

Providing Leadership in Environmental Entomology

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WHITE GRUB MANAGEMENT IN TURFGRASS

White grubs are the larval (immature) stage of several different beetles. Most of the grubs will assume a “C” shape when they are dug out of the soil (Fig. 1). They have a well-developed brownish head and three pairs of well-developed legs. With one exception, the grubs feed on the roots of warm and cool-season grasses. They show no preference for home lawns, golf courses, sports turf, or industrial landscape. All



Figure 1. A typical white grub.

managed grass areas are potentially susceptible to grub attack. When grub numbers are high enough, the grass may be lifted like a throw rug because the grubs have eaten the roots. At lower numbers, the grass may appear unthrifty.

Many times, grubs are concentrated in localized areas. For this reason, it is very important to sample several areas in the lawn or other grassy area.

Since grubs feed on the roots, this is the area that must be inspected. The simplest method of sampling is to make cuts on three sides of a 12-inch square with a stout knife or a shovel, pry this flap back, and carefully inspect the root zone and the upper 1-3 inches of soil. If grubs are present, they will be found in this area. Sample several areas and determine the average number of grubs per square foot. Most healthy turfgrasses that are not under stress can tolerate at least 5-7 grubs/square foot. Poorly managed turfgrass may show damage at lower infestation levels. These treatment thresholds can vary depending on the kind of white grub present. Treatment thresholds and identification tips will be presented during the discussion of each major type of grub.

In South Carolina, turfgrass can be attacked by Japanese beetles, masked chafers, green June beetles, or by May/June beetles. Japanese beetles, masked chafers, and green June beetles all have a one-year life cycle. Eggs are laid in the soil during the summer and the adult beetles emerge from the soil the next spring or summer. May and June beetles have 2-3-year life cycles. All of these pests go through four distinct forms during the life cycle: egg, grub (larva), pupa, and adult. The grubs go through three stages or instars during their development. The pupa is the resting stage during which the change from grub to adult occurs.

Japanese Beetles: This introduced pest is now found in most states east of the Mississippi River except Florida, Mississippi, and Minnesota. In South Carolina, they are well established north of a line drawn from Charleston to North Augusta. It is slowly moving south of this line.

The 0.3-0.5 inch long adults have a metallic green head and thorax (area behind the head) and coppery brown wing covers. There are five tufts of white hairs on the sides of the abdomen and two tufts at the tip of the abdomen. The adults are active daytime fliers that can fly half a mile. They feed on over 300 different kinds of plants, including ornamentals, vegetables, and field crops and can cause considerable damage to the foliage, fruit, and flowers. The female beetle lays eggs in the top 2-3 inches of soil. Eggs hatch in 10-14 days into 0.1-inch grubs, which are nearly translucent. These tiny grubs begin feeding on grass roots. After feeding, the posterior end of the body becomes black or gray. After 2-3 weeks the grubs molt into second instars, which feed for 3-4 weeks before molting to the final or third instar. Mature grubs are about 1-inch long. The head is yellow-brown. Feeding continues through the fall until the beginning of winter. At this time the grubs move deeper into the soil. In March or early April the grubs move back into the root zone, feed for a short time, and pupate. After 1-3 weeks the adults emerge from the soil, mate, feed, and start the cycle again by laying eggs (Fig. 2).

Healthy turfgrass that is not under stress usually can tolerate 10 grubs per square foot. However, skunks

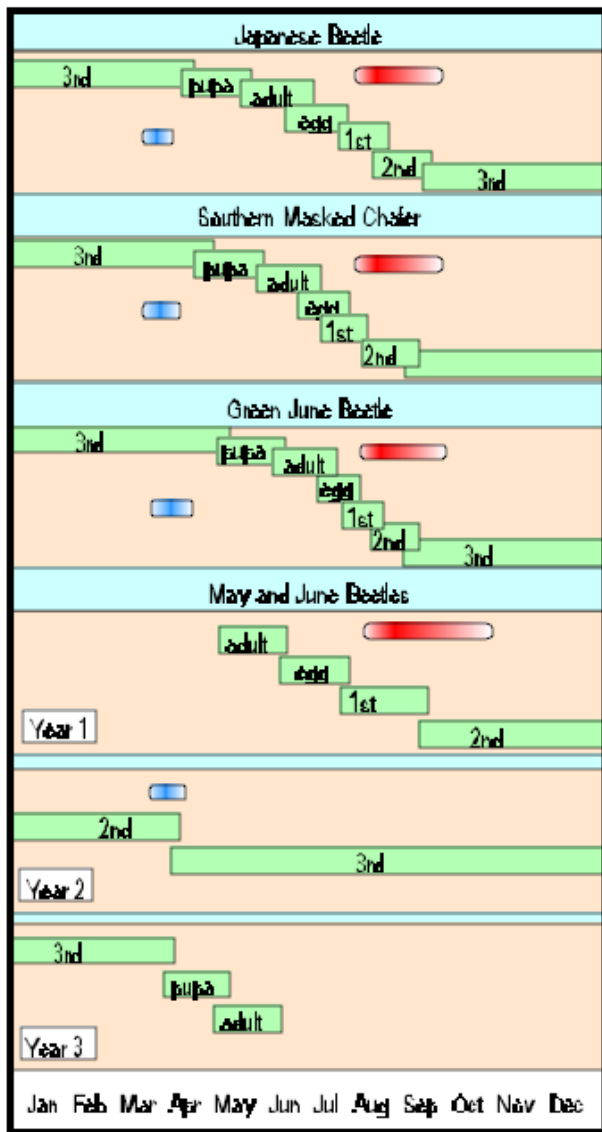


Figure 2. Seasonal life cycles of the four major white grubs in South Carolina. Optimal control timing is indicated by a red bar, secondary control timing is indicated by a blue bar.

and other animals may begin to dig up the turfgrass when grub populations are less than 10 per square foot. Six to eight grubs per square foot may be a safer treatment threshold for healthy turfgrass.

Southern Masked Chafer: This native beetle is found throughout South Carolina. The adult has a shiny, light red-brown body and a chocolate brown head. The size is about 0.5 inch long and 0.25 wide. The adult beetles do not feed. They are often attracted to lights at night. Newly hatched grubs are about 0.12 inch long. The grubs are white when they first hatch but turn gray after feeding. Mature third instar grubs are about 1 inch long. The head is chestnut brown.

Masked chafers have a one-year life cycle. The egg stage lasts 14-21 days, the larval stage 10-11 months, the prepupal and pupal stage 15-21 days,

and adults 5-25 days (Fig. 2). The feeding cycle of the grubs is very similar to that of the Japanese beetle. However, the grubs tend to feed on the roots just below the thatch layer. Damage is most severe in the late summer and fall. Drought conditions and hot weather aggravate the damage symptoms. Populations of 40 or more grubs per square foot are fairly common. At these levels, dead patches of turfgrass often appear and can be rolled back like a throw rug. Skunks and raccoons often will dig in the turfgrass for the grubs.

Well-managed turfgrass may be able to tolerate 20 grubs per square foot. Stressed turfgrass will develop symptoms when eight or more grubs per square foot are present.

May and June Beetles: This large group of native beetles belongs to the genus *Phyllophaga*. The May and June beetles are found throughout the United States. Several species are found in South Carolina. Generally, adults are somewhat oval, are 0.5 to 1 inch in length, and light to dark brown. Adults are active at night and are attracted to lights. They feed on the leaves of herbaceous plants, shrubs, and trees.

May and June beetles usually have a two to three year life cycle (Fig. 2). The eggs are laid singly in cells in the upper soil layers. Hatching occurs in a few days and the young grubs begin to feed on grass roots. The first and second instars are present for only a short time. Most of the life cycle is spent as a third-instar grub. Just before pupation, the mature grub stops feeding and empties its gut. This gives the rear end of the grub a shrunken appearance. This is referred to as the prepupa. After a few days pupation occurs. Adult beetles emerge in May and June, depending on the species. Because nearly a year is spent in the third instar, considerable damage can be done by these grubs.

Populations of more than seven grubs per square foot can result in complete loss of roots. The usual treatment threshold is four to five grubs per square foot. Controls should be aimed at the first and second instar grubs because they are easier to kill and cause less damage.

Green June Beetle: This native beetle is found throughout the eastern half of the United States. Adults are active during the day and range from 0.75-1.0 inch in length. The upper surface of the body is a forest green and usually has a tan stripe along the margin of the wing covers. The underside of the body is a bright, metallic green. Adults feed on overripe fruit among other things. Large numbers may cluster on a ripe peach or plum. Adults are often seen swarming just above the surface of the turfgrass on bright, sunny days. Their beelike buzzing may alarm people who do not know what they are.

Green June beetles have a one year life cycle (Fig. 2). Adults are present from mid to late June through early August. Eggs are laid in the upper soil layer. The egg and first two grub stages are quite short. By the end of August, nearly all the grubs will be in the third instar. Mature grubs are two inches long. The grubs differ from the other white grubs. Green June beetles have short legs, there are short, stiff bristles on the back, they usually lie on their back in an extended position and rarely assume a “C” shape (Fig 3), and they feed primarily on decaying organic matter instead of turfgrass roots. The young grubs construct horizontal tunnels in the top two inches of the soil, while third-instar grubs construct vertical tunnels in the soil and come to the surface at night to feed. The tunneling can disrupt the root system and under drought conditions can cause the turfgrass to die out. Piles of soil are pushed up at the entrance to the tunnel. This can be unsightly, damage reel type lawn mowers, and disrupt golf play. While feeding on the surface, the grubs may move around considerably. Often they are found on paved areas in the early morning or trapped in the gutters where curbs and gutters are present on streets. If the grubs become trapped on the hot pavement, they die and smell bad as they decay.



Figure 3. A green June beetle grub.

Although the grubs do not feed on turfgrass, their tunneling can cause problems if there are more than five to seven grubs per square foot. After treatment, the grubs will come to the surface within 12 hours. As they decay, the odor can be very strong. With high populations it may be necessary to remove the grubs from the treated area to prevent odor problems.

Management: Control of white grubs can be difficult at times because they live in the soil. This makes it much more difficult for the insecticide to reach the grubs. Heavy thatch will bind with most insecticides and restrict downward movement. It is very important to follow label directions with respect to watering after application. Sprays should be watered in as soon as possible after application to prevent drying of the spray. When sprays dry, the insecticide sticks to the grass blades and is difficult to wash off

and into the soil. Most materials for grub control, such as Battle/Scimitar, Sevin, Dylox, and Bayer Advanced Lawn 24 Hour Grub Control, should be applied after egg hatch is complete. This will be August and early September in most cases. However, Merit, Mach 2, and Bayer Advanced Lawn Season-Long Grub Control need to be applied during peak adult activity before egg hatch begins. Always follow all label directions and cautions.

White Grub Identification: The four white grubs can be identified by the arrangement of spines and bare areas around the anal opening. These are called the raster or the rastral pattern. The grub must be placed on its back and the area on the underside of the last abdominal segment washed off with water so that the arrangement of the spines can be seen. A 10X lens will help in determining the pattern. The rastral patterns of the common grubs in South Carolina are shown in Figure 4. The Japanese beetle is fairly easy to identify because of the distinct “V” shaped arrangement of smaller spines near the anal opening. The southern masked chafer has a fairly random arrangement of 25 to 30 coarse, hooked spines around the anal opening. May and June beetles have two longitudinal rows of spines surrounded by more or less randomly arranged, stouter spines. These first three grubs also will assume the “C” shape when removed from the soil. The green June beetle has two rather faint rows of longitudinal spines surrounded by numerous, randomly arranged short spines. Also, the green June beetle grub will more or less lie straight instead of curling up.

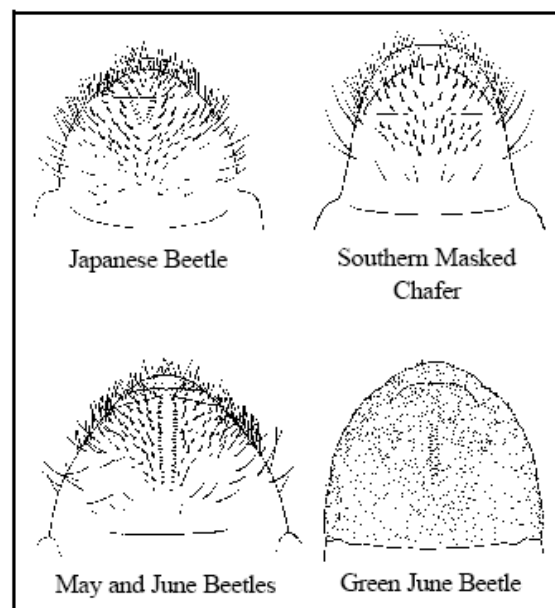


Figure 4. Rastral patterns used for identification of the four white grubs causing problems in South Carolina.

If grubs are to be sent in for identification, it is important to preserve them properly. The best way to kill the grubs is to bring a container of water to a boil and then remove the container from the heat. Immediately drop the grubs into the water and leave them in for three or four minutes. Remove the grubs from the water and dry them on a paper towel. When dry, place them in a container filled with rubbing alcohol.

This “cooking” action kills the enzymes and bacteria present in the gut. If not killed in this manner, the grubs will turn black, making identification much more difficult. The alcohol will then preserve the grubs.

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