

White Grub Management in Turf¹

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White grubs are immature scarab beetles. They hatch from eggs laid in the soil, have three larval instars, and also pupate in the soil. The third instar is often the most damaging and may be present in the soil the longest. The adults are rarely turf pests, but some may feed on tree leaves or make mounds in the soil. White grubs may have one or more generations each year in Florida.

Signs of Infestation

When white grubs feed on grass roots, the grass gradually thins, yellows, and dies. This makes the grass feel soft and spongy. Scattered, irregular, brown patches of grass appear, which increase in size over time. The root injury reduces the turf's ability to take up water and nutrients and withstand drought stress. Heavily infested grass pulls up easily.

In addition, white grubs attract moles, raccoons, armadillos, and birds, which can make an already damaged area look worse. However, these animals may be interested in earthworms or other insects besides grubs. Large numbers of dark-colored, parasitic wasps with yellowish to white stripes on

their abdomens that hover over the lawn on sunny days in the summer or fall may also be a sign of infestation. Sample the area to confirm that a white grub problem really exists.

Sampling

Proper monitoring and identification can prevent turf loss and costly renovation. To confirm a grub infestation, get a shovel, sift through the top 3 inches of soil, roots, and thatch. Look for creamy-white, C-shaped beetle larvae, with tan to rusty-brown heads and six legs. Larvae that look like grubs but lack legs are probably billbugs. Mature grubs vary in length from 1/4 to 2 inches, depending on species and age. The pattern of hairs, or raster (Figure 1), on the tip of the grubs abdomen helps in larval identification. However, adults are needed for an accurate species identification. After examining the soil, replace the grass and water it. It is normal to find an occasional grub and is not cause for alarm. Healthy turf can usually outgrow the root loss caused by a couple of grubs. Damage thresholds vary depending on the grub species and quality of the turf.

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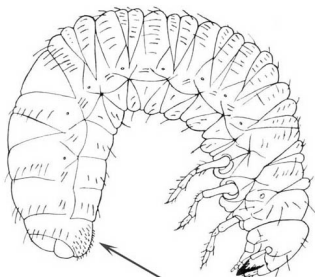


Figure 1. Raster (hair) pattern on the inner tip of a grub's abdomen.

Adults can also be monitored using ultraviolet blacklight traps (Figure 2), commercial pheromone traps (Figure 3), or homemade bait traps (Figure 4). Knowing when the adults are active helps in timing preventive insecticide applications. Black light traps catch night-flying insects. Commercial traps can be bought from vendors like BioQuip (www.bioquip.com), Trécé (www.trece.com), Great Lakes IPM (www.greatlakesipm.com), or Phero Tech (www.pherotech.com/pheromone_traps.html). The homemade traps are easy to make, but are only effective for day-flying insects like Green June beetles and flower beetles. Cut two windows in a plastic 1 gallon milk jug for the beetles to fly into, and put either soapy water or dilute antifreeze in the bottom. Mix some stale beer and an over-ripe banana, fill a small yogurt container or film canister, drill holes in the sides of the bait container, string a wire through it, and hang it near the top of the milk jug (keep the cap on the milk jug). Then, hang the trap about 6 feet off the ground, check it at least weekly, and replace the bait at least monthly.

Life Cycles

The most abundant species of **masked chafers** (Figure 5) in Florida are *Cyclocephala lurida* and *C. parallela*. They have 2 generations each year throughout Florida, and the first generation is the most damaging. Adults are tan, about 5/8 inch long, and slightly smaller than May/June beetles. Adults fly from April to June and again in August and September. They are attracted to lights at night, but do not feed. Adults lay their eggs in the top inch or two of soil, often in small clusters. Small grubs hatch from the eggs and feed on grass roots. Most damage occurs from the first generation by July or August.



Figure 2. Ultraviolet blacklight trap.



Figure 3. Commercial pheromone trap.

The raster pattern is indistinct and does not have any rows of short, thick hairs (Figure 6). They pupate in earthen cells.

Sugarcane grubs (*Tomarus subtropicus*) have a 1 year life cycle. The grubs (Figure 7) attack sugarcane, most warm season turfgrasses, and some ornamental plant roots. Peak adult emergence occurs in May and June in southern Florida, but may begin in April and end in late July. Eggs are white and round. Small grubs are dark gray and whiten as they grow. Third instar (mature) grubs are present and feeding from September to late spring, and are nearly 2 inches long. The larvae have rusty-red colored head



Figure 4. Homemade bait trap.



Figure 5. Masked chafer adult. Credits: Jim Newman, UF/IFAS

capsules, and their raster pattern looks similar to that of masked chafers. Pupae are tan-colored. Adult beetles are about 1 inch long, and are nearly black, with tiny horns behind the head (on the pronotum). This species is most damaging along the Gulf and Atlantic Coasts. A sister species, *T. cuniculus*, is increasing in abundance in southeastern Florida. The larvae look nearly identical to sugarcane grubs, but the adults are present every month of the year in Fort Lauderdale, with greater activity during the summer. These adults are more hairy than sugarcane grub adults.

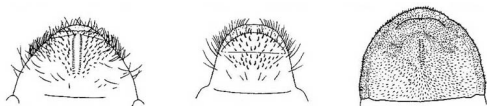


Figure 6. Raster patterns of some white grubs in Florida; May/June beetle (left), Masked chafer (center), Green June beetle (right). (Adapted from Ohio State University Cooperative Extension Service.)

Florida has about 54 species of **May/June beetles** (*Phyllophaga* spp.). Most of the species have



Figure 7. Sugarcane grub.

a one-year life cycle in Florida, but the Cuban May beetle, *P. bruneri*, has 2 generations in southern Florida. Adults (Figure 8) of different species have the same general shape, but may vary somewhat in color, size (1/2 to 1 inch long), and hairiness. Adults often feed at night from April to early July on shrub and tree leaves. Eggs are laid singly in the soil. Mature grubs reach up to 1 1/4 inch long. Grubs have a zipper-like hair pattern (raster) on the tip of the abdomen (Figure 6). Grubs can be very damaging to the roots of ornamental plants grown in nurseries. May/June beetles are infrequent turf pests.



Figure 8. May/June beetle (*Phyllophaga*) adult. Credits: P. Choate, University of Florida

Green June beetle (*Cotinus nitida*) larvae feed on decaying vegetation and turfgrass roots. They may be damaging in over-fertilized turfgrass or where organic fertilizers are used. Grubs feed in the soil during the day and feed aboveground on decaying organic matter at night. Their frass pellets on the soil surface are a sign of infestation. Mature grubs (ca. 2 inches long) can cause considerable turf damage through February during a warm winter. This is one of two damaging grub species in Florida that can walk on their backs with their legs in the air (Figure 9). Its raster pattern has a lot of very short hairs (Figure 6). The coppery-green adults (3/4 to 1 inch long; Figure 10) fly during the day and feed on thin-skinned fruit during the summer. It has a 1-year life cycle.



Figure 9. Green June beetle grub walking on its back. Credits: L. Buss, University of Florida



Figure 10. Adult green June beetle. Credits: L. Buss, University of Florida

The other grub that walks on its back is the **flower beetle**, *Euphoria sepulcralis*. This day-flying beetle may have a one-year life cycle, but adults occur nearly year-round throughout Florida. The adults are about 1/2 inch long, dark brown to black, with metallic bronze or green reflections (Figure 11). Adults feed on several plants (corn, roses, mangos, avocados, thistle, mock orange, milkweed, dogwood, sumac, yarrow, daisies, and goldenrod), as well as fruit tree blooms, sap, and decaying fruit. Grubs live in the soil beneath dead sod or manure, in sandy soil containing oak roots and decaying oak leaves, and in seashore paspalum and bermudagrass. Grubs may develop for about two months, and pupate in earthen cells for about two weeks. The raster pattern is V-shaped. An infestation of 8-10 grubs per square foot may not cause obvious turf damage, but is enough to attract birds.



Figure 11. Adult *Euphoria sepulcralis*, a flower beetle. Credits: L. Buss, University of Florida

White Grub Management

Water

Moist soil is critical for eggs to hatch and grubs to survive. Frequent irrigation during adult flights may attract egg-laying females, especially if surrounding areas are dry. But, proper irrigation and fertility may help plants tolerate or outgrow moderate infestations. This latter strategy is risky, though, because animals may dig up the turf or watering restrictions may occur.

Natural Enemies

Several predators (e.g., ground beetles and ants) and parasitoids (e.g., *Tiphia* spp. or scoliids) attack white grubs. Parasitic wasp larvae usually feed externally on the grub, kill it, and then spin a fuzzy, brown cocoon in the soil. Few of the natural enemies of grubs are known in Florida, so their effectiveness is also unknown.

Insect Parasitic Nematodes

Commercial preparations of insect parasitic nematodes (*Steinernema* and *Heterorhabditis* species) can suppress white grub populations. Nematodes work better under moist soil conditions than in dry soils. Some nematodes may work synergistically with neonicotinoid insecticides (e.g., imidacloprid or Merit) to provide greater grub control.

Curative Applications

Curative treatments like trichlorfon (Dylox® or Bayer Advanced® 24-Hour Grub Control) are applied after grubs have been feeding and damaging the turf. Application timing depends on when the grubs are discovered, but usually occurs when grubs are second or third instars. The best curative timing may be in July for masked chafers, or in August or September for sugarcane grubs. Curative products have short residuals, so a second application may be needed. Most grubs die in the soil, but Green June beetle and flower beetle grubs die on the soil surface, rot and make a mess.

Preventive Applications

In areas where grubs are repeatedly a problem, preventive applications may be helpful. Preventive treatments give turfgrass managers more flexibility in application timing than curative treatments. They also require less sampling and monitoring of grub populations. Preventive control requires the use of long residual insecticides, such as imidacloprid (Merit®, Season-Long Grub Control®), thiamethoxam (Meridian®), halofenozide (Mach2®, Ortho Grub-B-Gon®, Grub-Ex®), clothianidin (Arena®), or chlorantraniliprole (Acelepryn®). These products give good control of newly hatched grubs. The best application period is during the month or so before egg hatch until the time when very young grubs are present. Preventive control requires the use of long residual insecticides. Professional combination products (e.g., Allectus®, Aloft®) have a pyrethroid and a neonicotinoid insecticide premixed together, which could be used to try to reduce both adult and larval populations.

Ensuring Successful Treatments

To get the best results with any grub insecticide, mow and rake out dead grass and thatch (if more than 1/2 inch thick) before treatment. This allows the insecticide to penetrate better and reduces the amount of insecticide bound in the thatch and organic matter. Also, water the grass immediately after treatment (1/4 to 1/2 inch of water) to leach the insecticide into the root zone where the grubs are feeding, if this is stated on the label. Irrigating also brings grubs closer to the soil surface, which increases their contact with the insecticide residues. If irrigation is not possible, apply the insecticide just before a good rain. Prompt, post-treatment irrigation is especially important for sprays; once spray residue dries on foliage, it cannot be washed into the root zone by later drenching. Granular formulations may work better if you can't irrigate immediately.

For Additional Information

Sugarcane grub: http://creatures.ifas.ufl.edu/orn/turf/sugarcane_grub.htm

Ritcher, P. O. 1966. White grubs and their allies. Oregon State University Press, Corvallis, OR. 219 pp.