

# Scale insects can suck the life out of trees

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# 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

mealybug



armored scale



soft scale

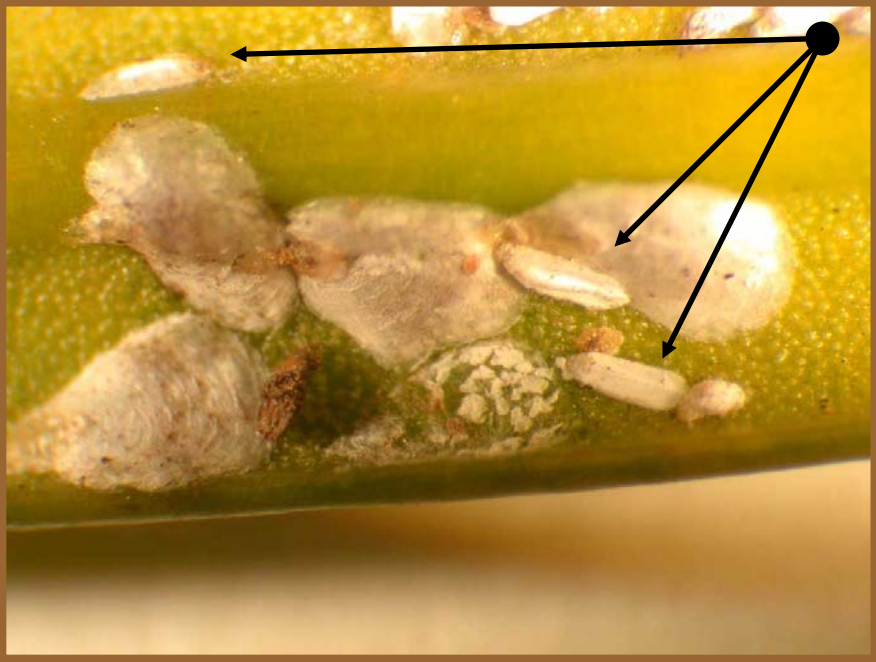


armored scale



# 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

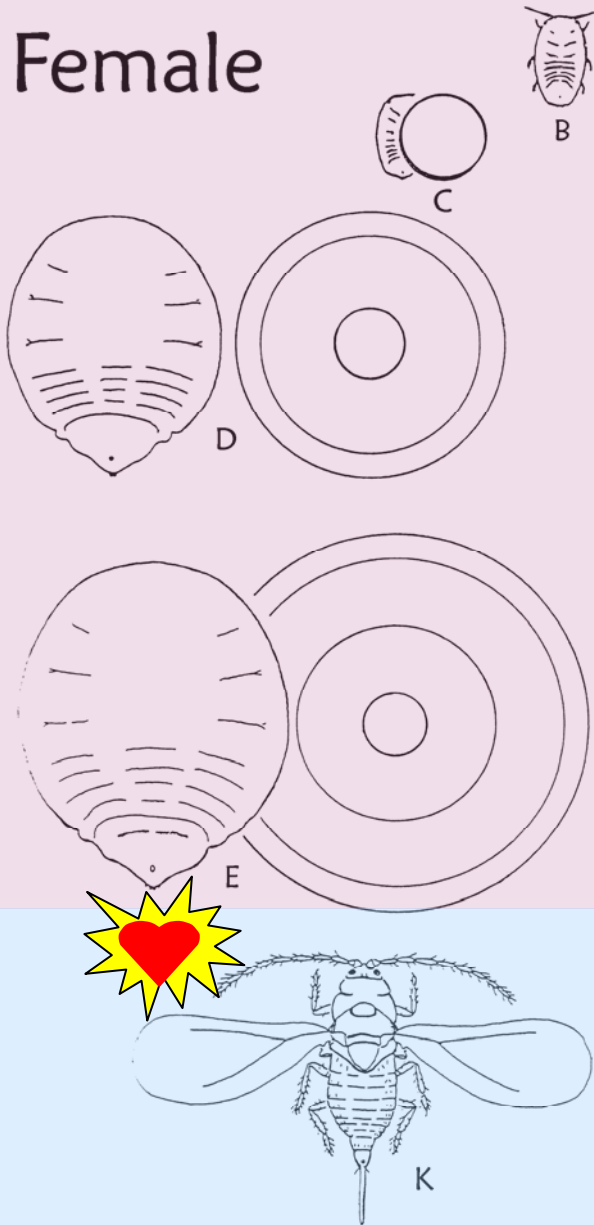




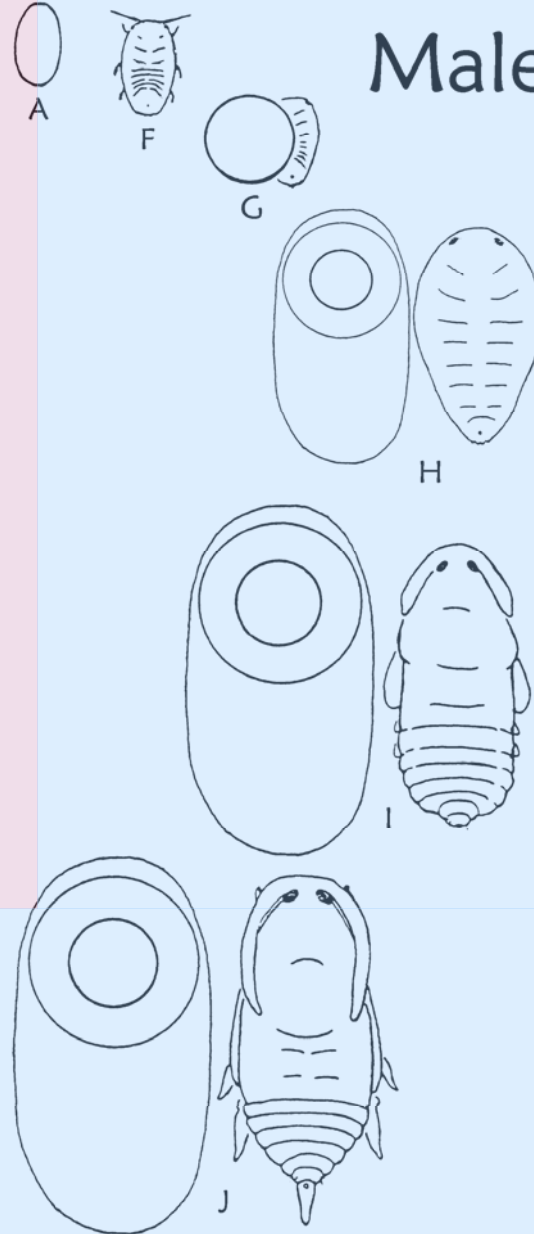
# Scale life cycle

- 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

# Female



# Male



A – egg

B, F – crawler

C, G – settled crawler w/ cap

D, H – 2<sup>nd</sup> 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 pineleaf 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
- Hosts: lodgepole pine, ponderosa pine, Monterey pine, Douglas-fir and white fir
- 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

- *Parthenolecanium* 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 hesperidum*
- 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* (see this again)
- *Garden Insects of North America.*  
Cranshaw. 2004. ISBN 0691095604
- *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!!!

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