Scale insects can suck the life out of trees

Erin W. Hodgson
Extension Entomologist
Utah State University
Outline – scale insects

• Background and key characters
• Biology and life cycle
• Geographical distribution
• Most common species
• Control options
• Where to get more information
Scale background

• More than 7,500 scales species
• Related to aphids, cicadas, psyllids
• Hemiptera (order)
  – Sternorrhyncha (suborder)
• Coccoidea (superfamily)
  – Mealybugs Pseudococcidae
  – Armored scales Diaspididae
  – Soft scales Coccidae
Scale biology

- Soft-bodied insects, most <5 mm long
- Cryptic nature
- Body covered in wax or “cotton” dust
- All scales have piercing-sucking mouthparts
  - Fluid feeders that remove plant sap (phloem)
  - Dehydrates plant
  - Excrete honeydew like aphids
What do scales look like?

• Females
  – Sac-like, no defined body regions
  – Adults resemble nymphs
  – Obvious mouthparts
  – Covered in wax, powder or dust
  – May not have legs
  – Rarely moving around on or between plants
What do scales look like?

• Males
  – Fly-like, defined body regions
  – Wingless or one pair of forewings
  – Reduced or absent mouthparts
  – Not covered in wax or powder
  – Highly mobile on or between plants
Scale life cycle

• Most scales have males and females
• Some never form males
  – Asexual, clonal reproduction like aphids
• Generations per year is variable
  – Temperature, humidity, food quality
  – 1-3/year is typical
• Overwintering stage is variable
  – Crawlers, mature nymphs or adults
A – egg
B, F – crawler
C, G – settled crawler w/ cap
D, H – 2\textsuperscript{nd} instar
E – ♀ Adult
I – prepupa
J – pupa
K - ♂ Adult
Geographic distribution

- Scales are found throughout the world
- Usually on trees, shrubs
- Less common on annual plants
Are scales good or bad?

• We **like** them for:
  – Candle wax
  – Shellac (varnish)
  – Dyes (fabric)
  – Cochineal (pigment)
  – Weed biocontrol

• We **hate** them on our:
  – Agricultural crops
  – Fruit trees
  – Forests
  – Greenhouses
  – House plants
  – Woody ornamentals
  – Turfgrass
Are scales economically important?

• Yes, some are persistent problems
  – Armored scales
  – Several $million in damage and control costs in U.S. annually

• 200 considered pests (8%)
  – Wide host range
  – Vector pathogens, toxins
  – Insecticidal control can be difficult
What kinds of plants do scales like?

- Can feed on >180 plant families
- Most commonly feed on a few families
  - Leguminosae
  - Gramineae
  - Euphorbiaceae
- Scales can feed on all plant parts
  - Stems, bark, leaves, roots
Why are scales so successful?

- >700 species in North America
- Most trees are acceptable hosts
- Cryptic nature, often go unnoticed
- Insecticides often kill natural enemies
Do scales have enemies?

- Predators, parasitoids and pathogens
Can enemies reduce scale #’s?

- Yes! Great option for homeowners
- Usually a time delay in suppression
- Susceptible to broad spectrum insecticides

- Adults feed on pollen/nectar
- Diverse plantings will attract many enemies
Most common scales in Utah

- Pinyon needle scale
- Pine needle scale
- Juniper scale
- Oystershell scale
- Black pine leaf scale
- Cottony maple scale
- Lecanium scale
- Brown soft scale

Armored scales

Soft scales
Pinyon needle scale

- *Matsucoccus acalyptus*
- 1.5 mm long
- Black, bean shaped nymphs and adults
- Hosts: pinyon, single-leaf pinyon
- Cottony egg masses found around the root collar, in crotches of large branches, along the undersides of large branches, and in the fissures of rough bark
Pinyon needle scale

- Scales feed on year-old needles
- Infestations cause overall yellowing/thinning of the foliage, leaving needle tufts at branch tips
- Needle length is greatly reduced
- Repeated colonization weakens and frequently kills small trees
- Weakened trees attract other harmful insects (e.g., bark beetles)
Pine needle scale

• *Chionaspis pinifoliae*

• 3 mm, white oyster shell-shaped scale
• Hosts: mugo pine, scotch pine, austrian pine, spruce, firs, Douglas-fir and cedars
• Overwinters as deep reddish colored eggs protected under the female's old armor
• Spread by crawlers being blown from tree to tree or when mature trees begin to touch branches
Pine needle scale

- Scales can completely cover needles, causing plant discoloration
- Heavy infestations cause trees to look frosted
- Needle, twig and branch death may occur with persistent feeding
Juniper scale

• *Carulaspis juniperi*

• 1-2 mm, circular, flat “fried egg”
• Hosts: redcedar, cypress, falsecypress, junipers
• Feeds on stems or leaves
• Feeding causes brown patches, dieback, death
• Most readily found on the underside of the foliage
Oystershell scale

- *Lepidosaphes ulmi*
- 2.5 mm long; grayish brown, banded “shell”
- Hosts: ash, dogwood, lilac, poplar and willow
- Old scales can stay attached for several years before falling off
- Bodies blend in with bark, can be overlooked
- Heavy infestations can kill twig or branches
- Bark becomes cracked and scaly, trees loose vigor, foliage is yellow, spotted or dwarfed
Oystershell scale
Black pineleaf scale

- *Nuculaspis californica*

- 1-1.5 mm long, armored scale
- Black with grey margins
- Attacks needles only, can reduce number, length, and retention
- Heavily infested needles are yellow in the spring, drop off by the fall
Black pineleaf scale
Cottony maple scale

- *Pulvinaria innumerabilis*
- Large and conspicuous soft scale
- 3-4 mm long; brown, flat, oval body
- Hosts: silver and red maples, honey and black locust, white ash, euonymus, oak, boxelder, dogwood, hackberry, sycamore, beech, elm, willow, basswood, poplar, and birch
- Heavy infestations can result in branches being turned completely white with the egg sacs
Cottony maple scale

- Outbreaks occur on weakened or stressed trees
- Heavy infestation can cause the death of small branches and occasionally the death of a tree
- Produce large amounts of honeydew, leaves may be shiny/sticky
- Promotes black sooty mold on branches/trunk
- Adults and eggs are resistant to insecticides
Lecanium scales

- *Parthenoolecanium* spp.
- 2-6 mm in diameter
- Turtle-shaped, waxy and reddish to dark brown
- Eggs resemble fine pollen
- Hosts: dogwoods and oaks
  - Terrapin scales prefer maples and peach
  - Hickory lecanium scale prefers hickory and elm
  - European fruit lecanium scale prefer a wide variety of shade and fruit trees, shrubs, and woody ornamentals
- Severe infestations may stunt plants, leaf drop
Lecanium scales
Brown soft scale

- *Coccus hesperidium*
- 2.5-4 mm long, oval shape
- Yellowish green, often mottled with brown spots
- Hosts: ferns, most greenhouse/indoor plants, but seems to prefer perennials over annuals
- Heavy feeding reduces tree vigor, kills twigs, and reduces yields
- Honeydew/sooty mold can affect fruit grade
- Tending ants can interfere with the biocontrol
Brown soft scale
Control options – Level 1

• Tolerance, do nothing
• Natural enemies can regulate populations
• Keep plants healthy
  – Stressed plants attract scales (and other insects!)
  – Follow irrigation and fertilization regimes
  – Remember over-fertilization also favor scales (and other insects!)
Control options – Level 2

• Monitor for eggs and crawlers
• Pruning infested branches and leaves will protect new growth
• Rake, bag and discard infested debris
• Scrub limbs with mesh dish sponge
• High pressure from water hose
Control options – Level 3

• Dormant oils
  – Suffocants geared for the overwintering stages
  – Typically applied before bud burst
  – May not be effective against armored scales

• Horticultural oils
  – Suffocants geared for crawlers
  – Can burn plants

• Insecticidal soaps
  – Remove the waxy cuticle and causes dehydration
  – Repeated applications may be needed
Control options – Level 4

• Reduced risk insecticides
  – Conserve natural enemies
  – Relatively short residual
  – E.g., Concern, Esteem (IGR), Pyganic

• Systemic Insecticidal Drenches
  – Geared for all feeding stages
  – Extended residual for fluid feeders
  – E.g., Imidacloprid
Control options – Level 5

• Foliar Insecticidal Sprays
  – Geared for crawler stage, time with new growth
  – Longer residual, broad spectrum
  – Must make contact!
  – Armored scales may survive
  – E.g., carbaryl, chlorpyrifos, dimethoate, malathion, permethrin
Summary of Scales

• <10% are persistent problems
• Many attack trees common to Utah
• Cryptic, inactive females
• Usually a protective shell or wax
Where to get more information

• [utahpests.usu.edu](http://utahpests.usu.edu) (see this again)


• *Insects and diseases of woody plants.* Cranshaw et al. 2003. ISBN 1889143049

• *Insects that feed on trees and shrubs.* Johnson and Lyon. 1991. ISBN 0801426022
THANK YOU!!!

Erin W. Hodgson
Extension Entomologist
Utah State University

erin@biology.usu.edu

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