

INSECT IDENTIFICATION GUIDE

Scouting for pests

Managers who are skillful at differentiating causes of turf damage should use those skills in a structured format known as pest scouting to provide early, site and pest specific data for making management decisions that are appropriate, accurate, and require the minimum input of material and labor needed to accomplish the goal.

Pest scouting should be done using a defined system on a regular basis by designated personnel.

For some managers, pest scouting can be a formalized structure that acts as the foundation for the use of data intensive Integrated Pest Management (IPM) strategies, while for others, scouting can be used as a viable alternative to traditional preventive pesticide applications based on regional or historic factors.

Either way, pest scouting should be done using a defined system on a regular basis by designated personnel. How the process is established is up to the individual preferences of the manager involved, but any successful scouting must include the following to be effective:

- ▶ accurate identification of pests involved;
- ▶ some means of quantifying numbers of pests found;
- ▶ some way of locating areas of pest involvement.

How these principles are applied for each pest species involved will vary. Some will require the use of light traps, sweep nets, hand lens, hand trowels, sod lifter, cup cutter, good observational powers, scouting during defined periods or on a weekly or biweekly basis, soap or insecticidal flushes, or written or graphed results. All three principles are required to provide managers with a consistent foundation to make the best control decision for their site, their site usage, their management style and, not the least, their operating budget.

Tips for accurate insect identification

Historically, when broad-spectrum, season-long



Knowing which species of insect is present and how that insect's biology relates to the grass species is critical for safe use of control materials.

control materials where available, knowing the species of insect involved in turf damage and how the insect's life cycle facilitated their control was not particularly important, since the nature and toxicity of the materials used blurred those distinctions. Today, knowing which species of insect is present and how that insect's biology relates to the grass species managed and the sites' usage is critical for the safe use of control materials in the current climate of increased environmental awareness and responsibility.

Accurate field identification of an insect species requires the acquisition of specimens; either the immature (larval) or the adult stage, or both. In many cases, several specimens are needed for an accurate identification. Regional or local land-grant universities have cooperative extension services or entomology departments that can help with identification. If you plan to use outside experts, proper preservation of samples is very important. Store collected samples using either shellac thinner or rubbing alcohol as a preservative solution.

Do not use just the visual examples provided in this guide as the sole means of insect identification. The more closely the other factors described in this guide relate to your site, its environment, and the known species distribution, the more accurate will be your insect pest identification.

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MACH 2 Turf Insecticide is a new, unique tool in the professional turf and grounds managers' ongoing challenge to successfully manage insect pests.

Unlike most of the currently available turf insect management products, which are characterized by high toxicity, MACH 2 belongs to a new class of chemistry called the diacylhydrazines that offer low toxicity and high efficacy. This new class displays excellent control of grubs, sod webworms, cutworms, and armyworms.

How MACH 2 works

MACH 2 belongs to a new class of chemi-

cal compounds called molt accelerating compounds which interfere with the normal molting process of targeted pests. It targets the insect's own body chemistry in a unique and highly effective way. MACH 2 mimics hormones that cause the insect to molt prematurely, disrupting the natural metamorphosis process. This causes the target insect to stop feeding shortly after it has been ingested. Later, the insect dies beneath the turfgrass surface.

Although death may take up to three weeks, the treated insect will do no further damage.

MACH 2 offers applicators increased flexibility

MACH 2 Turf Insecticides' long residual combined with its systemic action offer applicators a highly effective control material with an expanded window of application.

MACH 2 can be applied any time from before eggs are deposited through the 1 - 2 instar growth stage of grubs and still provide 90% + control. University tests have shown that both the sprayable formulation (2SC) and the granular formulation (1.5G) are equally effective whether they are watered in immediately or not. This tremendous flexibility allows applicators to schedule treatments at times when conditions are favorable or when workloads permit and be assured of the same high levels of targeted insect control, whether or not rainfall is in the forecast.

MACH 2 Effect of Application Timing on Performance

% CONTROL

Treatment	Pre-Egg	Egg Lay to 1 Instar	1-2 Instar
MACH 2 (2SC)	100	99	93

3 Trials: OH, MA, GA (1995) Japanese Beetle

cal compounds called molt accelerating compounds which interfere with the normal molting process of targeted pests. It targets the insect's own body chemistry in a unique and highly effective way. MACH 2 mimics hormones that cause the insect to molt prematurely, disrupting the natural metamorphosis

SURFACE FEEDERS

BLACK CUTWORM (BCW)

aka: Greasy cutworm

scientific name: *Agrotis ipsilon*

Similar species: Variegated cutworm,
Bronzed cutworm

FIELD KEYS

Hosts: bentgrass, ryegrass, and most other grasses

Site symptoms: Small roughly circular areas of eaten turf often surrounding an aeration hole or tunnel or cavity dug in soil or thatch.

Plant symptoms: Larvae eat plants at or near the soil line.

Site keys: A problem pest on golf greens and tees and other highly maintained bentgrass locations.

SPECIMEN ID

Larvae range from ¼ inch translucent first instars to large, 2-inch long, dull gray to black striped caterpillars that will roll into a coil when disturbed. Adults are gray moths with black wing markings and a 1½ inch wing span.

SCOUTING TIPS

Look for small circular or depressed areas around aeration holes or shallow dug tunnels in soil or thatch. Mature larvae are night feeders that can be seen with a light or can be dislodged from their holes or tunnels during daylight with a soap or insecticidal flush. BCWs can produce from 2 to 6 generations per year depending on the region. Look for active larger larvae feeding on turf at night. Monitor larval populations with flushes and be aware that BCW is a pest on many agriculture crops so reinfestation can occur rapidly. Look for adult females feeding on neighboring flowering shrubs or trees at night.

CONTROL STRATEGIES

Cultural: If BCWs are using aeration holes as hiding places, delay aeration practices to less favorable periods after active larval growth stages or try backfilling holes with topdressing.

Chemical: In most areas, where BCWs are a consistent problem in turf, consider beginning control applications when concentrations of larger immatures reach one per three square feet. Use a soap flush to monitor for larvae every week. Treat with MACH 2 as soon as several small larvae are found. On golf courses, also treat 15-30 feet around greens and tees to prevent reinvasion. Resample in 40-50 days.



LARVA



ADULT

SPECIES ACTIVITY, BIOLOGY & LIFE CYCLE



Growth stages: egg - caterpillar (several instars)* - pupa - adult
* - treatable stages

Life cycle: 1 year cycle (multiple generations)

Sequence: larva - adult - egg - pupa - adult - egg - larva

DISTRIBUTION



SURFACE FEEDERS

BLUEGRASS SOD WEBWORM (BSWW)

LARGER SOD WEBWORM (LSWW)

aka: Lawn Moth, Snout Moth

scientific names: *Parapediasia teterrella*,
Pediasia trisecta

Similar species: Additional members of the cool season SWW species - Corn Root Sod Webworm, Sliver Striped Sod Webworm, Stripped Sod Webworm, Vagabond Sod Webworm



LARVA



ADULT

FIELD KEYS

Hosts: Bluegrass, fine fescues, bentgrass, ryegrass

Site symptoms: Small areas of thinning turf turn off color and increase in size daily. These smaller patches coalesce into larger areas of thinning, brown turf. Birds feed on affected areas leaving peck holes and small gray to tan moths can be seen flying low over turf at dusk.

Plant symptoms: Above-ground plant structures show damage from insect feeding activities and frass or green fecal pellets can be found near the centers of smaller damaged areas.

Site keys: Sunny to transitionally shaded well-managed sites that tend to be on the dry side.

SPECIMEN ID

Immatures are gray, green, or tan segmented worms with black spots on their bodies, tan to black heads, and range from 1/2 to 1-1/4 inch long when fully grown. Adults are small gray to tan 1/2 to 1-inch long moths with 3/8 to 1-3/8 inch wing spans and have readily visible snoutlike projections from their heads.

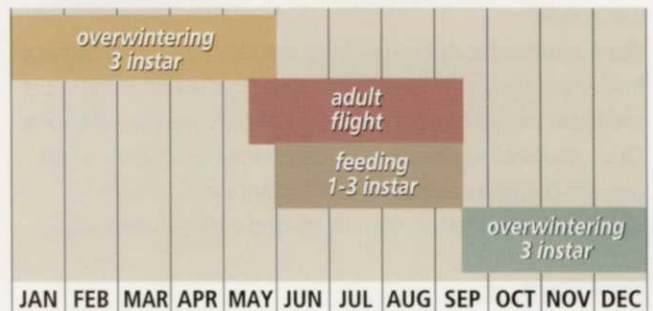
SCOUTING TIPS

Although the presence of adults flying low in a characteristic zigzag pattern when disturbed or at dusk is definitive, it may not correlate to treatable larval populations. Once adults have been seen, monitor larval populations with soap or insecticidal flushes beginning about two weeks after peak adult activity. Turf can vary widely in its ability to tolerate higher populations of SWWs, but heat or moisture-stressed sites almost always suffer greater damage. Since grasses are SWW's primary food source and their life cycles are quite short, small populations can rapidly increase over several generations to cause substantial damage.

CONTROL STRATEGIES

Cultural: Manage turf for vigorous growth. Overseed or renovate damaged areas with high-endophyte ryegrass or tall fescue varieties. Small adult populations late in the year usually do not require treatment, but should be monitored the following spring.

SPECIES ACTIVITY, BIOLOGY & LIFE CYCLE



Growth stages: egg - larva (up to ten instars)* - pupa - adult

* - treatable stages

Life cycle: 1 year life cycle (multiple generations)

Sequence: larva - pupa - adult - egg - larva

DISTRIBUTION



Chemical: Where scouting is ongoing, correlate larval population data with observed damage to develop site specific treatment thresholds. If this information is not available, consider control applications once damage has been observed or when populations reach 2-15 larvae per square yard (9 sq ft).

SURFACE FEEDERS

TROPICAL SOD WEBWORM (TSWW)

scientific name: *Herpetogramma phaeopteralis*

Similar species: Subterranean Sod Webworm

FIELD KEYS

Hosts: bermudagrass, St. Augustine, Kikuyu-grass, centipedegrass, zoysiagrass, bahiagrass

Site symptoms: Small areas of thinning turf turn off color and increase in size daily. These smaller, unkempt-looking patches coalesce into larger areas of thinning brown turf. Birds feed on affected areas leaving peck holes and small moths can be seen flying low over turf at dusk.

Plant symptoms: Above-ground plant structure shows damage from insect feeding activities that range from skeletonized upper and lower leaf surfaces to complete leaf consumption with some silken webbing. At pupation, unlike cool-season species, larvae can spin cocoons made of webbing, plant parts, and soil.

Site keys: Sunny to transitionally shaded well-managed sites.

SPECIMEN ID

Immatures are cream-colored segmented worms with yellow brown heads that range from 1/8 inch long at hatch to 3/8 inch long when fully grown. Adults are dusky brown moths with 3/4 inch wing spans and a wedge or arrowhead-shaped appearance at rest.

SCOUTING TIPS

Like other SWW species the presence of adults flying at dusk is definitive, it may not correlate to treatable larval populations. Adult TSWWs feed on nectar and other sweet food sources, so they also can be seen in flowering or fruit bearing shrubs or trees near infested sites. Once adults have been seen, monitor larval populations with soap or insecticidal flushes beginning about two weeks after peak adult activity. Turf can vary widely in its ability to tolerate higher populations of TSWW, but sites with consistently warm temperatures and high humidity or rainfall frequently suffer greater feeding damage. Larval damage at infested sites can be similar to armyworm damage - where actively feeding high larval populations can literally mow down grass.

CONTROL STRATEGIES

Cultural: Manage turf for vigorous growth. Overseed or renovate damaged areas with high-endophyte regionally-appropriate grass species or varieties that show tolerance, like common bermudagrass. Because TSWW is a true warm season species and because it has a relatively short life cycle, once it has been identified at a site, managers should maintain a consistent scouting regimen.



LARVA



ADULT

SPECIES ACTIVITY, BIOLOGY & LIFE CYCLE



Growth stages: egg - larva (up to eight instars)* - pupa - adult

* - treatable stages

Life cycle: 1 year life cycle (multiple generations)

Sequence: larva - pupa - adult - egg - larva

DISTRIBUTION



Chemical: Where scouting is ongoing, correlate larval population data with observed damage to develop site specific treatment thresholds. If this information is not available, consider control applications once damage has been observed.

SURFACE/SOIL FEEDERS

ANNUAL BLUEGRASS WEEVIL (ABW)

aka: Hyperodes weevil

scientific name: *Listronotus anthracinus*

FIELD KEYS

Hosts: Annual bluegrass

Site symptoms: Wilted turf at short-cut, highly-managed, *Poa annua* sites that turn yellow to brown in small to large areas from May to August.

Plant symptoms: Grubs hatch from eggs laid in holes in leaf bases. They enter and feed on the stem. When sawdust-like frass packs the inside of the leaf stems, grubs exit to enter new stems. Older grubs exit to feed at crowns. Adult feeding produces holes in leaves or ragged leaf edges.

Site keys: Golf courses and recreational sites where *Poa annua* is intensely managed at low cutting heights - tees, greens, fairways, tennis, and lawn bowling facilities

SPECIMEN ID

Immatures are small plump legless white grubs with light brown heads. Grubs can grow to 1/2 inch. Adults are light brown to black, 1/2 inch beetles with a beak-like snout that has two elbowed antennae near its end.

SCOUTING TIPS

Over-wintering beetles become active in early to mid-spring, look for early signs of feeding in *Poa annua* turf areas near trees/shrubs with litter at base. Affected plant leaves separate easily from crown. Leaves with stems are hollowed out and frequently filled with frass. Damage may appear as early as mid-May to as late as early August. Adult feeding and egg-laying produces small holes in stems and at leaf edges. Adults can be captured with a sweep net in evening or seen with a light while crawling on turf at night. Soap or insecticidal flushes can be used to dislodge adults from turf during daylight hours. Look for over-wintering adults in litter/mulch under trees/shrubs near infestation sites.

CONTROL STRATEGIES

Cultural: Since ABW is only a pest on *Poa annua*, either manage the site to favor existing bentgrass, renovate, or sod heavily infested areas with bentgrass varieties suited for the site. Where renovation/sodding is not an option, remove litter/mulch from base of adjacent trees/shrubs.

Chemical: Scout for adults at over-wintering sites in late winter to very early spring and at vulnerable *Poa annua* sites in early to mid-spring. If chemical control is warranted both the adults and the grubs can be treated, but at different times - adults in early to mid-spring and mid to late summer with grubs late spring to mid-summer.

Note: Although MACH 2 does not control adults, it can be applied at the time of adult migration and the residual material will affect the later larvae.



GRUB



ADULT

SPECIES ACTIVITY, BIOLOGY & LIFE CYCLE



Growth stages: egg - grub (five instars)* - pupa - adult*

* - treatable stages

Life cycle: 1 year cycle

Sequence: adult - egg - grub - pupa - adult

DISTRIBUTION



■ Indigenous states

SURFACE/SOIL FEEDERS

BILLBUG

aka: Bluegrass billbug

scientific name: *Sphenophorus parvulus*

Similar species: Hunting billbug

FIELD KEYS

Hosts: bluegrass, ryegrass, fescues

Site symptoms: Wilted turf that doesn't respond to water, turns brown in spots in June through August near walks, drives, or near trees or shrubs.

Plant symptoms: Grubs hatch inside leaf stems where they feed. Older grubs exit stems to feed at crowns. Sawdust-like frass can be found at base of plants.

Site keys: Sunny locations near trees/shrubs with litter/mulch at base and areas with reflected heat - drives, walks, or buildings.

SPECIMEN ID

Immatures are small, legless, white grubs with brown heads that can reach ½ inch. Adults are narrow football-shaped brown to black, ¼ inch beetles with a downward-pointing snout that has two angled antennae near its base.

SCOUTING TIPS

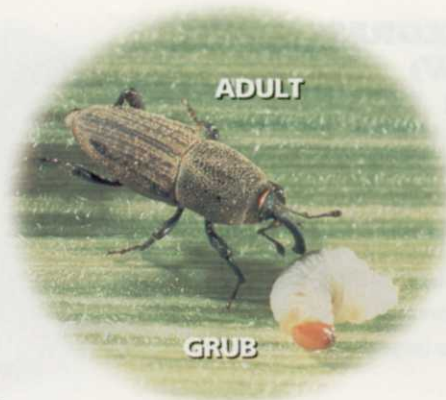
Adults are often seen crawling on warm walks or drives in early to mid-spring. Look for damaged areas near trees/shrubs with litter/mulch at base and in areas of reflected heat - walks, drives, and buildings. Damaged stems at these locations will easily pull away from crowns and may show exit holes and hollowed stems. Look for frass at the base of damaged plants on soil or in top of thatch. In off-season look for over-wintering adults in litter/mulch at the base of trees/shrubs. Use soap or insecticidal flushes to dislodge adults in season on turf.

CONTROL STRATEGIES

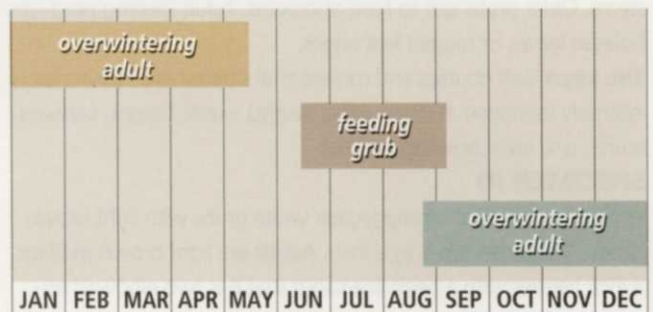
Cultural: Replant or overseed with resistant species/varieties. In bluegrass stands use fine leafed bluegrass varieties if disease is not a problem. Where disease is a problem, use high-endophyte ryegrass varieties instead. Remove litter or mulch from over-wintering locations.

Chemical: Scout for adults at over-wintering sites in late winter-early spring and vulnerable turf site areas in early to mid-spring paying attention to adjacent flat areas that show heat buildup early in the year. If chemical control is necessary, both the grub and the adult stages can be treated but at different times - adults before soil surface temperatures reach 75°F and grubs when soil surface temperatures exceed 75°F.

Note: MACH 2 is only effective against the grub stage, but because of its residual activity, MACH 2 can be applied at the adult target time.



SPECIES ACTIVITY, BIOLOGY & LIFE CYCLE



Growth stages: egg - grub (several instars)* - pupa - adults*

* - treatable stages

Life cycle: 1 year cycle

Sequence: adult - egg - grub - pupa - adult

DISTRIBUTION



**PREVENT
GRUBS.**

**STOP THEM IN
THEIR TRACKS.**

**OR MAKE SURE
IT'S NOT EVEN
AN ISSUE.**