First Edition

Economic Pests of Turfgrass

Identification Guide

Dozens of pests can damage turfgrass to a degree that can be costly. This guide is designed to help identify these pests at different stages of the life cycle to allow turf professionals reduce the damage they cause.

Virginia Cooperative Extension
Virginia Tech • Virginia State University

VTF
VIRGINIA TURFGRASS FOUNDATION

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White grub complex

White grubs are economic pests of turfgrass and many other commodities. The eggs and pupae of white grubs are similar across species. The larvae are typically whitish in color, soft, have a brown head, and can be found in the soil in a C-shape. The size varies greatly by instar and species. Most grubs can be identified to genus or species by the raster pattern located at the end of their abdomen.

Eggs: Small, white, and initially oval, they become round as they absorb moisture. Eggs are deposited singly or in clusters in the soil.

Larvae: Described by species.

Pupae: White grubs pupate in the soil, darkening from cream/white just before emerging as adults.

Adults: Described by species.

All life stages of Japanese beetle *David Shetlar*

Japanese beetle, *Popillia japonica*

Raster *David Shetlar*

Adult *David Cappaert*

Larvae: The raster pattern consists of a V-shaped bristle configuration. Larvae feed on all species of turfgrass.

Adults: Bright emerald green head and pronotum; wing covers are shiny brown. About 1/2 inch long by 1/4 inch wide.

Distribution: Throughout the U.S., but is primarily located east of Michigan, Illinois, and Alabama.

Green June beetle (Fig Eater), *Cotinus nitida*

Larva *Erfan Vafaie*

Raster *David Cappaert*

Larvae: A large white grub. Legs are much smaller than other white grubs, so they move by undulating on their back on top of the soil at night. The raster pattern consists of two irregular rows of bristles. They feed on all species of turfgrass.

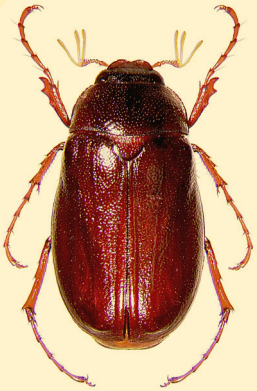
Adult: Larger than Japanese beetles, about 1 inch long. Dorsal side is dark green in color with yellowish margins; the ventral side is a shiny dark green.

Distribution: New York to Florida and across to Texas, Kansas, and Southern California.

Adult
David Cappaert

May beetle (June bug), *Phyllophaga* spp.

Raster *David Shetlar*



Adult *David Shetlar*

Larvae: The raster pattern for *Phyllophaga* consists of two parallel rows of bristles pointing toward each other. Larvae feed on all species of turfgrass.

Adults: There are several *Phyllophaga* species with life cycles ranging from one to four years. All species have the same shape, but may vary greatly in size and color. Adults may be light brown to almost black and are between 1/2 inch to 1 inch long depending on the species.

Distribution: Throughout the U.S.

Chafer sp., (*Cyclocephala* spp.)

Raster *David Shetlar*

Adult *David Shetlar*

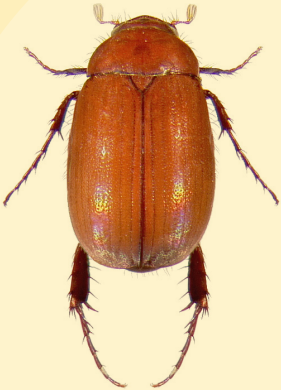
Larvae: All *Cyclocephala* larvae have random bristle patterns on the raster. Mouthparts of the larvae are dissected to determine the species. Cool- and warm-season grasses can be attacked by chafer grubs.

Adults: Yellowish-brown beetles with a dark brown band across the head and eyes, about 1/2 inch long.

Distribution: Different species are found in different regions of the U.S.

Asiatic garden beetle, *Maladera castanea*

Raster *David Shetlar*



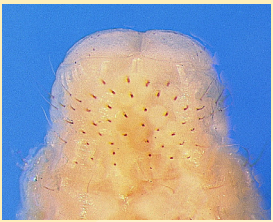
Adult *David Shetlar*

Larvae: Identified by enlarged maxillary palps, the Y-shaped anal slit, and a single slanted row of spines on the raster. They feed on cool-season grasses.

Adults: Small (3/8 inch), shiny reddish-brown beetles. Adults also feed on turfgrass, causing irregular holes or complete defoliation of the grass.

Distribution: New England to South Carolina and across to Iowa.

Black turfgrass ataenius, *Ataenius spretulus*



Raster *David Shetlar*

Larvae: Small (less than 1/3 inch long), with two pads near the anal slit and a few scattered bristles on the raster. Black turfgrass ataenius is mainly a problem on annual bluegrass, creeping bentgrass or Kentucky bluegrass. With two generations per year, damage is first seen in June and July.

Adult *David Shetlar*

Adults: Small (1/5 inch), black, shiny beetles. Small pits can be found on the prothorax. The elytra (wing covers) have longitudinal striations.

Distribution: Throughout the U.S.

Sugarcane beetle, *Euetheola humilis*

Larva *David Shetlar*

Adult *John C. French Sr.*

Damage *Terri Billeisen*

Larvae: White with a red head capsule and a double row of bristles on the raster.

Adults: Dull black beetle about 3/5 inch long. The pronotum has many punctures throughout, and the elytra have multiple double rows of longitudinal furrows.

Distribution: Southeastern U.S.

Damage symptoms: Considered to be a pest of warm-season turfgrass, most commonly bermudagrass and zoysiagrass. The adults cause most of the damage by feeding directly on the stem of the grass; they may also burrow into the soil, causing tunneling. Larvae feed primarily on detritus in the soil, but may also feed on turfgrass roots.

White grub damage

M.G. Klein

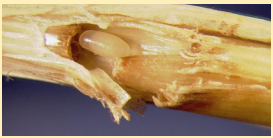
Feeding damage by white grubs.

Ward Upham

Turf can be pulled back like a carpet, if the roots have been eaten by white grubs.

Feeding injury from infestations of white grubs in turf usually occur in late summer and early fall. The turf starts to yellow and look drought-stressed; it may die in scattered irregular patches. High densities of white grubs (more than 8 per square foot) feeding in the soil-thatch zone can cause the turf to feel spongy when walked on and can be easily pulled up like a carpet. Also, animals that feed on grubs (raccoons, moles, skunks, and birds) may dig up the turf to get to the grubs.

Bluegrass billbug, *Sphenophorus parvulus*

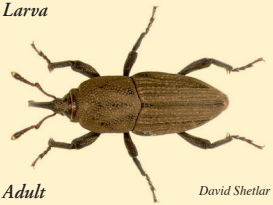


David Shetlar

Egg located in a grass stem

David Shetlar

Larva



Adult David Shetlar

David Shetlar

Bluegrass billbug life stages

Eggs: Small, off-white, bean-shaped and laid in a small hole chewed in grass stems.

Larvae: Weevil grubs are legless, off-white "humpbacked" grubs with light brown heads; they usually attack Kentucky bluegrass.

Pupae: Darken from white to a reddish brown as they mature. A weevil snout and pronotum are visible on the pupa.

Adults: Beetles are about 1/4 inch long. They are reddish-brown upon emergence, but turn dark brownish-black once sclerotized. They have a long snout with antenna that arise from the base. The pronotum has small uniform punctures and the wing covers have parallel longitudinal furrows.

Distribution: Throughout the U.S.

Hunting billbug, *Sphenophorus venatus vestitus*

Larva *David Shetlar*

Adult *David Shetlar*

Eggs: Similar to bluegrass billbug.
Larvae: Similar to bluegrass billbug, but show preference for zoysiagrass and bermudagrass.

Pupae: Similar to bluegrass billbug.

Adults: Beetles are about 1/4 inch to 1/2 inch long, usually larger than the bluegrass billbug. The pronotum has a smooth Y-shaped area with a parenthesis-like mark on each side. Adults also feed on turfgrass, usually near the base of the plant in the thatch area.

Distribution: Throughout the U.S.

Billbug damage

David Shetlar

David Shetlar

David Shetlar

Billbug larvae feeding damage to Kentucky bluegrass

David Shetlar

Easily broken grass filled with frass

Injury from bluegrass billbug larvae usually appears as yellow patches in Kentucky bluegrass in mid to late summer (fig. A and fig. B). In warm-season grass, damage from the hunting billbug usually occurs in spring and fall. In bermudagrass, the damage is similar to spring deadspot or delayed spring green-up (fig. C). Brown frass — the debris or excrement produced by insects — near the crown of the plant, or grass stems filled with frass that break easily, indicate presence of billbug larvae (fig. D). Early instar billbug larvae feed inside the grass stem; larger larvae drop to the thatch to feed on crowns and roots.

Annual bluegrass weevil, *Listronotus maculicollis*

David Shetlar

Pupa (upper) and mature larva (lower)

Adult David Shetlar

Eggs: Small, oblong and laid in grass stems. They change from yellow to grayish-black prior to hatching.

Larvae: White, crescent-shaped larvae without legs. The head capsule is light brown and darkens with maturity. They usually attack annual bluegrass and creeping bentgrass.

Pupae: Creamy white changing to brown before emerging as adults. The snout, wing covers, and legs are visible on the pupa. They pupate in earthen cells.

Adults: Adults are black and about 1/8 inch long. The elytra and thorax are coated with fine grayish-yellow hairs and scales. Can be differentiated from billbugs, as they are smaller and their antenna originates at the tip of the snout instead of the base.

Distribution: New England, mid-Atlantic, Ohio, West Virginia, and North Carolina.

Annual bluegrass weevil damage

Damage signs appear in late May to early June on annual bluegrass. Larval feeding injury can range from a slight yellowing or browning of the turf to dead patches in large areas depending on the population. Young larvae feed on the grass stem and move down to feed on the crown when they mature. Adults feed on the blades and can cause leaf notching.

Larvae feeding damage to annual bluegrass *H. D. Niemczyk*

Wireworm and click beetle

Tom Kuhar

Corn wireworm, Melanotus communis (top) and Conoderus spp. *(bottom)*

Adult, Melanotus spp. Joseph Berger

Eggs: White and very small (1/100th of an inch), laid singly or in small clusters in soil.

Larvae: Usually yellow-brown with a slender, hard, cylindrical, jointed body ranging from 1/2 inch to 1 1/2 inches long.

Pupae: White and soft, and resemble the adult beetle.

Adults: Brownish-black with slender bodies from 1/2 to 3/4 inch long. The beetles have a spine that points backward from the middle of their thorax. This spine fits in a groove to help the beetles jump and click.

Distribution: Different species are found in different regions of the U.S.

Damage symptoms: Wireworms feed on seed, resulting in reduced plant populations. They also bore into the underground portion of the stem, killing the plant.

Fall armyworm, *Spodoptera frugiperda*

Egg mass on leaf *David Shetlar*

Larva *David Shetlar*

Eggs: Laid on leaves, flags, or signs in layers of up to 300 eggs. Color changes from greenish-gray to dark brown as they mature. Covered with colored scales from the female's abdomen.

Larvae: Armyworms have three pairs of true legs, four pairs of soft prolegs, can vary in color, and can grow up to 1 1/2 inches long. They will feed on all grasses. The fall armyworm head has a white upside-down Y-shaped marking surrounded by a dark pattern. Three pale yellow stripes run laterally down the body with wide dark bands found on the sides. Four black spots form a square near the last abdominal segment.

Fall armyworm, *Spodoptera frugiperda*

Pupae: Reddish-brown in color; pupate in earthen cells.

Adult: Armyworm moths are very similar in appearance with a wingspan of about 1 1/2 inches. The fall armyworm moth has darkly mottled forewings with light and dark marks, with a white spot at the end of each.

Distribution: Throughout the U.S.

Adult *David Shetlar*

Yellowstriped armyworm, *Spodoptera ornithogalli*

Larva *David Shetlar*

Adult *Mark Dreiling*

Eggs: Similar to fall armyworm.

Larvae: Similar to fall armyworm, but the yellow armyworm has two yellow stripes running down the top of each side of its body. Black triangular markings are located on top of the yellow stripes with a tan- to brown-colored stripe in between.

Pupae: Reddish-brown in color; found in earthen cells in the soil.

Adults: Similar to fall armyworm. The yellow armyworm has a complex pattern of dark and light markings with a dark yellowish-brown elongated triangular marking 2/3 of the way down on the forewing.

Distribution: Throughout the U.S.

"True" armyworm, *Pseudaletia unipuncta*

Larva *David Shetlar*

Adult *John Capinera*

Eggs: Small, white, and spherical. Laid in rows or masses on leaves; frequently found rolled up in the leaves.

Larvae: Similar to fall armyworm, but have stripes of light white, orange and brown which run the length of the abdomen and a dark band on each proleg. Head is mottled with two dark stripes.

Pupa: Similar to fall armyworm, but slightly larger.

Adults: Similar to fall armyworm, but the center of the forewing is light brown with a white dot.

Distribution: Throughout the U.S.

Armyworm damage

Armyworms will feed in large numbers on all species of turf, moving from one food source to another. They will eat all of the leaf tissue, leaving only a few stems.

Armyworm feeding damage. *David Shetlar*

Dingy cutworm, *Feltia jaculifera*

Larva *Erfan Vafaie*

Adult *Mark Dreiling*

Eggs: Deposited singly or in clusters on vegetation.

Larvae: Color is variable, but usually a dark to light gray. Gray V-shaped markings are located on the dorsal surface of each abdominal segment. Skin is smooth with tubercles that are the same size; black cutworms have rough skin and tubercles that vary in size.

Pupae: Reddish-brown in color; pupate in earthen cells in the soil.

Adults: Dark gray and black pattern with light gray and brown streaks and a wing span of about 1 1/3 inch. A light brown kidney-shaped marking is located in the middle of the forewing.

Distribution: Throughout the U.S.

Black cutworm, *Agrotis ipsilon*

Larva *Adam Sisson*

Adult *Mark Dreiling*

Eggs: Deposited singly or in clusters on vegetation.

Larvae: Dark olive green to a nearly gray-black with a broad pale stripe running down the back. A few bristles can be found on the skin, but they are otherwise hairless. Skin granules of different sizes give the larvae a greasy look.

Pupae: The pupae are brown, reddish-brown, or black; they pupate in earthen cells in the soil.

Adults: Wings are dark black and gray-brown with a black dagger mark on the outer edge of the forewing. At rest, the wings are folded flat over the abdomen. The wingspan ranges from 1 1/2 to 2 inches wide.

Distribution: Throughout the U.S.

Variegated cutworm, *Peridroma saucia*

Larva *David Shetlar*

Adult *Mark Dreiling*

Eggs: Deposited singly or in clusters on vegetation.

Larvae: Gray to brown mottled body with four to seven light yellow spots along the middle of their back and a black W-shaped marking located on the dorsal side of their last abdominal segment.

Pupae: Reddish-brown; they pupate in earthen cells in the soil.

Adults: Mottled light and dark brown with black notch markings on the edge of their forewings; wingspan is about 2 inches

Distribution: Throughout the U.S.

Cutworm damage

Cutworms are nocturnal feeders and will feed on all grasses. When they feed, they cut plants at the soil surface. Their feeding can cause patches of sunken marks (pock marks) on short-cut turf where they have burrowed into the ground.

Black cutworm larva and damage *David Shetlar*

Sampling methods for Lepidoptera

Use a drench test to bring cutworms, sod webworms, armyworms, and several other insects to the surface. To do so, mix 1 to 2 tablespoons of Dawn Ultra or Joy Ultra in 1 gallon of water. Pour evenly over 1 square yard of turf. Watch the area for five minutes, identifying the caterpillars as they rise to the surface.

Sod webworms

Sod webworm life stages. *David Shetlar*

David Shetlar

Sod webworm larva with frass.

David Shetlar

Sod webworm adult resting pointing downwards

Eggs: White changing to yellow, and then brown as they mature.

Larvae: Much smaller than armyworms or cutworms. They will feed on cool- and warm-season grasses. They have a mottled brown head and a light tan body, with rows of dark brown/green spots running longitudinally down their body; thick hairs emerge from these spots. They build silk-lined burrows in the thatch layer.

Pupae: Yellow changing to reddish-brown with maturity; found in earthen cells in the soil.

Adults: Light tan to gray with markings on the wings. At rest, wings are usually wrapped around the abdomen while facing downwards. A prominent snout arises from the front of the head.

Distribution: Throughout the U.S.

Tropical sod webworm, *Herpetogramma phaeopteralis*

Larva and frass

Adult

Tropical sod webworm photos by David Shetlar

Eggs: Flat, white changing to brown before hatching; deposited in small clusters.

Larvae: Head is dark yellowish-brown with a dark line on the side; body is a light yellow to green, with two pairs of brown spots on each abdominal segment. They build silk-lined burrows in the thatch and feed on warm-season grasses.

Pupae: Reddish-brown and usually found in the upper thatch.

Adults: Brown to light brown wings that are held horizontally when resting, giving them a triangle appearance. Wingspan is about 3/4 inch.

Distribution: Gulf States of the U.S.

Webworm damage

Webworm larvae are nocturnal feeders; they spend the day burrowed in the thatch. As the larva grows, feeding injury changes from grazing on the surface of the grass blade to consuming the entire blade of grass. Large larvae can consume patches of grass to the thatch layer. Silk-lined burrows and fecal pellets (frass) can also be found when digging into sod webworm-infested yellow patches of turf. The most severe damage usually appears in the late fall.

Tropical sod webworm silken burrows *David Shetlar*

Chinch bugs, *Blissus* spp.

David Shetlar

Southern chinch bug adult, Blissus insularis

Eggs: Small, white, and oval with a blunt end; they turn orange before nymphal emergence. Eggs are laid near the thatch layer.

Nymphs: Bright orange, darkening to a brown or gray color as they mature, with a white band across their abdomen.

Adults: About 1/10 to 1/5 inch long and dark gray with shiny white wings, which may be short or long.

Distribution: Different species are found in different regions of the U.S.

Hairy chinch bug, Blissus leucopterus, life stages

David Shetlar

Chinch bug damage

David Shetlar

Hairy chinch bug damage

David Shetlar

Southern chinch bug damage

Chinch bugs will feed on Kentucky bluegrass, bermudagrass, fescues, perennial ryegrass, bentgrass, and zoysiagrass. Chinch bug damage is usually worse in hot, dry sunny locations with a thick thatch layer. Feeding blocks the flow of water and nutrients in the plant, so damage resembles drought stress. Patches of turf turn yellow and then brown, with the turf eventually dying. Damage usually occurs during hot, dry summers.

Ground pearls, *Margarodes* spp.

'Pearls' *David Shetlar*

Adult females *David Shetlar*

Eggs: Clusters of light pink, cylindrical eggs deposited in a waxy sac.

Nymphs: "Crawlers" are creamy white and disperse in the soil to attach to plant roots. After they attach to roots, they cover themselves with light-colored wax and form the pearl stage.

Adults: Small (1/16 inch), pink or orange and sac-like.

Distribution: Southern U.S.

Ground pearls damage

David Shetlar

Damage to bahiagrass

David Shetlar

Damage to bermudagrass

Ground pearls are subterranean scale insects about the size of a grain of sand. They feed on warm-season grasses, usually bermudagrass, St. Augustinegrass, zoysiagrass and centipede grass. Damage begins to appear during spring when they feed on grass roots. Irregular patches of turf first turn yellow, followed by browning and death.

Rhodesgrass mealybug, *Antonina graminis*

David Shetlar

Adult with anal wax tubes and honeydew

Damage symptoms: Mealybugs feed under leaf sheaths, on nodes, or in the crown of warm-season grasses. Feeding results in discoloration, wilt, stunting, and thinning of the grass. Damage is worse in sunny locations during hot, dry periods. Indications of mealybug presence include masses of waxy, white secretions, honeydew that attracts ants or bees, and sooty mold growing on the honeydew.

Eggs: Oval and cream colored; remain under the female until hatching

Nymphs: "Crawlers" are cream-colored with a purplish stripe. They have six legs and move to grass nodes, crowns or under leaf sheaths to settle.

Sessile nymphs: After settling, they begin to secrete a white waxy coat. The waxy area and the wax filament become larger as they grow.

Adult: Small (1/10 inch long), dark purplish brown, and covered by a white cottony wax covering that turns yellow with age.

Distribution: Southern U.S.

Twolined spittlebug, *Prosapia bicincta*

David Shetlar

Adult

David Shetlar

Spittlebug mass containing a nymph

Nymphs: Cream-colored and surrounded with frothy white spittle.

Adults: About 1/4 inch long, black with red eyes and legs, and two orange stripes across their wings.

Distribution: Most common from Maryland to Kansas and throughout the Gulf States.

Damage symptoms: Spittlebugs feed on all grasses, but primarily centipedegrass and St. Augustinegrass. They cause the most damage to grasses with thick thatch, usually in shady areas. Heavy feeding causes weakened, stressed grass that turns yellow and then brown.

Greenbug (aphid), *Schizaphis graminum*

Greenbugs *Kansas Department of Agriculture*

Greenbugs *David Shetlar*

Nymphs: Similar to adults but smaller.

Adults: Small (8/100ths of an inch long), pear-shaped, and green with a dark green stripe running down the back. There are winged and wingless forms.

Distribution: Can be found throughout the U.S., but has been reported as damaging turf from Maryland to New York to Kansas, the Midwest, and Florida.

Greenbug damage

Greenbugs prefer to feed on Kentucky bluegrass, but will occasionally feed on some fescue. Feeding causes leaves to turn yellow and then burnt-orange. Damage is most evident in shady turf, especially under trees, but damage can also occur in full sun. As damage worsens, turf color changes from green to yellow to brown. Damage occurs from June until a killing frost. Sample by examining leaf blade surfaces. A dozen or more greenbugs can line up on each blade. The presence of ladybeetles, wasps, and flies, which feed on aphid honeydew or on the aphids, can indicate a high greenbug population.

Greenbug damaged Kentucky bluegrass *David Shetlar*

Bermudagrass scale, *Odonaspis ruthae*

David Shetlar

Bermudagrass scales

David Shetlar

Scales among leaf sheathes and nodes

Eggs: Pink and laid under the shell of the adult female.

Nymphs: "Crawlers" are pink with a flat body and short legs. They move a short distance away to settle on crowns, stolons, or leaf sheaths of bermudagrass.

Sessile nymphs: Once settled, they produce a waxy shell that is yellowish-white.

Adults: Females are protected by white oval shells, about 1/16 inch long. Males are much smaller (1/50 inch) and are light pink with a few waxy threads emerging from the abdomen.

Distribution: Southern U.S. and Hawaii.

Bermudagrass scale damage

Damage occurs during hot, dry weather. They prefer bermudagrass, but will feed on centipedegrass, bahiagrass, St. Augustinegrass, and tall fescue. Damaged bermudagrass first looks like it is under drought stress; heavy infestations may kill the grass. Spring green-up may be delayed in areas where bermudagrass has been dormant during winter.

Damage to bermudagrass *David Shetlar*

Mole cricket

A

Northern mole cricket, Neocurtilla hexadactyla

Betsy Betros

Eggs: Barrel-shaped, opaque white, and laid in clusters about a foot underground.

Nymphs: Look similar to the adults, but smaller and without complete wings.

Adults: There are several species of mole crickets, and each are about 1 1/2 to 2 inches long. Northern mole crickets have a pronotum without a pattern and four dactyls (claws or teeth) located on the front tibia (fig. A and fig. B).

Robert Lord Zimlich

Southern mole cricket, Neoscapteriscus borellii

Mole cricket

Perry Babin

Tawny Mole Cricket, Neoscapteriscus vicinus

David Shetlar

Shortwinged mole cricket, Neoscapteriscus abbreviates

Southern mole crickets have four pale spots or areas on the pronotum and a U-shaped area between the tibial dactyls fig. C). Tawny mole crickets have a V-shaped area between the tibial dactyls and are larger than other mole crickets (fig. D). Shortwinged mole cricket adults have hindwings that only extend about one-third the length of the abdomen. They have a mottled pronotum and a U-shaped area between the tibial dactyls (figure E).

Distribution: Different species are found in different regions of the U.S.

Mole cricket damage

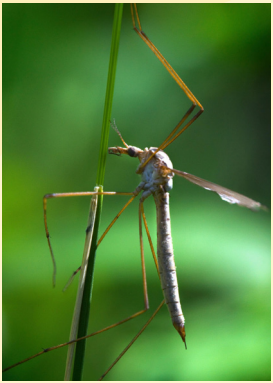
Mole cricket adults and nymphs feed at night on turf, as well as other organic material and insects. Mole crickets will feed on turf roots causing the turf to appear drought-stressed during heavy infestations. The main damage they cause is tunneling, usually within the upper 10 inches of soil. Tunneling reduces the aesthetic quality of turfgrass, interferes with the roll of the ball on the golf course, and can be scalped by the mower. Sample for mole cricket nymphs in early summer using the soapy water drench test described on page 17 for caterpillars.

David Shetlar

Typical mole cricket burrowing and damage to bermudagrass turf

Crane fly, *Tipula* spp.

Crane fly larva *David Shetlar*



Adult *David Cappaert*

Larvae: "Leatherjackets" are brownish-gray, tubular, legless, and about 1 inch long. Native species feed on decaying thatch of cool- and warm-season grasses; European and common/marsh crane flies feed on turf roots, crowns, and shoots of cool-season grasses.

Adults: Adults look like giant mosquitoes with a wingspan of more than 1 inch.

Distribution: Pacific Northwest, New York, and the Eastern Great Lakes region.

Damage symptoms: Turf damage starts as a general thinning, progressing to large dead patches. Sample for leatherjackets using the soapy water drench test described on page 25 for caterpillars.

Frit fly, *Oscinella frit*

H. Niemczyk

Frit fly larva burrowing in a stem of grass

David Shetlar

Adult

H. Niemczyk

Frit fly damage to grass stem

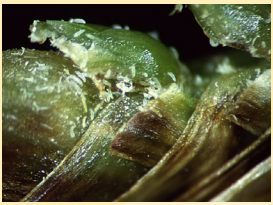
Larvae: Tiny, off-white, legless maggots that tunnel into grass stems near the surface. They prefer to attack Kentucky bluegrass, bentgrass, and ryegrass.

Adults: Tiny (about 8/100ths of an inch long), black or yellow. They will hover close to the grass from mid to late morning.

Distribution: Throughout the U.S.

Damage symptoms: The central stem of turf infested with the larva turns yellow and dies while the other stems remain green. The adults are a nuisance to golfers because they are attracted to white clothes, balls, and golf carts.

Bermudagrass mite, *Eriophyes cynodoniensis*



David Shetlar

Bermudagrass mites at leaf base

David Shetlar

David Shetlar

Witches broom

Nymphs: Extremely small; color ranges from almost clear to white.

Adults: Whitish cream color and very tiny; can only be seen with a hand lens.

Distribution: Southern U.S.

Damage symptoms: Damage is most severe during hot, dry weather. Infested bermudagrass shows weak growth in the spring, with yellowing and rolling of leaf tips. Stem length between nodes shortens and "witches broom" occurs. Eventually bermudagrass develops clumps that resemble miniature cabbage heads, with irregular sections of turf turning brown and dying.

Winter grain mite, *Penthaleus major*

David Shetlar

Eggs attached to dead grass

David Shetlar

Winter grain mites

Eggs: Red and smooth, changing to light brown and wrinkled after drying in the sun. Adhered to blades of grass and roots.

Larvae: Pinkish-orange to brownish-black depending on age, but mouthparts and legs are always reddish-orange. Have only six legs.

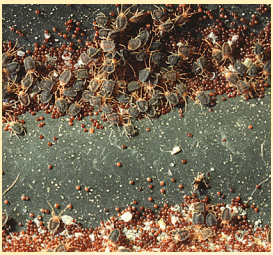
Nymphs: Reddish-orange to dark brown with eight legs.

Adults: About 4/100ths of an inch long. Bodies are dark brown to black with a greenish tinge. Legs are reddish-orange. A reddish-orange spot (anal pore) is located on top of the abdomen.

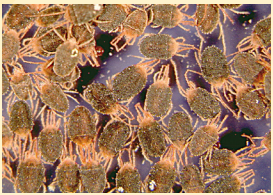
Distribution: Throughout the U.S.

Damage symptoms: Winter grain mites are active from mid fall until spring. They prefer to attack Kentucky bluegrass, ryegrass, bentgrass, and fescues. Reddish-orange eggs are visible on stems and roots of turfgrass during the summer. Damaged grass blades appear frosted or moldy.

Clover mite, *Bryobia praetiosa*



Clover mites and eggs *David Shetlar*



Clover mites *David Shetlar*

Eggs: Bright red, spherical, and very small (2/100ths of an inch).

Larvae: Newly hatched larvae are tiny, crimson-colored, and six-legged.

Adults: Smaller than a pinhead (3/100ths of an inch), they range in color from dark green with orange-red spots to a general brick red appearance. Adults have an unusually long pair of front legs, which distinguishes them from other mites.

Distribution: Throughout the U.S.

Damage symptoms: Clover mites feed on Kentucky bluegrass, perennial ryegrass, and fescues. Damage occurs during cooler seasons, causing the damaged areas of grass blades to appear silvery. Look for clover mites if you have turf injury in cool conditions in areas near the sun-exposed sides of buildings, trees, or shrubs.

Imported fire ant, *Solenopsis invicta*

Workers *David Shetlar*

Fire ant mound *Jake Farnum*

Eggs, larvae, and pupae: Cared for by worker ants in the nest.

Adults: Aggressive (stinging and biting), reddish-brown to black ants that are 1/8 to 1/4 inch long.

Distribution: Southern U.S., primarily east of Texas.

Damage symptoms: Fire ants do not damage turf directly, but their mounds can hinder mowing operations and can smother grass. They build dome-shaped nests up to 3 feet across in sunny, open areas.

Soil-dwelling ants, *Lasius* spp.

Workers *David Cappaert*

Typical mound *Mohammed El Damir*

Eggs, larvae, and pupae: Cared for by worker ants in the nest.

Adults: Small (less than 1/8 inch), they come in various shades of brown. These ants do not sting.

Distribution: Throughout the U.S.

Damage symptoms: The ants construct mounds up to 4 inches in diameter on turfgrass. The soil and sand from the mound can kill the grass.

Cicada killer, *Sphecius speciosus*

Adult with prey *Ronald F. Billings*

Adult at its burrow *Jessica Louque, Smithers Viscient*

Larvae: White, legless grubs found in burrows in the soil. Larvae feed on cicadas that have been paralyzed and placed in burrows by adult wasps.

Adults: Look like oversized yellow jackets. They are up to 1 1/2 inches long, and have a black and yellow striped abdomen, rusty colored head and thorax, and yellowish wings.

Distribution: East of the Rockies.

Damage symptoms: Cicada killers do not feed on turf, but their burrows, and the presence of the large (though not aggressive) wasps can be a nuisance. Cicada killers usually nest in areas of sparse vegetation and in sandy soils such as golf course bunkers. Clusters of burrows are common.

Earwigs

Eggs: Laid in clusters in the soil.

Nymphs: Similar to adults, but have thinner pincers (cerci) and no wings.

Adults: Dark brown to black; they have a pair of pincers at the tip of the abdomen. Wings are short and don't cover the entire abdomen. They grow up to 1 inch long.

Distribution: Different species are found in different regions of the U.S.

Damage symptoms: Earwigs are both beneficial and a pest. They feed on aphids, mites, and insect eggs; but occasionally they also feed on seedlings and flowers. Some earwigs will burrow into the soil and create soil "pushup," which is disruptive on putting greens.

European earwig, Forficula auricularia, adult *David Cappaert*

Ground beetles

Ground beetle larva *David Shetlar*

Big headed ground beetle, Scarites subterraneus *David Cappaert*

Calosoma spp.
Emilie Bess

Other predatory beetles

Rove beetle larva *David Shetlar*

Rove beetle adult *David Shetlar*

Firefly larva *Gerald J. Lenhard*

Most ground beetle adults and larvae are predators that feed on other insects and invertebrates. Some adults and larvae feed on plant seeds. They typically hunt at night.

The larvae and adults of the rove and soldier beetles, as well as firefly larvae (and adults of some species), are carnivorous. They feed on insects and other invertebrates.

Solider beetle larva
David Shetlar

Parasitoids

David Shetlar

Blue-winged wasp, Scolia dubia

Parasitoids parasitize other insects by laying their eggs in or on their host. The eggs hatch and the larvae feed on the host, usually resulting in death to the host. Most parasitoids species are wasps. Some fly and beetle species are also parasitoids.

Scott Bauer

Braconid wasp, Aleiodes indiscretus

David Shetlar

Braconid pupae on fall armyworm

Parasitoids

Roger Ryan

Ichneumonid wasp parasitizing a moth pupa

Parasitized armyworm with tachinid eggs

Robert J. Bauernfeind

Tiphiid adult

David Shetlar

David Shetlar

Tiphiid larva on white grub,

Fungi

David Shetlar

Green muscardine disease, Metarhizium anisopliae

Louis Tedders

White muscardine disease, Beauveria bassiana

Brian Little

White muscardine disease, Beauveria bassiana

Green muscardine, *Metarhizium anisopliae*, and white muscardine, *Beauveria bassiana*, are naturally occurring fungi that kill insects. Once the fungal spores come in contact with a host, they germinate and enter the host. The fungus acts like a parasite by multiplying rapidly within the host and killing it within a few days. They are very effective biological control agents.

Entomopathogenic nematodes

David Shetlar

White grub infected with ***Heterohabditis*** spp.

Jonathan D. Eisenback

Female Heterorhabditis bacteriophora and many second-stage juveniles.

Entomopathogenic nematodes are roundworms that are parasites of insects. They naturally occur in the soil and can be an effective biological control agent. The infection begins when a juvenile penetrates an insect host. It grows and reproduces inside the host, usually causing mortality within 48 hours after infection.

Peggy Greb

Wax moth larva infected with Heterorhabditis bacteriophora

Worms and slugs

Joseph Berger

Common earthworm, Lumbricus terrestris

Gary Bernon

Dusky slug, Arion subfuscus

Earthworms are considered beneficial for the soil. They help aerate and mix the soil, which aids in nutrient cycling.

Slugs can be a pest of turfgrass. They feed on seeds, seedlings, and leaves. A slime trail can indicate the presence of slugs.

Centipedes and millipedes

Millipede *Joseph Obrien*

David Shetlar

Stone centipede, Lithobius spp.

Tom Murray

Garden symphylan, Scutigerella immaculate

Millipedes have two pairs of legs per body segment. They are herbivores and can be a minor nuisance pest because they may feed on seedlings.

Centipedes have one pair of legs per body segment. They are predators and eat insects, worms, and other centipedes.

Garden symphylans resemble centipedes. They are an occasional pest of turf that can be destructive. They feed on root hairs of plants, causing stunted growth. They reach about 1/4 inch in length and are usually white.

Virginia Cooperative Extension

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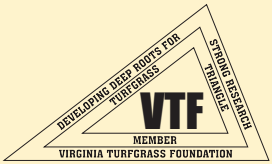

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