

Hosts

- Fir (*Abies* spp.)
- Hemlock (*Tsuga* spp.)
- Occasionally found on spruce (*Picea* spp.), Douglas-fir (*Pseudotsuga menziesii*), and pines (*Pinus* spp.)

Damage Potential

- Low–high

Symptoms and Signs

- Yellowing of needles on the interior of the lower branches; damage moves upward as population increases
- Scale coverings on the underside of the needles
- Premature needle drop; eventual branch and limb dieback and death of tree with severe infestations
- Tree may appear flocked

Causes of Similar Symptoms

- Spruce spider mite
- Cryptomeria scale

Identification

Elongate hemlock scale—sometimes referred to as Fiorinia scale—is an armored scale found more prevalently in southeastern Pennsylvania. Translucent, oval eggs occur beneath the scale covering of the female. The pale yellow crawlers are about 1/250 inch (0.1 mm) long and have six short legs. When they settle to feed, the crawlers lose their legs and excrete an amber-colored, oval covering. Male and female scales develop differently and have different protective coverings. Immature males are about 1/20 inch (1.0–1.5 mm) long and produce a whitened, waxy covering. Longer threads of wax are occasionally present and may give the covering a fuzzy appearance. Immature females are longer at 1/4 inch (1.5–2.0 mm) and produce a yellowish to orange-brown, parallel-sided covering. At maturity, the

delicate, light brown, male scales emerge and fly to the sessile, wingless females. They may be mistaken for parasitoids as they crawl over the female coverings prior to mating.

Biology and Life Cycle

Elongate hemlock scale overwinters in several developmental stages in Pennsylvania and matures in spring (Figs. 1 and 2). In southern and Mid-Atlantic states, two overlapping generations have been reported, while in states in the Northeast, a single generation is known. In Pennsylvania, reproduction is staggered, so crawlers are present throughout the growing season.



Figure 1. Heavy infestation of elongate hemlock scale. Courtesy of PDA



Figure 2. Female (brown) and male (white) scales. Courtesy of Sandy Gardosik, PDA

Calendar of Activities

	Jan.	Feb.	March	April	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	
Symptoms	[Solid black bar]												
Monitor					[Solid black bar]								
Mechanical Control	[Solid black bar]										[Solid black bar]		
Spray Control			[Green bar]			[Solid black bar]							

[Green bar] Apply dormant oil prior to bud break.

ELONGATE HEMLOCK SCALE

Fiorinia externa Ferris



Chlorotic damage from elongate hemlock scale feeding on the undersides of needles. Courtesy of Sandy Gardosik, PDA



Figure 3. Female scales and mobile yellow crawlers on the needles. Courtesy of Sandy Gardosik, PDA



Figure 4. Chlorotic scale feeding damage on grand fir. Courtesy of Cathy Thomas, PDA



Figure 5. Female elongate hemlock scale. Courtesy of Sandy Gardosik, PDA



Figure 7. Adult male elongate hemlock scale. Courtesy of Jim Stimmel, PDA



Figure 6. Immature male elongate hemlock scales. Courtesy of Sandy Gardosik, PDA



Figure 8. Eggs inside the overturned female elongate hemlock scale casing. Courtesy of Sandy Gardosik, PDA

Monitoring and Management Strategies

Plantation Establishment

- Plant tree species that are not susceptible to elongate hemlock scale.
- Properly space trees when planting to minimize infestation from tree to tree and enable thorough coverage if chemical controls are used.
- Weed management is important to expose lower branches for ease of detection and effective control.
- Remove and destroy any mature host trees that may serve as source of infestation. (Canada hemlock is a common host in Pennsylvania.)

Preseason

- Limit the use of nitrogen fertilizers; nitrogen enhances survival and developmental rate of scales.
- Scout for elongate hemlock scale on the underside of needles. Note: Sometimes a combined population of *Cryptomeria* scale, balsam woolly adelgid, and hemlock scale can be found on the same trees.
- If only a few infested trees are found, removing and destroying them before bud break may prevent a serious infestation from developing.
- If numerous infested trees are located, tag a few to use for observations of crawler emergence.
- Place sticky cards on branches showing symptoms to trap adult male scale insects (Fig. 9). Their emergence signals that eggs will soon follow.



Figure 9. Yellow sticky cards used to attract the emerging male elongate hemlock scales. Courtesy of Cathy Thomas, PDA

Growing Season

- Starting in mid-May, scout tagged trees every few days to check for crawler emergence.
- Growing degree days: Crawlers are active from 360 to 700 GDDs.
- Threshold level: No specific threshold level exists at this time. However, dieback of major limbs tends to occur by the time the population reaches ten scales per needle.
- Continue scouting for crawlers every few weeks to determine the need for additional controls.
- At the end of the season, evaluate results and update records.

Control Options

Biological

- Encourage natural predators such as lady beetles, parasitic wasps, and several lacewing species.
- Avoid applications of broad-spectrum insecticides that will kill natural predators.

Mechanical

- Remove and destroy heavily infested trees before bud break. Wrap trees in a tarp/plastic when dragging them through the field to prevent transferring scales to other trees.
- Clean mower blades or tractors when moving them from an infested field to an uninfested field.
- Butt-prune infested trees to remove the most heavily infested lower branches.

Biorational

- No recommendations are available at this time.

Chemical

- Horticultural oil may be applied during the growing season. Use lower rate to avoid damage to new growth or wait to apply until new growth has hardened off.
- When first crawlers are active, apply a systemic insecticide spray three to four times over a 12-week period (three sprays four weeks apart or four sprays three weeks apart). Do not apply more than four times per season.
- Evaluate each application to determine the need for subsequent sprays.

Next Crop/Prevention

- Purchase and plant scale-free nursery stock from a reputable company.

