



Scarab Beetles and White Grubs

O & T Guide [T-#08]

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Cooperative Extension Service • College of Agriculture and Home Economics • October 2006

Probably the most common and most damaging pests of turfgrass in New Mexico are the white grubs, i.e., the larvae of scarab beetles. A number of scarab species are involved, varying widely in size, color and biological details. All turf species grown here, including the fine specialty turf on golf courses can be seriously damaged by these root-feeding larvae.



Example of a typical white grub or larva of a scarab beetle. Photo: University of Georgia Archives, The University of Georgia, www.forestryimages.org

Metamorphosis: Complete
Mouth Parts: Chewing (larva and adult)
Damaging Stage: larva on turf; adults of some species may be foliage-feeding pests of plants other than turf.

Typical Life Cycle: Egg in soil → Series of 3 Larval instars feeding in root

zone → Pupa underground → Adult; above ground, free-flying, some species feed as adults but others do not.

Ataenius has two generations annually, overwintering as adults seeking shelter around perennial shrubs and trees. Known from nearly all of the contiguous 48 states, *Ataenius* species were first noted as turf pests in the early 1930s but emerged as increasingly important pests of golf courses in the East, Midwest and adjacent Canadian provinces in the 1970s. Annual bluegrass, Kentucky bluegrass and bentgrasses are favored hosts. Insecticide resistance has been documented in the East. Mature larvae are about the size of rice grains; large populations make turf wilt but can also cut all the roots in patches of turf such that it can be rolled up. The tiny (about 1/8 inch), black adults are active at night.



Mature larvae of the black turfgrass *Ataenius* (compare size to that of the penny). Photo: Whitney Cranshaw, Colorado State University, www.forestryimages.org

Aphodius overwinters as adults but may have more than two generations annually in our lower elevations. Adults of many species are dung feeders; larvae feed on dung, organic matter and live roots. Attacking the same grasses as *Ataenius*, *Aphodius* also is found in warm season grasses grown at lower elevations, particularly those fertilized with manure or compost. Mature larvae are about the size of rice grains and are easily confused with *Ataenius* larvae (*Ataenius* larvae have a pair of distinct pad-like structures on the tip of the abdomen just in front of the anal slit). Adults are dark brown to black and about 1/8 inch long. *Aphodius* adults have two “notches” in the tibia of the hind leg whereas *Ataenius* adults have none, features that require higher magnification. While over 100 species of *Aphodius* have been described from North America north of Mexico, the dominant pest species (in New Mexico and elsewhere) is *A. granarius*, accidentally introduced from Europe.



Adult *Aphodius omisus omisus* in Kentucky bluegrass (compare size to that of the dime). Photo: Whitney Cranshaw, Colorado State University, www.forestryimages.org

Our May and June beetles, *Phyllophaga* spp., fly at night between May and July. After mating, the light brown females burrow 1 to 4 inches into the soil to lay small clutches of 6-10 eggs that hatch in two to four weeks. Females may lay 50-60

eggs total in their adult lifetimes of about three weeks.



May or June beetle larvae, *Phyllophaga* sp. Photo: Clemson University - USDA Cooperative Extension Slide Series, www.forestryimages.org



Example of a May or June beetle, *Phyllophaga* sp. Photo: Steven Katovich, USDA Forest Service, www.forestryimages.org

Newly hatched larvae feed voraciously on grass roots, often reaching third instar and nearly half of their mature weights before winter. In the fall, larvae of some species burrow several inches to a foot or more into the soil to hibernate; others may remain relatively close to the surface, feeding as temperatures permit. In early spring, all larvae return to the surface and resume feeding on grass roots. For species with annual life cycles, feeding is completed by spring. After pressing a small hollow into the soil, they pupate inside for about a month, resting briefly as young adults in their soil chambers before digging their way to the surface. Rainfall or irrigation stimulate adult emergence and

flight. Adults fly at night and are easily attracted to lights. Adults may feed on new foliage of some trees and shrubs, but do little damage. At least some *Phyllophaga* spp. in New Mexico may require more than one year to complete development as they do in many parts of the U.S.; overwintering initially as larvae, the last winter may be spent as a quiescent young adult below ground.

Masked chafers have annual life cycles, emerging as adults in late summer, hatching shortly thereafter and feeding heavily in early fall and spring. Their larvae also may dig deeper into the soil, becoming quiescent over the winter. Generally darker brown and very shiny, adults fly at night, are easily attracted to lights, but do not feed as adults.



Adult Japanese beetle, *Popilia japonica*, an invasive species known from a very limited distribution in New Mexico. The adult is about as long as your little fingernail. Photo: David Cappaert, , www.forestryimages.org

Japanese beetles (JBs) and the larger Green June beetles are active during the day during mid summer. Male Japanese beetles and apparently some other scarab species find mates by tracking pheromones released by virgin females. Female Japanese beetles and Green June beetles are readily attracted to strong floral or fruity odors. Both behaviors have proven useful in survey trapping programs for JB in New Mexico and elsewhere. Adult

Green June beetles are nearly one inch long with dull brassy wing covers; the rest of the body is metallic dark green.



Larva of the green June beetle, *Cotinus* sp., a native to New Mexico. Photo: University of Georgia Archives, The University of Georgia, www.forestryimages.org



Adult of the eastern species of green June beetle, *Cotinus nitida*. Photo: Clemson University - USDA Cooperative Extension Slide Series, , www.forestryimages.org

While Green June beetles are native insects, JB's obviously are not; JB's are currently established in small, isolated areas of north-central New Mexico where they are considered not only threats to turf and ornamentals but also regulatory pests requiring eradication efforts and close monitoring. JB's also have dull brassy wing covers with the rest of the body deep metallic green; however, JB's are only 3/8 inch long and have six pairs of white bristle patches around the edges of the wing covers. While Green June beetles are minor pests of turf, JB's can become primary turf pests as they have in other infested parts of the U.S. Adults of both

species will damage thin-skinned ripe fruit but JB's are also highly destructive to the flowers and foliage of over 300 species of landscape, garden and crop plants.



Adult lined June beetles, *Polyphylla* sp.
Photo: Gerald J. Lenhard, ,
www.forestryimages.org

Lined June beetles, *Polyphylla* spp., can be nearly an inch long and are more elongated than any of the common May or June beetles; longitudinal stripes of off-white and light brown distinguish these insects as well as large antennal clubs, making these structures look elbowed. Larvae are considered as minor pests of turf; however, they will feed not only on grass roots, but also roots of conifers, garden fruits, vegetables and some crop plants. Adults of at least one species are known to feed on conifer needles. Some species are known to have at least 3-year life cycles.

Description of Life Stages:

Egg---minute to the size of seed beads, round, pearly white, laid in small clutches, usually of 6-10 eggs in the soil around shallow roots of host grasses; rarely seen.

Larva---characteristically plump, white, segmented, C-shaped, with 3 pairs of well-developed thoracic legs, well developed brown head capsule with chewing jaws; larger larvae often have longer, stiff bristles, especially along their backs. Spiracle plates visible on larger specimens on the sides of the abdomen. Different groups of larvae can be distinguished by patterns of setae or bristles on the rear of the abdomen (called the raster).

Pupa---Off white initially but adopting the darker colors of the future adult at maturity. Developing wings wrap loosely around the thorax and abdomen; all of the legs are rigid and flexed below the thorax. Developing antennae, and mouth parts well defined but immobile. Compound eyes visible. Pupa typically found in a small cell pressed into the soil near host plant roots.

Adults---Robust, oval or slightly elongated, with prominent wing covers and relatively hard bodies. Lower parts of the forelegs are often broad and flat with the outer edges toothed or scalloped. Antennae short, ending in 3-7 segments that can be spread apart or united to form a compact terminal club. Colors and sizes vary with species as described above.

Habitat and Hosts: The eggs, larvae and pupae of all of the scarab pests of turf are found in the soil around the roots of their grass hosts. *Ataenius* has become a severely damaging and often difficult to control pest of golf turf in the Midwest and East; some populations are known to have some insecticide resistance. *Aphodius* seems most numerous on turf fertilized with animal manures. Green June beetle larvae can be found in these situations also, as well as under compost piles or wherever rotting plant matter accumulates

undisturbed. Neither Green June beetles nor lined June beetles, *Polyphylla* spp., are considered major pests of turf. The May and June beetles plus the masked chafers are extremely common and widespread turf pests throughout New Mexico; unless controlled, they often destroy turf stands, requiring reseeding, overseeding or resodding. Japanese beetles are invasive exotic pests of turf and 300+ other species of landscape and garden plants. Established in isolated parts of north central New Mexico since 1997, they are targets for eradication as well as causes for “insurance treatments” of commercial nursery stock and turf produced in infested counties.

Damage: White grubs root-prune their hosts, weakening and potentially killing plants. Affected turf may appear thinner, weaker or even wilted. Dull green, yellowing or brown patches also may appear in turf; white grubs can usually be found within an inch or two of the surface near the edges of these patches. In extreme situations, large populations of white grubs may make affected turf feel spongy to the feet or make it possible to pull up or even roll up sections of rootless turf. While exit and entry holes made by ovipositing female beetles or emerging adults can be objectionable, more serious turf damage can occur when birds, skunks, raccoons or other animals dig through turf to feed on white grubs near the surface.

IPM Notes: Failure to control white grubs in turf generally results in ever-growing dead patches that eventually coalesce, requiring reseeding, overseeding or resodding. Some turf managers replace patches of damaged turf while others opt to treat affected areas or entire turf plantings with insecticides. A variety of active ingredients and several formulations are labeled for white grub control in turf.

Strict adherence to label directions is required for the best results; time of year for application and application techniques are critical for these materials. A least one active ingredient is reported to remain effective against white grubs for several months.

While a biological insecticide containing the bacterium *Bacillus popilliae* is appealing to homeowners, the product performs poorly in the hot, dry, alkaline soils of New Mexico. Studies conducted in other states suggest that, although it may infect a variety of white grub species, the pathogen is widely distributed and has minimal effects on their survival. Even Japanese beetle, the insect from which the specific name *popilliae* is derived, seems to be becoming resistant to this once effective remedy in other parts of the U.S.

Some naturally occurring predatory nematodes have been associated with Green June beetle in New Mexico, particularly with those collected around compost piles. Treatment of white grubs in lawns with commercially available predatory nematodes is generally not economical or feasible, especially for large areas.

Scoliid and tiphid wasps are fairly common larval parasites wherever populations of white grubs are relatively high. These non-aggressive, sometimes brightly colored wasps fly slowly back and forth over affected turf, getting peoples' attention. Scoliid wasps in particular, may kill more white grubs than they parasitize. However, neither of these wasps is likely to provide acceptable control for a white grub infestation.

Soil-dwelling larvae of various bee flies and robber flies attack the pupae of some

white grubs but probably do little to control a pest population. A variety of insect-eating birds and small mammals will dig through turf to find grubs and

pupae. These animals provide better indications of how bad the white grub infestation is rather than effective control.