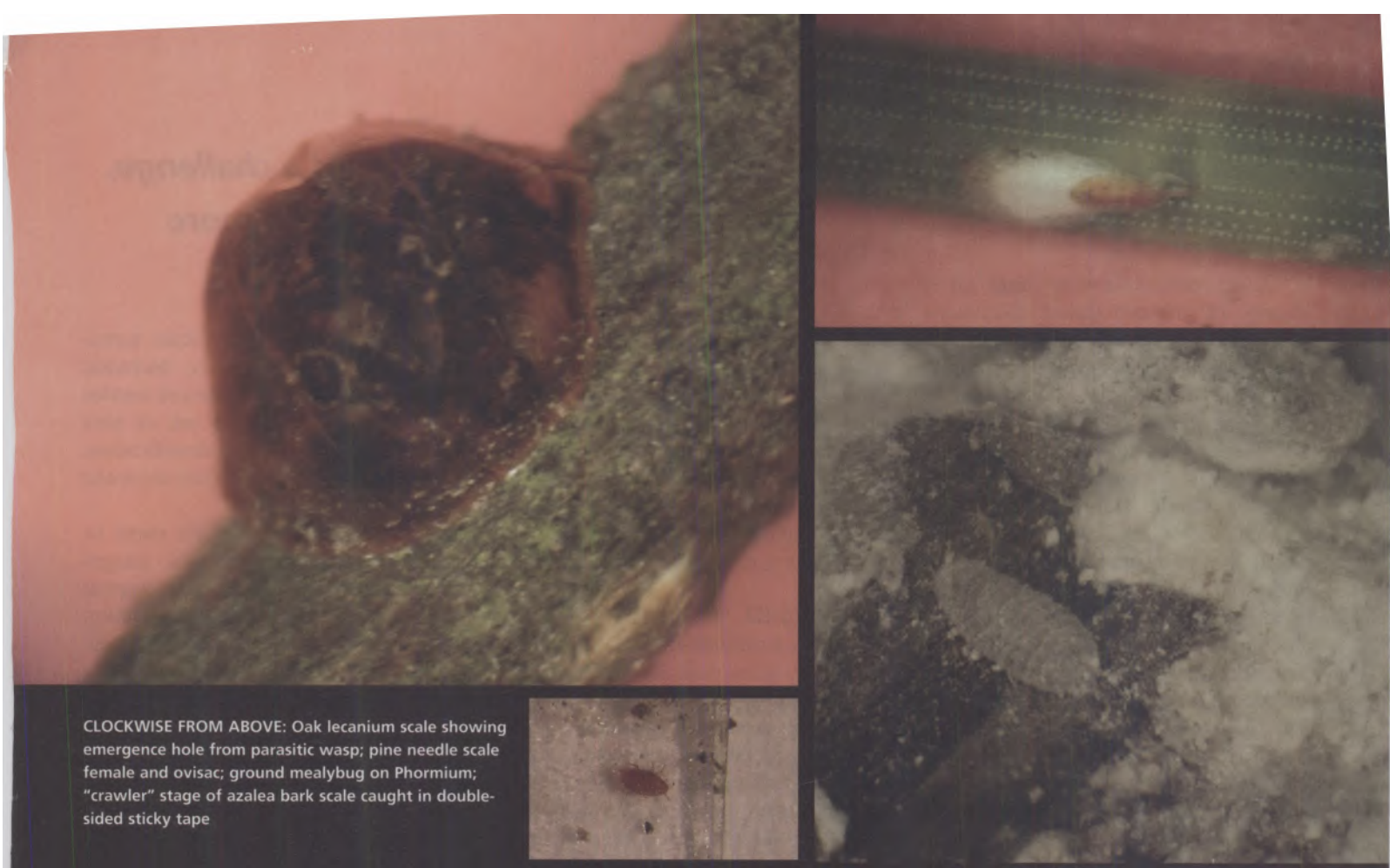


From Forest Nursery Notes, Winter 2009

**146. Economy of scale.** Rosetta, R. Digger 51(8):102-109. 2007.



CLOCKWISE FROM ABOVE: Oak lecanium scale showing emergence hole from parasitic wasp; pine needle scale female and ovisac; ground mealybug on Phormium; "crawler" stage of azalea bark scale caught in double-sided sticky tape

# ECONOMY OF SCALE

*Story and Photos by Robin Rosetta*

WATCH FOR SIGNS  
AND HIDE THE  
WELCOME MAT TO  
KEEP THESE CRYPTIC  
INSECTS FROM  
TAKING UP RESIDENCE

We all run into a few bumps on the road. As a horticulturist, you're also likely to run into a few bumps on your plants. Those bumps may turn out to be scale.

These tiny insects can wreak havoc on nursery stock through direct feeding and producing honeydew with the companion black sooty mold. Small and cryptic, they are often difficult to spot, increasing the risk for scale coming along for the ride when plants are transported.

**Scale identification can be a bit of a challenge,  
given that it's an insect not much more  
descriptive than a pimple.**

Scale refers to a very large super-family of insects called *Coccoidea*. According to the ScaleNet Web site, there are 28 families of scales comprising 7,355 species. Not all scale insects are pests. Some have been exploited for lacquer and shellac and candle wax, and used as biological control agents of noxious weeds. They produce a rich carmine color used as a natural dye for cloth and in the food and beverage industry. I recall the look of horror on a workmate's face when I told her that cochineal, the ingredient listed in her favorite all-natural lemonade, referred to the scale insect on *Opuntia* cactus, *Dactylopius*.

Most scale insects are female. Mature females are wingless and often secrete a hard shell-like covering for protection. The males are rare, small, nonfeeding and short-lived but look

more like other insects because they have wings. With a few notable exceptions, the first immature stage, or the first "instar" females, is generally the only stage that disperses on plant material. All other stages remain attached to the plant surface. Females lay eggs or crawlers under their secreted scale covering or in a cavity under their bodies.

#### **Checking ID**

Scale identification can be a bit of a challenge, given that it's an insect not much more descriptive than a pimple. The undisputed Web resource for the scale geek in all of us is ScaleNet, which offers identification tools for scales of quarantine importance. Contained within is a list and descriptions of families of scales, mealybugs and soft scales.

For those stumbling over scale terminology, there is a glossary. Included in the glossary are 18 different entries starting with "anal", giving one an idea of the nature of scale identification. The key is designed for slide-mounted specimens.

If you know the scientific name or care to browse species links, images of the scale as they would appear to the naked eye, hosts, distribution and life history are included. Or use the "Query" tool at the ScaleNet site. Many think of identification in terms of plant host, and that search query is available, listing scales found on that host. Much easier to use is the National Collection of Scale Insect Photographs, a site which also allows a search by host, even by state or city. A line of

potentially helpful images will appear. Suomi's *Scale Insects on Ornamentals* is Web-accessible, has great images and lifecycle charts, and focuses on common scale species in the Pacific Northwest.

Still prefer a book? Johnson and Lyon's seminal guide, *Insects that Feed on Trees and Shrubs*, lends itself to quick identification of scale problems by matching images of hosts and pests, and it is thick with information on species of concern. Many of us take counsel with Cranshaw's *Garden Insects of North America* when scale guidance is needed.

### **Monitoring**

Should you be looking for trouble, monitor your plants for damage and for activity of biological control agents. If a scale has taken a shine to your plants, look for the telltale signs of honeydew and sooty mold. Look for ant activity. Ants, fond of honeydew, will fight off scale's natural enemies to protect the source.

Look closely with a hand lens. Near buds, along veins, in the dark cracks of bark and underneath the leaves, these insects conceal themselves well. Note details. A round hole in the side of a scale covering may evidence the emergence of a parasitic wasp.

Crawlers test the sight of even young eyes. Use double-sided sticky tape to capture crawler emergence. As they emerge from their protective cover, they stick to the adhesive tape encircling either side of the infestation. The application of soaps and oils, insect growth regulators and other foliar insecticides are often timed for this occurrence.

### **Taking control**

Hide the welcome mat. Scrutinize new plant material received as if it were a future in-law. Need another reason to quarantine new stock? Watch your parents. Scion material and mother stock can be a source of joy or headaches, depending on whether you propagate

pests with your plants. Meticulous attention to their scale-free status pays dividends. Wind, equipment and clothing can move scale insects. Pruning and rouging may be an effective tactic in the landscape or on a limited number of nursery plants.

Natural enemies often keep scale under control. Factors that disrupt biological control include ants that tend, move and protect scale; dust; and long-residual, broad-spectrum insecticides. In protected culture, some growers have programs with augmentative releases of lady beetles such as the mealybug destroyer, *Cryptolaemus montrouzieri*, for mealybugs and *Chilocorus* and *Rhizobius* for soft scale.

There are various strategies to slay a scale. Many target the vulnerable young crawlers. This allows managers to choose a greater range of insecticides, including those of lower toxicity such as soaps, oils and insect growth regulators. Correct scale species identification helps predict whether the scale will have only one or multiple generations of crawlers emerging each year.

Some kill scale while they sleep, covering the overwintering stage with suffocating dormant oil. Thorough contact by foliar sprays is important. Another tactic is application of systemic insecticides that are drawn into the plant, managing multiple feeding stages of the scale. It helps to think a little ahead on this one, as time may be needed for some plants to translocate the insecticide to infested parts of the plant. Systemic insecticides are used against many scale species but generally have been less successful with hard scales and pit scales.

Purdue's "Scale Insects on Shade Trees and Shrubs" Web site includes a "Guide to Assessing Scale Infestation." It contains a nice decision matrix for management actions, particularly in landscapes where scale populations may be more easily tolerated.

## **Correct scale species identification helps predict whether the scale will have only one or multiple generations of crawlers emerging each year.**

### **Common scale families**

#### **Mealybugs.**

According to the USDA-ARS Web site, there are 56 introduced species of mealybugs in the United States; 45 of these species are pests.

The most likely plant host for mealybugs is a grass or composite. Many mealybugs are associated with greenhouse production or interiorscapes. Citrus mealybug, *Planococcus citri*, is a common pest in such situations. The longtailed mealybug, *Pseudococcus longispinus*, is another familiar species in protected systems distinguished by two long, waxy filaments forming a "tail."

Medeira mealybug *Phenacoccus madeirensis*, is one of the more recently introduced mealybugs to the United States. It is very polyphagous, feeding on 42 plant families. Pink hibiscus mealybug, *Maconellicoccus hirsutus*, is a species with a host range of more than 200 genera. Like Florida, California has begun a biological control program for this recent introduction.

Mealybugs are not only indoors in the Pacific Northwest; they can also be

found outdoors. The ground mealybug, *Rhizoecus*, on *Phormium* is a good example of a species that successfully winters over in our mild climate.

#### **Eriococcid scales.**

Eriococcid, or felt, scales are named for the felt-like waxy ovisac that encloses the body of the female. One species found in the Northwest is the European elm scale, *Gossyparia spuria*, named for its host, elm, particularly American and rock elm. There's also the azalea hark scale, *Eriococcus azalea*, which can be found on several different hosts, including azalea, rhododendron, andromeda, hawthorn, poplar, willow and blueberry.

#### **Soft scale.**

The soft scales are commonly identified scales on ornamental plants and can be quite variable. Some, such as brown soft scale, *Coccus hesperidum*, are extremely common throughout United States. This scale is flattened to slightly convex. The much rounder lecanium scale is also found in landscapes and nursery production.



## ***Hide the welcome mat. Scrutinize new plant material received as if it were a future in-law.***

native species and is found on many different woody plant hosts.

One can find oak lecanium, *Parthenolecanium quercifex*, on our native white oaks but it is often held in check by parasitic wasps. Conifers get soft scale, too. Fletcher scale, *Parthenolecanium fletcheri*, sometimes infests yew in nurseries. It can also infest juniper, arborvitae and bald cypress.

One of the most recent finds in Oregon included *Eulecanium excrecens* on *Styrax*. Around the country, entomologists report finding various soft scale species, including European peach scale, *Parthenolecanium persicae*; frosted scale, *Parthenolecanium pruinosum*; calico scale, *Eulecanium cerasorum*; magnolia scale, *Neolecanium cornuparvum*; spruce bud scale, *Physokermes piceae*; hemispherical scale, *Saissetia coffeae*; black scale, *Saissetia oleae*; and nigra scale *Parasaissetia nigra*.

### **Wax scale.**

Wax scales are definitely on the regulatory radar in the Pacific Northwest. Recently barnacle scale, *Ceroplastes cirripediformis*, was found in one nursery in Oregon. The crop was destroyed.

### **Cottony scale.**

The bane of many holly growers, cottony camellia scale, *Pulvinaria floccifera*, is also called cottony taxus scale. It produces long, narrow and unavoidably obvious ovisacs on the leaf undersides. Cottony maple scale, *Pulvinaria innumerabilis*, can produce quite a spectacular colony of females hunched over with their cottony ovisacs. It can infest many genera of woody plants besides maples.

### **Margarodid scale.**

Margarodid scale are very diverse and quite striking in appearance. This family of scale has been found in

Oregon on *Nandina*, infested with the cotton cushion scale, *kerya purchasi*. Adult females produce a long, fluted ovisac. Like its cousin the sycamore scale, *Stomacoccus platani*, all stages of this scale can move.

### **Armored or hard scales.**

These tiny scales do not produce honeydew, and their covering is separate from their body. They can build up to high populations, reducing the vigor of plants and causing die-back. Oystershell scale, *Lepidosaphes ulmi*, has been well-named based on resemblance to a mollusk. This species can infest a wide range of woody genera. A scale with a similarly wide appetite is San Jose scale, *Quadraspidiotus perniciosus*. Infestations can build up rapidly as this species has multiple, overlapping generations in some locations. Euonymus scale, *Unaspis euonymi*, is a worry for those growing that key host.

One hard scale species found in the Pacific Northwest is pine needle scale, *Chionaspis pinifoliae*. Pine, spruce, fir, hemlock and Douglas fir can all host this species. Adult females are elongated, white and armored, with a yellow area at the front end. Those growing juniper should be aware of the juniper scale, *Carulaspis juniperi*.

Scale have disappointed many a grower, posing as part of their plant's anatomy and feeding on the profits. With a little effort, it is possible to set up an IPM program that is effective and tips the balance in your favor in the battle with the scale.

*Robin Rosetta is an Oregon State University extension agent in nursery pest management. Visit the Pacific Northwest Nursery Management Web site at [www.orst.edu/Dept/nurspest/index.htm](http://www.orst.edu/Dept/nurspest/index.htm). You can reach her at [robin.rosetta@oregonstate.edu](mailto:robin.rosetta@oregonstate.edu) or at (503) 678-1264 ext. 133.*