Billbug Control

- Target small larvae (spring and early summer)
- Threshold: 15-20 larvae/sq ft
- Resistant turfgrass varieties
- Light irrigation to move chemicals into crown zone
 - Imidacloprid (Merit™)
 - Halofenozide (Mach 2™)
 - Scimitar™, Talstar™ & Tempo™ for adults
 - Carbaryl (Sevin™)
 - Beneficial Nematodes - *Heterorhabditis bacteriophora* (Cruiser™) & *Steinernema carpocapsae* (Scanmask™)
 - Fungus - *Beauveria bassiana* (Botanigard™ Naturalis™)



Sod Webworms

- Lepidoptera (moth, caterpillar)
- Snout moths
 - Gray to brown caterpillars
 - Larvae feed on grass blades
 - Larvae form silken tunnels in thatch
 - Injury not as severe as grubs & billbugs
 - Gray to brown moths fly just above turf in zigzag pattern; especially near dusk
- 1-3 generations per year



Sod Webworm Control

- Target young larvae (summer)
- Threshold: 20 larvae/sq ft
- Increase mowing height
 - *Bacillus thuringiensis* (Bt) - must be ingested by small larvae
 - Spinosad (Conserve™)
 - Azadirachtin (Ornazin™)
 - Halofenozide (Mach 2™)
 - Scimitar™, Talstar™, Tempo™
 - Acephate (Orthene™)
 - Carbaryl (Sevin™)
 - Beneficial Nematodes



Ornamental Insect Pests

Piercing-Sucking Injury



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; cause dieback



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 control



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 others timed with crawlers



Oystershell scale



Pine needle scale

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 numbers are very high
- Many generations per summer



Apple aphid curls leaves



Giant willow aphid feeds on limbs



Sooty mold

Aphid Management

- **Delayed Dormant Spray:**
Dormant oil + Pyrethroid (at bud break)
- **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, parasitic wasps



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

Box Elder Bug



- Primarily a nuisance pest
- **Exclusion of insects from buildings is most effective management**
- **Removal of female boxelder trees can be helpful (trees with winged seeds)**
- **Targeted removal of adults from problem areas (mechanical removal: hard spray of water, sweep, vacuum)**

Ornamental Insect Pests

Tree Borers



Bark Beetles (Scolytidae)



Spruce
Pine
Fir
Prunus

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

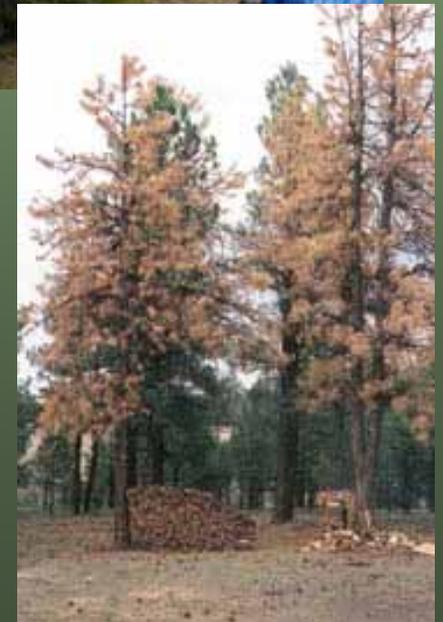
Ips Facts



- 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
 - Freshly cut wood is a preferred breeding site



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
 - Cover logs with ≥ 10 ml clear plastic & heat to lethal temperatures

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
 - Apply to entire bole & larger limbs

Tree Borers



- Avoid planting trees with borer problems (birch, poplars, aspen, ash)
- Maintain good tree health - stressed trees are more prone to attack
- Preventive trunk insecticide sprays
- Systemic insecticide (Merit) -beetles



Tree Borer Management

■ Preventive Trunk Treatments

- Timing is critical (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 – May and Sept.

■ Insecticides: Orthene, Sevin, Dimethoate, Thiodan, Permethrin, Merit

Ornamental Insect Pests

Gall Formers



Cooley Spruce
Gall Adelgid



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 forms galls
- Insecticide treatment at egg hatch (Merit, Orthene, Malathion)
- Avoid planting spruce and Doug fir together
- Prune off green/purple galls



Vegetable and Herb Garden Insect Pests Chewing Injury



Mexican Bean Beetle

- “Black sheep” of the lady beetle family
- Skeletonize leaves; scar stems & pods
- Cultural controls: Adults over winter in plant debris, clean up garden in fall
- Some beans are more resistant (Asian)
- Plant early and late crops; avoid major activity period of beetle (late July & August)
- Hand pick or squish
- Chemicals: Sevin, Permethrin, Neem oil, Success



Corn Earworm

- Corn: caterpillars feed on new silks & ear tips; reduce pollination & damage ear tips; allow entry of molds & attract other insects (sap beetles, earwigs)
- Tomato & Pepper: caterpillars feed on leaves & fruit
- Cultural control: Early crops avoid injury
- Protect young silk; difficult to control worms once inside ear tip
- Chemicals: Sevin, permethrin, pyrethrin, neem oil, oils applied to silks (reapply every few days)
- Bt & Success effective for tomato & pepper worms



Tomato Hornworm

- LARGE green caterpillars with horn on tail
- Feed on tomato, eggplant, potato
- Consume large amounts of foliage and buds in a short time period
- Remove by hand
- Chemicals: Bt (Dipel, Thuricide), Success, Many others
- Parasitic wasp - white cocoons on caterpillars



Cabbage Worms

- Caterpillars chew large holes in leaves; produce abundant frass (excrement)
- Bt (Dipel, Thuricide), Success - very effective
- Row cover fabric) - cover plants to prevent egg-laying



Leafminers in Leafy Veggies

- Adults - Small flies
- Larvae - White to cream maggots
- Winding trails on leaves, white blotches
- Scout regularly, >1 mine/leaf
- Natural enemies (Paper wasp)
- Row covers
- Spinosad (Success, Entrust) insecticide



Vegetable & Herb Garden Pests

Piercing-Sucking Injury



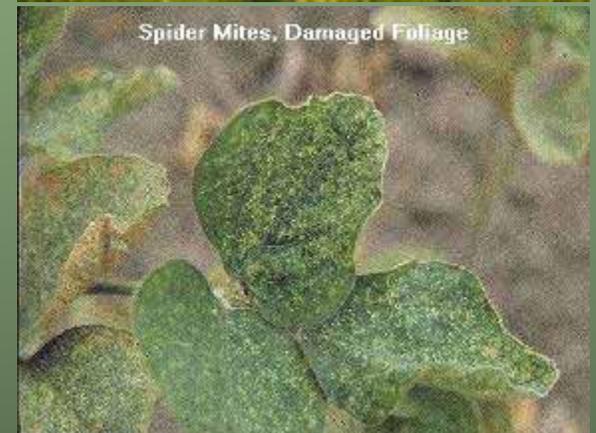
Squash Bug

- Adults & nymphs suck fluids from plant leaves, stems & fruit; may transmit Yellow Vine Disease (bacteria)
- Congregate in plant debris under plants
- Cultural controls: Remove garden debris in fall, nearby woodpiles or other protected sites (adults over winter)
- Hand pick or destroy eggs & nymphs
- Chemicals: spray when first detect nymphs, drench undersides of leaves & stems
- Malathion, Sevin, permethrin, Neem oil, Thiodan, Surround (kaolin clay)



Spider Mites

- Very small; 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
- Suppress mite population before it explodes
- Controls: pressurized stream of water, horticultural oils, insecticidal soap
- Don't recommend Vendex or other miticides unless a rescue treatment
- Biological control: Predaceous mites



Fruit Pests

Chewing Injury



Codling Moth

- Caterpillars bore into fruit; over winter as larvae inside silken cocoons on trunk; eggs laid by moth on leaf & fruit surfaces
- Chemical controls: target newly hatched larva; timing based on moth trap catch info. & degree-days in your area
- Imidan (14-21 d), Sevin (7-10 d), Permethrin (5-7 d), Malathion (5-7 d), Bt (3-5 d), CM Virus (CydX, Virusoft; 7 d)
- Sanitation: pick up dropped fruit
- Trunk banding: place corrugated cardboard bands (3-4" wide) around trunks (Jun-Sep)
- Fruit bagging (May-Aug)



Pyrethroid Insecticide Warning!!

- Multiple applications of pyrethroid insecticides can lead to mite burn
- Pyrethroids are safe for humans & other mammals
- But they are toxic to many natural enemies, including predaceous mites
- Use pyrethroids sparingly



Mechanical Codling Moth Controls



- Corrugated cardboard strip with codling moth pupa inside silk cocoon



- Fruit bags to exclude codling moth
- Place bags over 3/4" diameter fruit

Peach Twig Borer

- Over winter as young larvae on limbs; brown caterpillars burrow inside twigs from bloom to petal fall; a second generation enters fruit, usually at the stem end
- Delayed Dormant Spray: Dormant oil + Pyrethroid or Thiodan (by first pink) - targets twig boring OR At-Bloom Sprays: 2 Bt or Success sprays (early & full to late bloom)
- Fruit protection: Success, Imidan, Permethrin, or Thiodan timed with trap catch and degree-day info. or apply at shuck-fall & repeat if needed



Western Cherry Fruit Fly

- Larvae feed in sweet & tart cherries; female flies lay eggs in ripening fruit; fruit doesn't become soft enough for egg-laying until it turns straw to salmon colored
- Cultural controls: Landscape fabric or barrier under tree canopy
- Chemical control: Imidan (tarts only - 14 d), Malathion (5 d), Sevin (5-7 d), Permethrin (5 d), Success (7 d), GF-120 Fruit Fly Bait



Fruit Pests

Piercing-Sucking Injury



Grape & Virginia Creeper Leafhoppers

- Adults overwinter in leaf litter
- Lay eggs on new leaves
- 2 generations per season
- Natural enemies
- Vigorous vine growth
- Remove or incorporate leaves & debris
- Insecticides: Kaolin clay (Surround), Malathion, Spinosad (Success) – target young nymphs



Leafhopper
Erythroneura sp.
(adult)



Aphids



- Suck fluids from leaves & stems; curl leaves; produce sticky honeydew; black sooty mold growth
- Protect young trees, older trees can tolerate more aphid feeding
- Controls: Dormant oil + Pyrethroid or Thiodan (at green tip stage)
- Insecticidal soap, horticultural oil, Malathion, Thiodan, imidacloprid (apple & pear)
- Biological control: lady beetles, lacewings, syrphid flies, parasitic wasps

San Jose Scale

- Scales encrust limbs; can kill limbs after several years of feeding; scales and feeding spots on fruit
- Controls: Dormant oil + Pyrethroid or Thiodan (at green tip or pink)
- Use sticky tape in May to time a spray for "crawlers"
- Horticultural oil, insecticidal soap, imidacloprid (apple & pear), Malathion, Thiodan



Spider Mites

- Feed on leaves; produce webbing; injury appears as white speckles; severe feeding leads to bronzing
- Mites build up on broadleaf weeds (bindweed, knotweed, mallow, prickly lettuce); reproduce rapidly in hot weather
- Cultural controls: Avoid mowing, herbicides, drying of vegetation - prompts mites to move into trees
- Avoid multiple applications of pyrethroid insecticides
- Biological control: naturally occurring predatory mites & small lady beetle
- Chemicals: horticultural oil, insecticidal soap



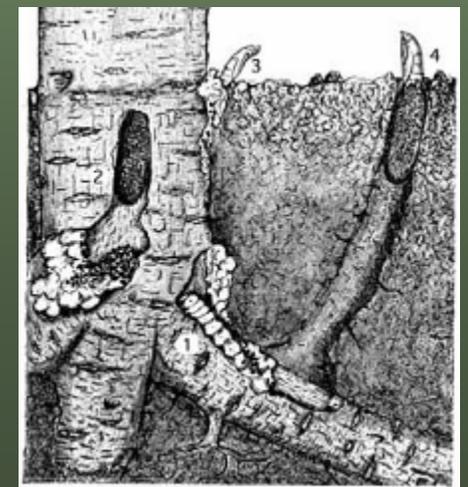
Fruit Pests

Tree and Cane Borers



Peachtree Borer

- Female clear-winged moths lay eggs on lower trunk or in cracks in soil near the base; larvae bore into the cambium in lower trunk; trees may be girdled & die; adults begin activity in late June to early July in northern Utah
- Control: Trunk spray with Thiodan during first week of July; repeat in first week of August



There are many other reasons that trees sap or bleed



Fungus canker



Winter injury

Raspberry Horntail

- Wood wasp
- Cane tips wilt; larvae tunnel within pith
- Prune & destroy infested cane tops
- Parasitic wasp attacks horntail larvae
- Chemicals - treat in at bud break, repeat; avoid bloom: Sevin, Malathion, Permethrin

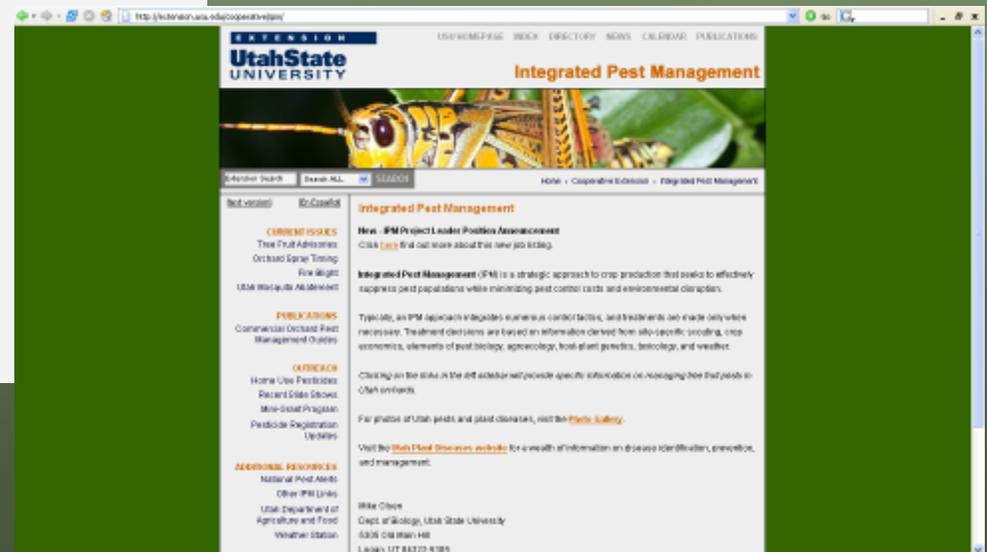
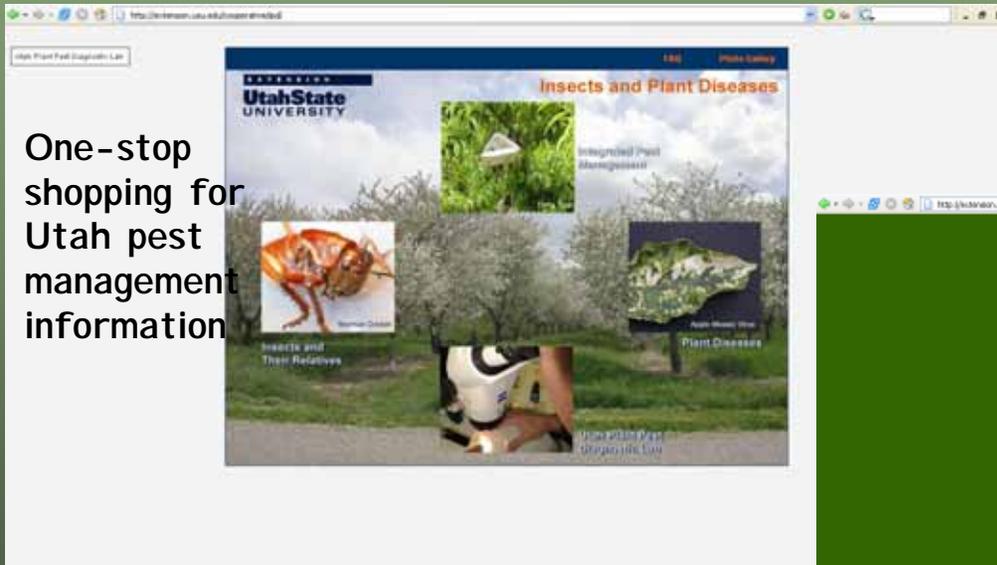


USU Extension Pest Management Slideshows

Where can you view this slideshow?

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

One-stop shopping for Utah pest management information



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

Contact Information

Diane Alston

Entomologist

Utah State University

(435) 797-2516

dianea@biology.usu.edu

[http://extension.usu.edu/cooperative/
ipm](http://extension.usu.edu/cooperative/ipm)