52. White Grubs

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Hosts

White grubs are soil-dwelling larvae of insects commonly known as "May beetles" or "June beetles" in the family Scarabaeidae. These grubs feed on herbaceous plant roots and other soil organic matter, but will also feed on the roots of woody plants, including all types of coniferous and hardwood seedlings in nursery settings. Numerous genera known to cause damage in forest nurseries include the common *Phyllophaga* (with more than 100 different species), *Polyphylla*, *Diplotaxis, Dichelonyx, Serica, Cotalpa*, *Anomala,* and others.

Distribution

Phyllophaga species and other white grubs are widely distributed, and can be found throughout much of North America, although the geographic range of an individual species may be more restricted.

Damage

Depending on the severity and extent of root injury, damage by white grubs kills seedlings or reduces their growth and vigor. Substantial losses may occur when more than one grub per 0.1 m^2 (1 ft^2) of soil surface exists. When white grub problems occur, they may be more severe on light (i.e., sandy) soils and in newly turned seedbeds. White grub populations can become abundant beneath dense sod, weeds, or agricultural and cover crops in fallow years, thus nursery bed establishment on or near these sites may increase the risk of damage.

Diagnosis

White grub damage is typically noticed from June through early fall, when formerly healthy seedlings become discolored, wilt, and die. Aboveground symptoms may resemble drought injury. Heavily damaged seedlings can be pulled gently from the soil due to extensive root loss (fig. 52.1) Belowground, the taproot or lateral roots may be chewed off, girdled, gouged or debarked (fig. 52.2).

White grub larvae are fairly large and distinct, and may be readily detected in freshly prepared or turned soil. Larval size varies with age and species, but mature larvae are typically 20 to 45 mm (0.8 to 1.8 in) long, C-shaped, creamy-white, with a brown head, prominent mouthparts, and three pairs of well-developed legs (figs. 52.3 and 52.4). The abdomen is usually slightly enlarged and translucent, allowing internal contents to be seen through the skin.

Figure 52.1—*Nursery-grown pine seedlings, showing root consumption by white grubs.* Photo from Florida Department of Agriculture and Consumer Services, Division of Forestry.

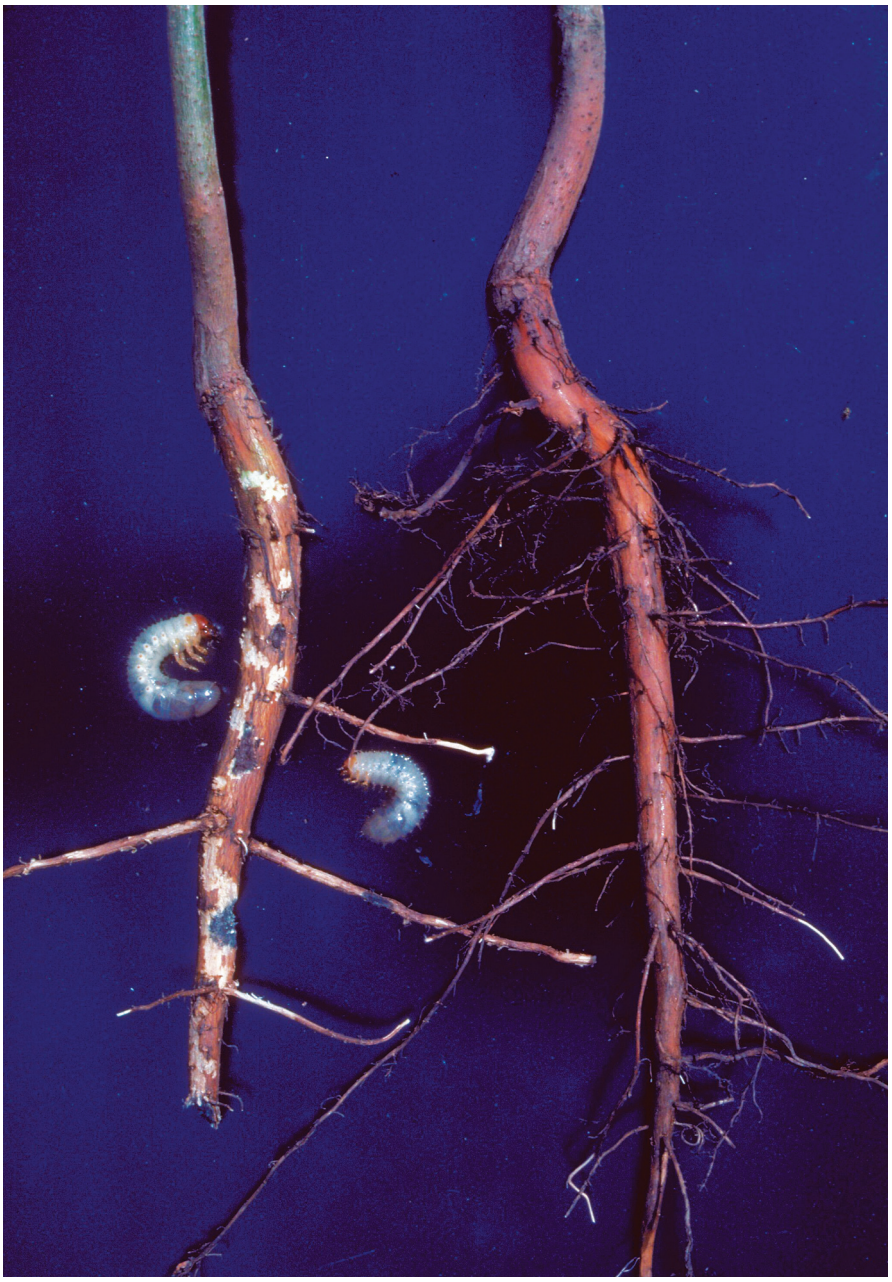

Figure 52.2—*Extensive white grub damage to seedling on left, including severed taproot, missing lateral roots, and debarked surfaces.* Photo by James D. Solomon, USDA Forest Service, at http://www.bugwood.org.

Adults in the genus *Phyllophaga* are robust, oval-shaped beetles with prominent legs, commonly 12 to 25 mm long, varying in color from yellow to reddish-brown to black (fig. 52.5). Other May and June beetle species may be shiny and brightly colored. Adults are nocturnal and not necessarily evident at the site where larvae have caused seedling damage.

Biology

The life cycle of *Phyllophaga* species may require 1 to 4 years to complete, depending on species and geographic location. Species with 2- and 3-year life cycles are common, and due to multiple species and overlapping broods, all life stages may occur during any given year at a particular location.

Adults emerge from the ground in the evenings (typically in May and June) and move to the foliage of nearby trees or other vegetation to mate and feed. At dawn, mated females return the soil and lay eggs at depths of 3 to 20 cm (1.2 to 8.0 in) beneath the surface. Larvae hatch within 2 to 3 weeks and begin to feed, first on soil organic matter and eventually on nearby seedling roots. In autumn, larvae migrate downward to depths of up to 1.5 m (5 ft), depending on temperature, frost levels, and soil characteristics, and remain inactive until spring, when they return to near the soil surface to feed again on roots. Larvae may repeat these patterns of root-feeding in the warm season and downward migration to overwinter for 1 or more years. When larvae are fully mature they pupate in earthen cells and later emerge as adults.

Figure 52.3—*White grub larvae.* Photo from Clemson University—USDA Cooperative Extension Slide Series, at http://www.bugwood.org.

Control

Cultural

Identify potential problem areas by scouting for white grubs in the soil at the start of and throughout seedbed preparation. Repeated disking of new, fallow, or infested planting ground, particularly when grubs are nearest the surface (late spring through early fall), may help destroy or reduce grub populations.

Chemical

Seedbed fumigation can eliminate white grubs in the upper soil horizons, but overwintering larvae may reside or migrate to depths below the effective fumigation zone. Granular and liquid formulations of insecticides may also be used against white grubs. Irrigating the soil before and after insecticide application may help to bring grubs nearer to the surface and move insecticide into the soil, respectively.

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Figure 52.4—*Three different species of white grub larvae, illustrating size variation (left to right:* Popillia japonica*,* Amphimallon majalis*, and* Phyllophaga *species).* Photo by David Cappaert, Michigan State University, at http://www.bugwood.org.

Figure 52.5—*Adult June beetle* (Phyllophaga *species*). Photo by Steven Katovich, USDA Forest Service, at http://www.bugwood.org.

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