

Armored and soft scales



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Eriococcid, felt scale



summer adult female with crawlers

European elm scale scale: elm



**summer
male**

soft scale



**summer female
and crawlers**

Tuliptree scale: linden, walnut



**summer
females**

soft scale



male covers

Tuliptree scale: linden, walnut

armored scale



**spring
adult females and males**



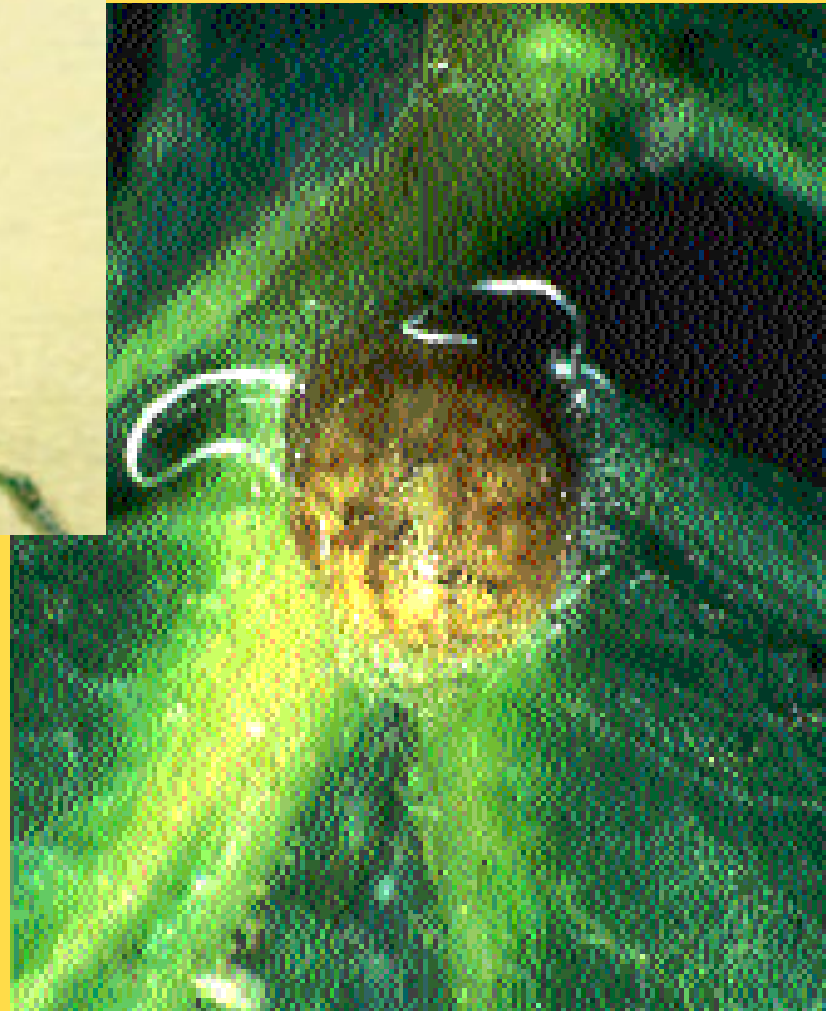
males

Euonymus scale: euonymus

gall-like scale



summer females



**Pin oak kermes,
Pubescent kermes scale: oak**

Taxonomy of scales

- **Order Hemiptera,**
formerly placed in order Homoptera
related to aphids and mealybugs
- **Diaspididae: armored scales**
- **Coccidae, Eriococcidae: soft scales**

Characteristics of armored and soft scales

- **Long stylets for feeding**
- **Males have different shaped covers**
- **Males look like winged aphids**
- **Crawler stage**
- **High density can kill branches**
- **Oils, chlorpyrifos**
- **Imidacloprid (soft only)**
- **Egg, crawler, nymph, immature, adult**

Life-history traits of armored scales (Diaspididae) and soft scales (Coccidae, Eriococcidae)

	ARMORED SCALE	SOFT SCALE
soft cover attached to the scale	no	yes
eggs laid in sac-like structure	yes	yes
overwintering stages	eggs/mated	mated/2nd
seasonal time for crawlers	late Apr/June	Apr/Aug
ability to move after crawler stage	no	yes
honeydew production	no	abundant
feeding site on the plant	parenchyma	phloem

Armored scales (Diaspididae)

ARMORED SCALES

black pineleaf scale

euonymus scale

gloomy scale

juniper scale

obscure scale

oystershell scale

pine needle scale

scurfy scale

Soft scales **(Coccidae, Eriococcidae)**

SOFT SCALES

calico scale

cottony maple scale

European fruit lecanium scale

Fletcher scale

pine tortoise scale

spruce bud scale

tuliptree scale

FELT SCALES

European elm scale (Eriococcidae)

European Elm Scale

Gossyparia spuria

Family Eriococcidae

Introduced pest

Hosts: Elm, *Celtis* species, and zelkova.



European Elm Scale

Life History: Eggs in May, crawlers in June and July. One generation a year.

Overwintering: Immatures in bark cracks.



winter immatures

European Elm Scale

Damage: Stunted, chlorotic foliage, premature leaf drop, branch dieback, sooty mold.

Monitoring: Look for honeydew, mature females, crawlers, and damage.



summer
crawlers

European Elm Scale

Chemical Control: Insecticides, oil.

Biological Control: Beneficials usually occur.



**summer adult female
with crawlers**

Calico Scale

Eulecanium cerasorum

Family Coccidae

Native pest

Hosts: Crabapple, dogwood, elm, firethorn, maple, sweet gum, star magnolia, zelkova, and all stone fruit trees.



Life History: One generation per year. Crawlers feed on leaf veins during summer.

Calico Scale

Overwintering: Second instar.

Monitoring: Look for adults and crawlers, honeydew, and sooty mold.

Chemical Control: Dormant oil, horticultural oil or soap residual insecticides.

Biological Control: Minute pirate bugs, lacewings, lady beetles, predaceous midges; parasitoids *Aphytis*, *Coccophagus*, *Encarsia*, and *Metaphycus*; yellow-rumped warbler.

Cottony Maple Scale

Pulvinaria innumerabilis

Family Coccidae

Native pest

Hosts: Maples, honeylocust, linden, other hardwoods.



Cottony Maple Scale

Life History: Immature females emerge in spring. Eggs and crawlers appear in summer.

Overwintering: Mated females on twigs.



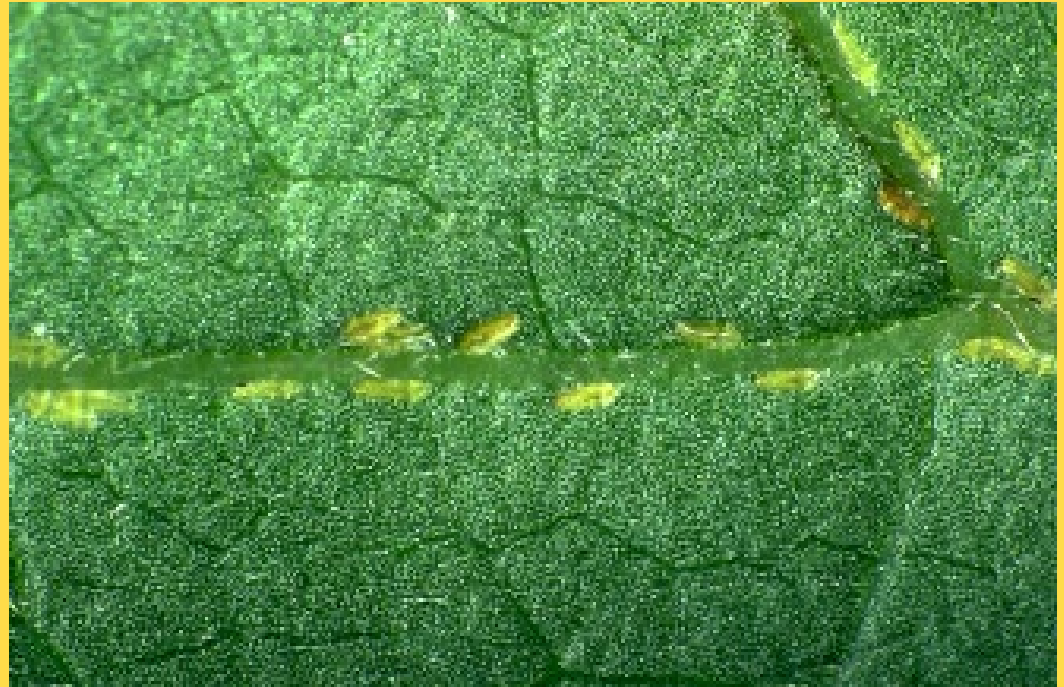
winter adult
females

Cottony Maple Scale

Damage: Sooty mold, leaf yellowing, foliage drop, dieback.

Monitoring: Look for old egg sacs and crawlers on the underside of leaf margins.

Chemical control:
Insecticides,
horticultural oil
or soap.



summer crawlers

Cottony Maple Scale

Biological Control: Minute pirate bugs, lacewings, lady beetles, predaceous midges; parasitoids *Aphytis*, *Coccophagus*, *Metaphycus*, and *Encarsia*; English sparrow.



summer females
with eggs

European Fruit Lecanium

*Parthenolecanium
corni*

Family Coccidae

Native pest

Hosts: Flowering
fruit trees, maples,
others.



spring adult females

Life History: Females mature in spring and lay
eggs. Crawlers feed in summer. One
generation per year

European Fruit Lecanium

Overwintering: Immatures.

Damage: Honeydew, sooty mold, dieback.

Monitoring: Look for adult females, crawlers, honeydew, and sooty mold.

Chemical Control:
Soil application
of insecticides,
oil sprays.



winter immatures

European Fruit Lecanium

Biological Control: Minute pirate bugs, lacewings, lady beetles, predaceous midges; parasitoids *Aphytis*, *Coccophagus*, *Encarsia*, and *Metaphycus*.



summer eggs under cover

Fletcher Scale

Parthenolecanium fletcheri

Family Coccidae

Native pest

Hosts: Yew, arborvitae, juniper.

Life History: Immatures in spring, eggs in May and June. Crawlers feed on needles. One generation per year.

spring adult
females



Fletcher Scale

Overwintering: Immatures on shoots and undersides of leaves.

Damage: Honeydew, sooty mold, yellow needles, needle drop.

Monitoring: Look for honeydew, sooty mold, and the insects.



winter nymphs

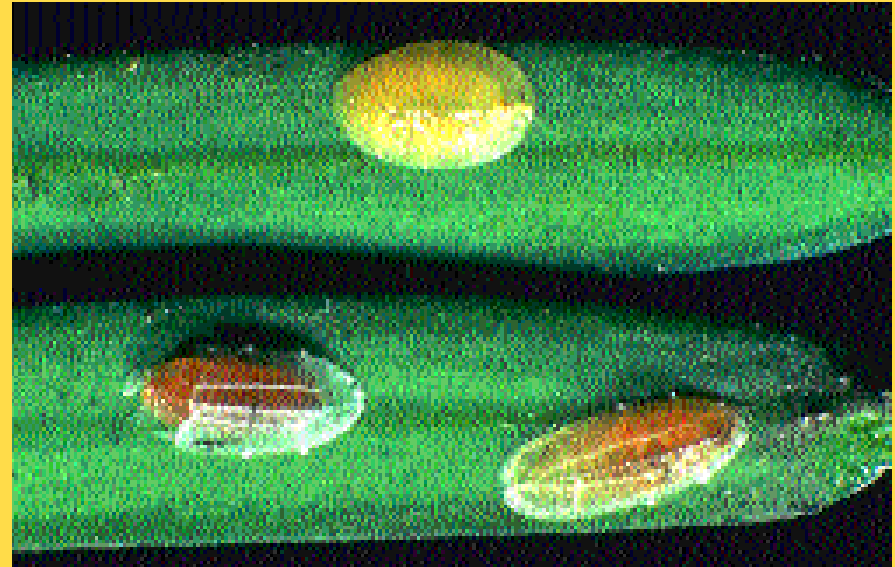
Fletcher Scale

Chemical Control:

Soil application of insecticides, horticultural oil.

Biological Control:

Minute pirate bugs, lacewings, lady beetles, predaceous midges; parasitoids *Aphytis*, *Coccophagus*, *Encarsia*, and *Metaphycus*.



above: male and female covers
below: adult females



Pine Tortoise Scale

Toumeyella parvicornis

Family Coccidae

Native pest

Hosts: Pines.

Life History: One generation per year on twigs.

Overwintering: Immatures on twigs.

Damage: Sooty mold, yellowing of branch tips, dieback.

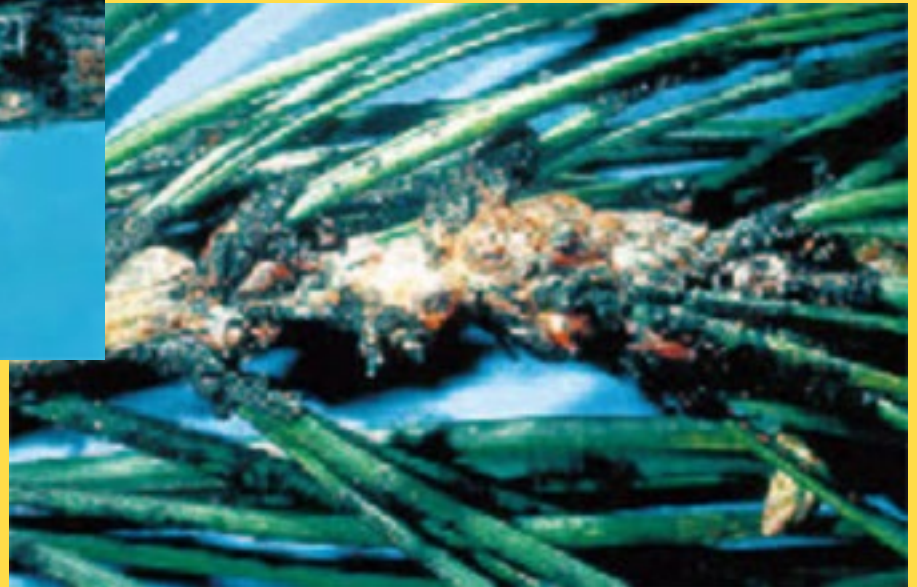


Pine Tortoise Scale

Monitoring: Look for scale covers and reddish crawlers. Look for ants seeking honeydew, sooty mold, and needle yellowing.



spring adult females



Pine Tortoise Scale

Physical Control: Remove and destroy infested branches.

Chemical Control: Dormant oil sprays.



spring adult females

Tuliptree Scale

Toumeyella liriodendri

Family Coccidae

Native pest

Hosts:

Tuliptree, magnolia,
basswood, hickory,
buttonbush, linden,
redbay, and walnut.

summer female
and crawlers



Tuliptree Scale

Life History: Females mature in spring, males emerge in June, live crawlers are produced. One generation per year.

Overwintering: Second instars on twigs.



male covers



summer male

Tuliptree Scale

Damage: Honey dew, sooty mold, leaf yellowing, leaf drop, and dieback.



above: summer dead female and settled crawlers

left: summer nymphs



Tuliptree Scale

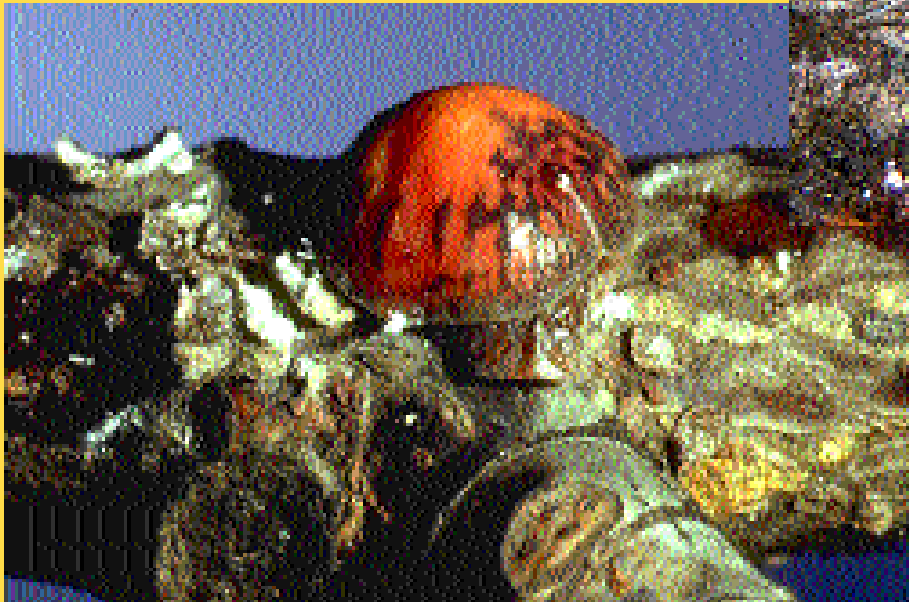
Monitoring: Look for black immatures overwintering on twigs. Look females and ants tending aphids.



winter immatures

Tuliptree Scale

Chemical Control: Dormant oil sprays, oil or soap in late June.



summer females

Spruce Bud Scale

Physokermes picea

Family Coccidae

Native pest

Hosts: Spruce.

Life History: Females complete mature in April. Crawlers appear in June and July. One generation per year.

Overwintering: Immatures on the underside of needles.



Spruce Bud Scale

Damage: Honey dew, sooty mold.

Monitoring: Look for adult females, honeydew, sooty mold, and dieback.

Chemical Control: Dormant oil sprays, oil or soap in late June.



summer females

Armored scales (Diaspididae)

ARMORED SCALES

black pineleaf scale

euonymus scale

gloomy scale

juniper scale

obscure scale

oystershell scale

pine needle scale

scurfy scale

Black Pineleaf Scale

Nuculaspis californica

Family Diaspididae

Native pest

Hosts: Douglas fir, jack and mugo pines, other pines.

Life History: One generation per year on needles.

Overwintering: Immature stages.



summer adult females

Black Pineleaf Scale



Damage: Yellow needles, loss of needles, short needles.

Monitoring: Look for adults and crawlers, yellow and short needles.

Chemical Control: Dormant oil, insecticides.

Biological Control: Parasitic wasps, *Prospaltella* sp. and *Phyiscus varicornis*.

summer adult females

Scurfy Scale & Elm Scurfy Scale

Chionaspis furfura &
C. americana

Family Diaspididae

Native pests

Hosts: Elm, apple,
crabapple, mountain
ash, aspen, willow,
dogwood.

**top and bottom:
summer females**



Scurfy Scale & Elm Scurfy Scale

Life History: Crawlers appear in June mature in August, mate and lay eggs. One generation, possibly two, per year.

Overwintering: Eggs under dead mother scale.

Damage: Twig and branch dieback.

crawlers



Scurfy Scale & Elm Scurfy Scale

Monitoring: Look for scale covers and crawlers.

Cultural Control: Most populations can be controlled by reducing tree stress. Avoid killing natural enemies with insecticides.

Chemical Control:
Horticultural oil or
soap during crawler
emergence.

male and female
covers



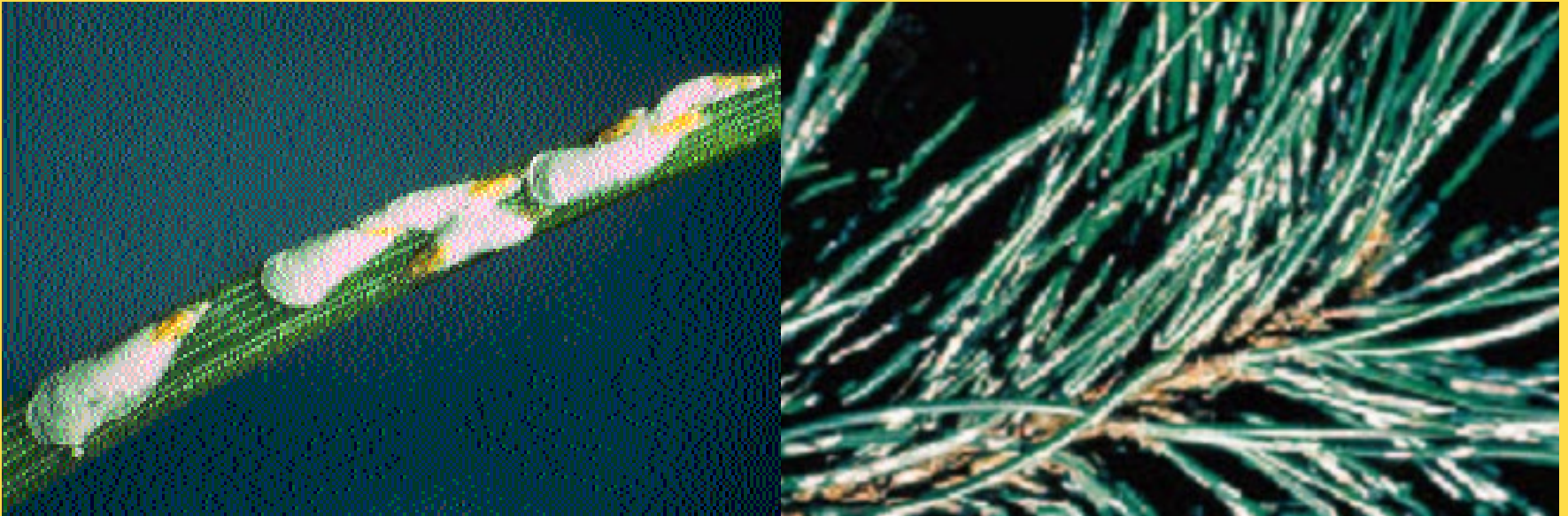
Pine Needle Scale

Chionaspis pinifoliae

Family Diaspididae

Native pest

Hosts: Douglas fir, fir, hemlock, pine, spruce.

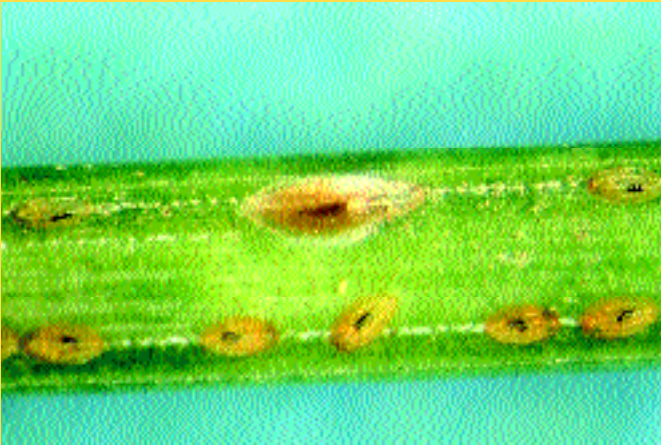


summer adult females

Pine Needle Scale

Life History: Crawlers hatch and mature during the summer and eggs are laid in the fall. One generation per year.

Overwintering: Eggs under scale covers.



nymphs



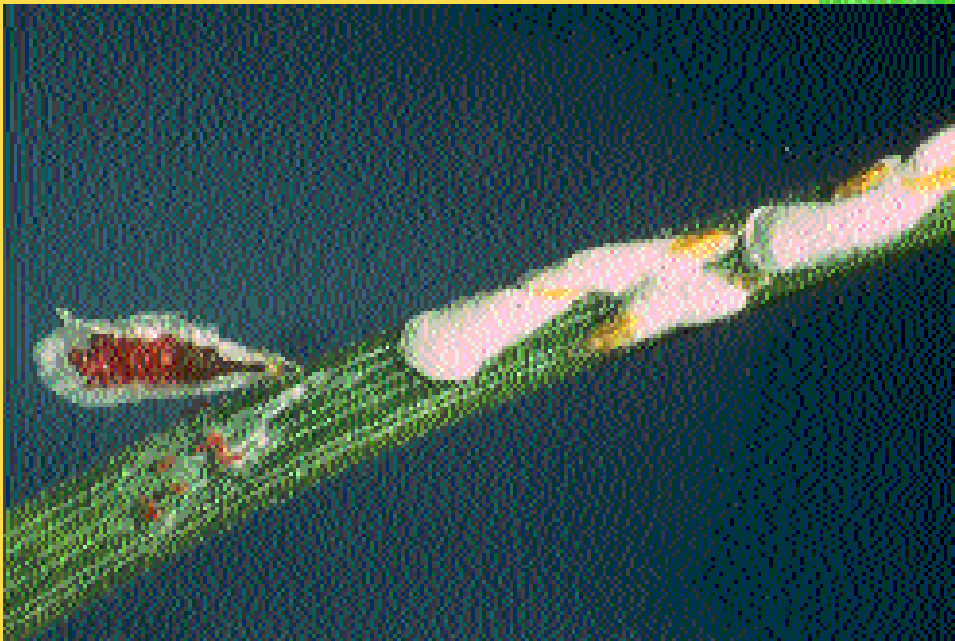
Pine Needle Scale

Damage: Brown needles, loss of needles.

Monitoring: Look for scale covers and crawlers.



adult females



Pine Needle Scale

Physical Control: Remove and destroy heavily infested branches.

Chemical Control: Dormant oil sprays.



parasitoid



parasitoid
and predator

Gloomy Scale

Melanaspis tenebricosa

Family Diaspididae

Native pest

Hosts: Red and silver maples, boxelder, catalpa, elm, hackberry, mulberry, sycamore.



spring adult female

Gloomy Scale

Life History: Eggs and crawlers in June and July, adults in August. One generation a year.

Overwintering: Mated females.



spring adult
female

Gloomy Scale

Damage: Stunting and dieback.

Monitoring: Look for scale covers and crawlers.

Chemical Control: Dormant oil.

Biological Control: Minute pirate bugs, lacewings, lady beetles, predaceous midges; parasitoids *Aphytis*, *Coccophagus*, *Encarsia*, and *Metaphycus*.

Obscure Scale

Melanaspis obscura

Family Diaspididae

Native pest

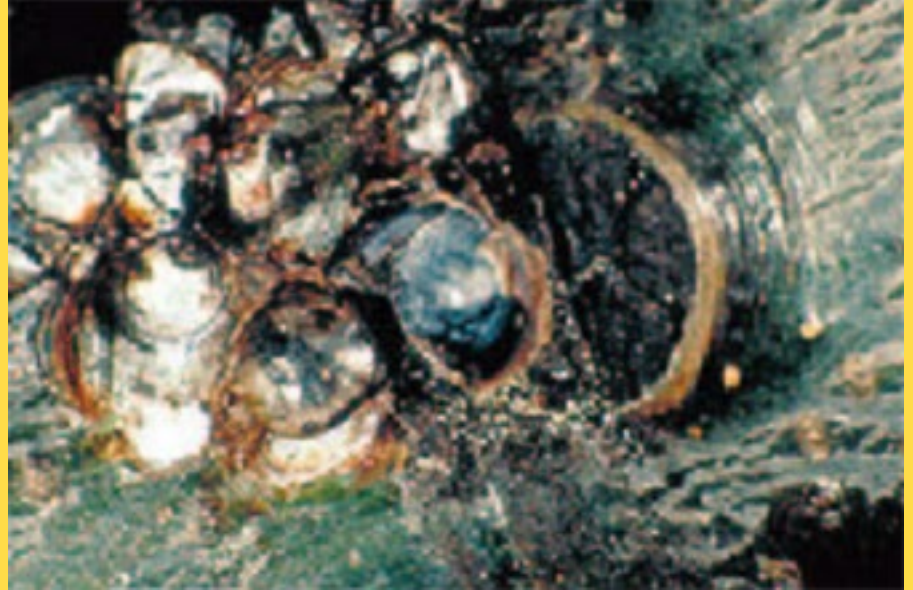
Hosts: Oaks.

Life History: Adults in May, eggs in June, crawlers in July. One generation a year.

Overwintering: Immature stages.

Damage: Dieback on small branches.

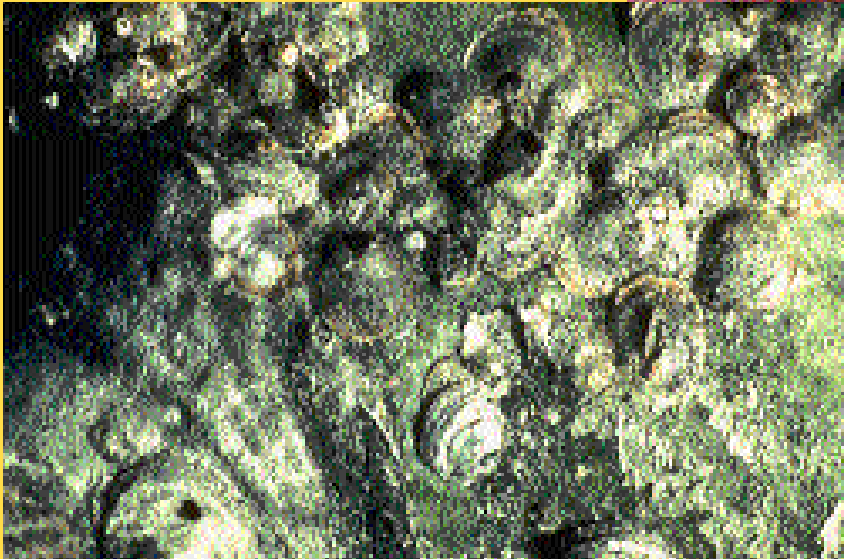
Monitoring: Look for scale covers and crawlers.



Obscure Scale

Cultural Control: Avoid over-fertilizing.

Chemical Control: Dormant sprays, summer oil sprays.



summer adults

Juniper Scale

Carulaspis juniperi

Family Diaspididae

Introduced pest

Hosts: Juniper, cryptomeria, northern white cedar, cypress.

Life History:

Crawlers appear in late June. One generation per year.



spring adult males and females

Juniper Scale

Overwintering: Adult females on needles.

Damage: Failure of new growth to develop, yellowing, dieback.

Monitoring: Look for yellowing and scale covers.

Chemical Control: Dormant oil. Do not make further insecticide applications if natural enemies are present.

Biological Control: Lady beetles *Hippodamia*, *Cryptolaemus*, and *Rhizobius*.

Euonymus Scale

Unaspis euonymi
Family Diaspididae
Introduced pest

Hosts: Euonymus,
bittersweet, and
pachysandra.

Life History: Two
generations per year.
Females on bark, males
on leaves.

Overwintering: Mated females.



Euonymus Scale

Damage: Yellow spots on leaves, loss of leaves, dieback.

Monitoring: Look for white male covers on leaves, brown female covers on bark, and damage.



Euonymus Scale

Cultural Control: Plant resistant species of Euonymus, such as *E. alatus* and *E. kiautschovicus*.

Chemical Control:
Dormant oil.

Biological Control:
The lady beetle
Chilocorus kuwanae.



Oystershell Scale

Lepidosaphes ulmi

Family Diaspididae

Native pest

Hosts: Ash, beech, birch, boxwood, cotoneaster, elm, fruit trees, lilac, maple, poplar, willow.



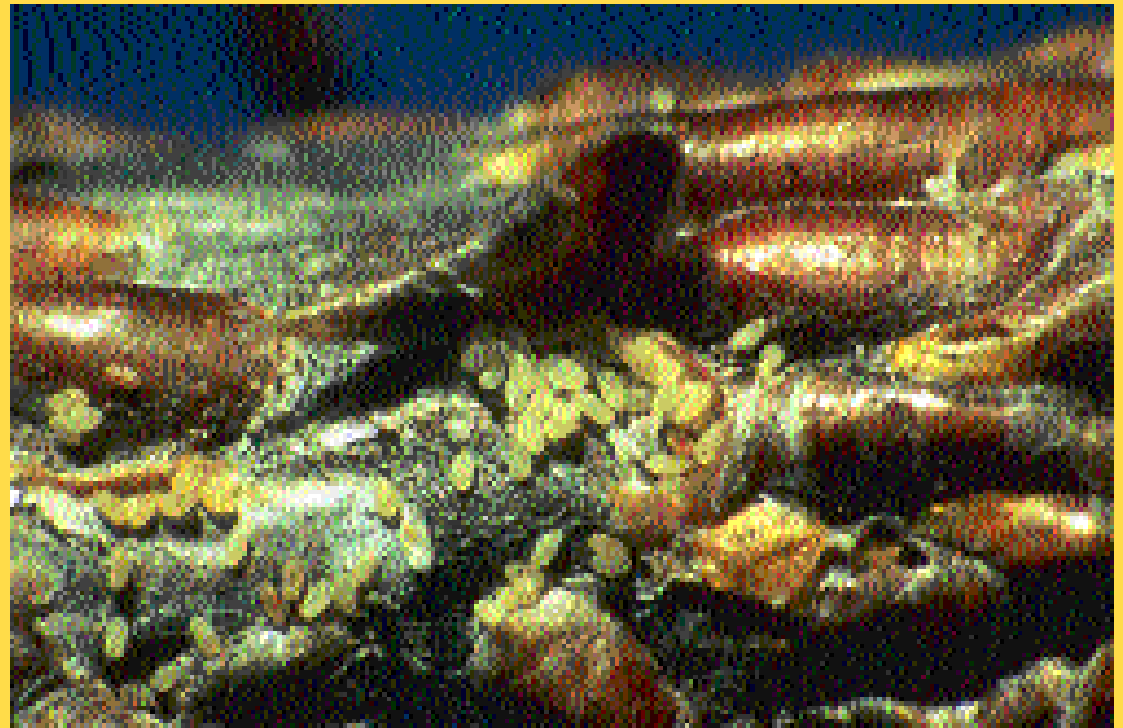
brown adults

Oystershell Scale

Life History: Nymphs mature in mid-summer to mate. Eggs in late summer and early fall. One generation a year.

Overwintering: Eggs under the cover of the dead mother scale.

winter
crawlers



Oystershell Scale

Damage: Cracked bark and chlorotic, stunted foliage, yellowing, wilting, dieback.

Monitoring: Look for crawlers, scale covers, and damage.

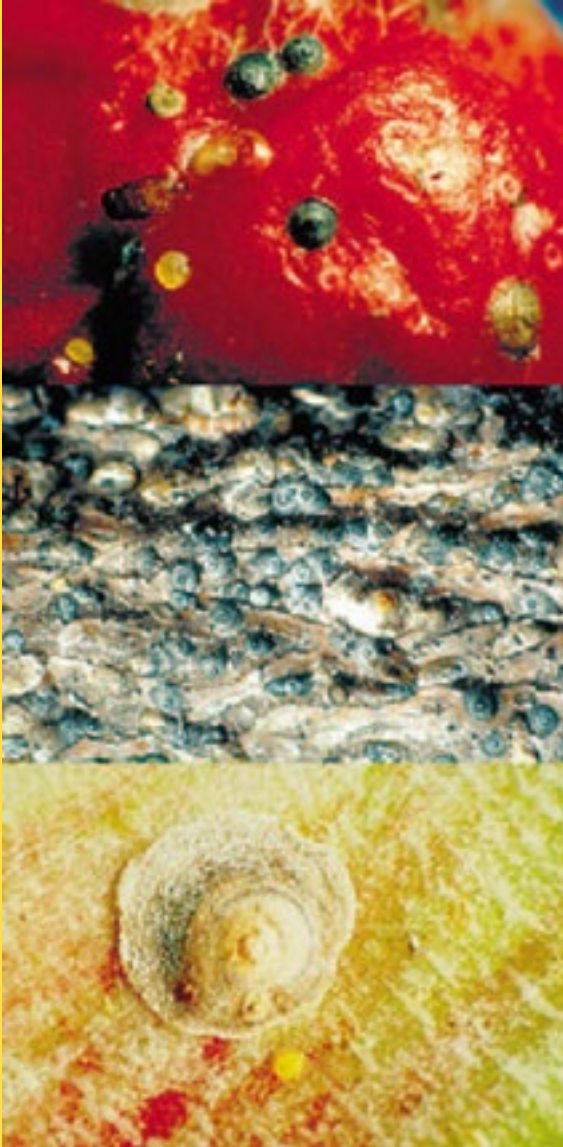
Cultural Control:
Remove and
destroy heavily
infested branches.

Chemical Control:
Horticultural oils.



summer gray adults

San Jose Scale



Quadraspidiotus perniciosus
Family Diaspididae

Hosts: Rosaceous flowering fruits and plants.

Life History: Generations overlap from mid-May through September. Yellow crawlers are active from late June to early July.

Overwintering: First instars on bark.

San Jose Scale

Damage: Inner bark turns red. Leaf wilting, dieback.

Monitoring: Look for scale covers, yellow crawlers, and damage.

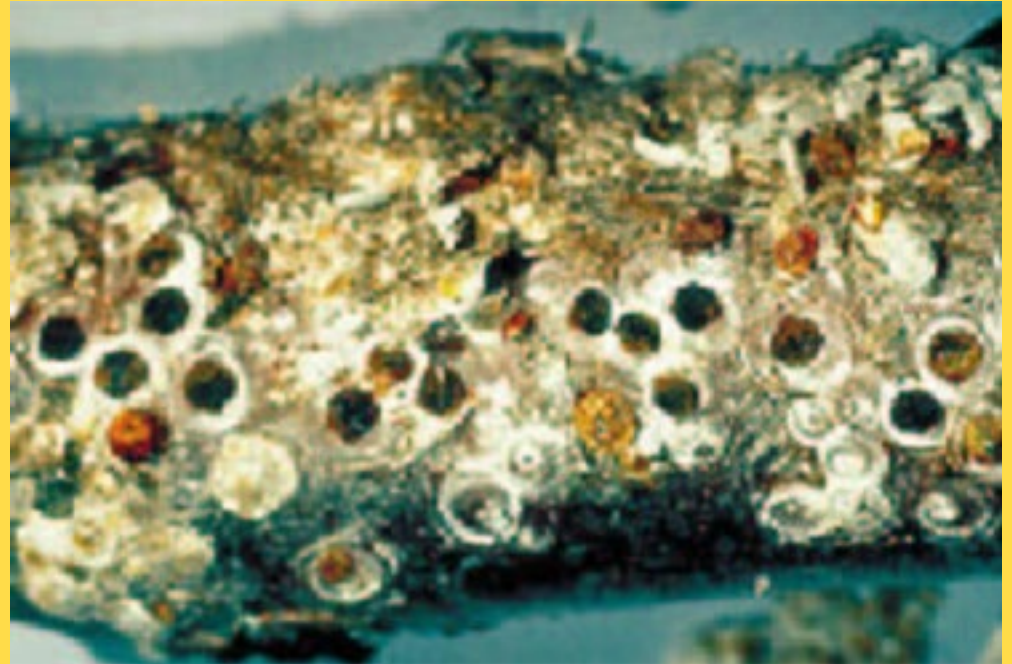
Physical Control: Remove and destroy heavily infested branches and branches showing dieback.

Chemical Control: Dormant and summer oil sprays, insecticides.

White Peach Scale

*Pseudaulacaspis
pentagona*
Family Diaspididae

Hosts: Mulberry,
peach, persimmon,
and redstemmed
dogwoods.



Life History: Several generations a year.

Overwintering: Adult females.

White Peach Scale

Damage: Leaf yellowing, leaf drop, dieback.

Monitoring: Look for damage, white male covers, and pink crawlers.

Physical Control: Prune out heavily infested limbs that are showing dieback. Remove accessible white patches on healthy trees by scrubbing.

Chemical Control: Horticultural oil or soap. Use residual insecticides sparingly.

White Prunicola Scale

*Pseudaulacaspis
prunicola*
Family Diaspididae

Hosts: *Prunus*
spp., lilac, privet.

Life History:

Several generations a year.

Overwintering: Adult females on bark.



White Prunicola Scale

Damage: Leaf yellowing, leaf drop, dieback.

Monitoring: Look for damage, white male covers, and white and pink crawlers.

Physical Control: Prune out heavily infested limbs that are showing dieback. Remove accessible white patches on healthy trees by scrubbing.

Chemical Control: Horticultural oil or soap. Use residual insecticides sparingly.

Pubescent Leaf Kermes & Pin Oak Kermes



Nanokermes pubescens &
Allokermes galliformis
Family Kermesidae
Native pests

Hosts: Oak.

Life History: Females on leaf stems, males on branches. Eggs in June and July. One generation per year.

summer female

Pubescent Leaf Kermes & Pin Oak Kermes

Overwintering: Crawlers in bark.



**summer
females**



Pubescent Leaf Kermes & Pin Oak Kermes

Damage: Leaf distortion, flagging, yellowing, dieback.

Monitoring: Look for the insects.

Chemical Control: Dormant oils, residual insecticides.

Biological control: Parasitic wasps (family Encyrtidae), the lady beetle *Chilocerus stigma*.