

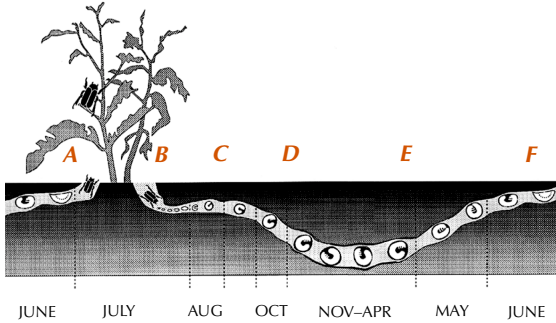
A GRUB'S LIFE: EGG TO BEETLE

Knowing the life cycle of grubs is the key to determining whether you have a problem, what to do about it, and when to do it. A white grub is the immature (larval) form of a scarab beetle, such as a European chafer or Japanese beetle.



European chafer beetle (adult)

Grubs live in the soil, feeding on plant roots, so you may not be aware of them until you see damage. By considering a grub's life cycle, you can anticipate problems before your lawn is ruined. The biology of the Japanese beetle is typical of most grubs encountered in New York State and is explained below.



Life cycle of Japanese beetle. Letters correspond to text below.

A. In late June and early July, Japanese beetle adults emerge from the ground and begin to search for food and mates. The adults can fly as far as a mile and feed on a multitude of plants; their favorites include roses, grapes, and linden trees. Other scarab beetles may go unnoticed at this time because they are not attacking ornamental plants.



Adult Japanese beetle

B. In July, female beetles spend 2–3 weeks laying up to 60 eggs in the soil. Depending on soil moisture and temperature, eggs hatch about 2 weeks later. These first-stage (“first-instar”) grubs feed on grass roots for most of August. The grubs are small, feeding close to the surface, and vulnerable to biological and chemical insecticides at this time. Control high populations at this stage, before feeding on turf roots is noticeable.



Eggs and newly hatched grubs



Grub larva, third stage (instar)

C. From late August through October (depending on your climate), grubs molt into a second and then a third stage. As they grow, grubs consume more roots. Damaged turf often appears now.

D. As temperatures drop in autumn, grubs move down in the soil. They overwinter as third-instar grubs below the frost line.

E. In the spring, they move up in the soil to feed on roots for a very short time. (Most of the lawn damage seen in the spring is a result of *fall* feeding, not spring feeding.)

F. In late spring, grubs stop feeding and turn into pupae that are resistant to insecticides. In late June or early July, beetles emerge from the pupae and crawl out of the soil, completing the cycle.



Pupa (becoming an adult)

TREAT IN THE FALL—IF AT ALL

You might be tempted to treat grubs in the spring, when you see last fall's damage—but most spring treatments are a waste of time and money. The grubs have already damaged your lawn and are fairly resistant to insecticides at this time. Furthermore, even if you could eradicate them, summer will bring a new batch of beetles to your lawn.

Sample for grubs in the late summer, as described in this brochure. If you decide to treat, do so in the late summer or early fall, when grubs are susceptible to both biological and chemical insecticides and haven't had a chance to cause severe damage. Treat only the areas where grub populations exceed the suggested thresholds, in areas of your lawn that are aesthetically important.

Beneficial nematodes (microscopic worms) of the species *Heterorhabditis bacteriophora* are a nonchemical product that can be used on young grubs. A variety of chemical insecticides may also be applied. Selection depends on the species and life stage of grubs present. Products containing imidacloprid are unique in that you must apply them *before* egg-laying and should therefore base treatment decisions on past history of grub infestation. Consult product labels and your local Cornell Cooperative Extension office for legal and recommended practices.

The New York State IPM Program



We encourage people to adopt a sustainable approach to managing pests, using methods that minimize environmental, economic, and health risks. For information: NYS Integrated Pest Management Program, NYSAES, Geneva, NY 14456; 1.800.635.8356;

<www.nysipm.cornell.edu>. For additional copies of this brochure (IPM No. 412), contact your local Cornell Cooperative Extension office or the NYS IPM Program.

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Grubs in your lawn?

a guide for lawn care professionals and homeowners



Cooperative Extension

THE GRUB-DAMAGED LAWN

Severe grub damage in a lawn appears as large, irregular sections of brown turf that detach from the soil without effort. Unlike turf damaged by drought or excessive fertilizer, the turf peels away like a carpet being rolled up.

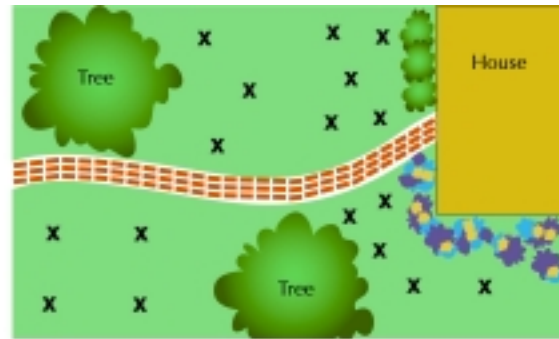
For most of the year, however, grubs are out of sight and out of mind. They feed on grass roots in your lawn and are usually noticed only when dead and damaged areas appear.

FIND YOUR PROBLEM AREAS

You can prevent losses by locating high grub populations before they cause damage.

When to sample

Seek out grubs in early August on Long Island and in mid-August upstate. Sampling early in a grub's life cycle means that you'll catch grubs while they are small and less capable of seriously damaging your lawn. Early sampling, ("scouting") while your lawn looks healthy increases your chances of being effective and decreases the possibility that skunks and other animals will tunnel your lawn, feeding on grubs.



Draw a simple map and mark sampling sites.

Where to sample

Begin by sketching a simple map of your property, such as the one shown here. Now think of areas that are important to you from a visual or aesthetic standpoint. The front lawn, where

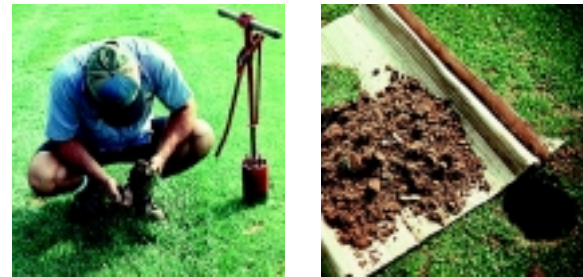
visitors enter? Near the back patio? Mark these high-priority areas with X's that translate to about 10 feet apart. These will be your sampling sites. Consider areas with a history of grub damage and mark these areas, too. Mark low-priority areas with X's every 20–30 feet. You probably won't need to sample or treat remaining areas.

Mount your map on a clipboard, grab a full watering can, a piece of cardboard, and either a bulb planter or a shovel, and go to one of the sampling sites marked on your map.

How to sample

Method 1: bulb planter or cup cutter

Use a bulb planter or a cup cutter to remove a core of soil and grass. Examine the contents on a



Sampling with the cup-cutter (bulb-planter) method.

piece of cardboard. The area is approximately 1/10 of a square foot of sod. Jot down the number of grubs on your map, then multiply it by 10 for the number of grubs per square foot. Replace the soil and sod, and water thoroughly.

Method 2: shovel

If you have time to take only a few samples, try this method. Using a garden shovel or spade, cut three sides of a 12-inch square. Grab a hold of the open edges and peel back the turf like a carpet, towards the attached side. Look for c-shaped grubs on the newly-exposed soil and under the sod mat. Count them and make a note on your map. Replace the sod, water thoroughly, then move to your next sampling site.

Scouting for grubs helps you decide whether to treat—but first, watch for natural controls.

HOW NATURE FIGHTS GRUBS

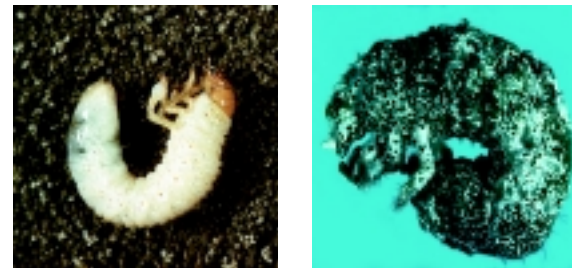
Natural enemies kill grubs

In the soil, microscopic worms known as nematodes live and breed. Some nematodes infect and kill grubs, thereby reducing populations. You can also purchase and release nematodes that will kill grubs, if used properly.



Parasitic nematodes inside a grub.

Other natural diseases and parasites occur in the soil. If you see sick or dying grubs, as pictured here, it may be best to let nature do its work.



Left: a grub infected with milky spore disease. Right: a grub infected with *Metarhizium*, a fungus.

KNOW YOUR GRUBS

White grubs are immature scarab beetles (for example, European chafers, Japanese beetles, and Oriental beetles). Although all grubs cause similar damage, the treatment you choose should correspond to the species. Homeowners can have their grubs identified at a local Cornell Cooperative Extension (CCE) office. Lawn care professionals should learn how to identify grubs and can consult with CCE staff for training. Knowing the species helps you pinpoint effective strategies that will work in your climate.

GOT GRUBS? COUNT TO 10

How many grubs are too many? Research in upstate New York has shown that only 20 percent of home lawns and golf course fairways require treatment. Here's a guide to treatment thresholds for European chafers, Japanese beetles, and Oriental beetles, the most common grubs in home lawns in New York State. Numbers are based on grubs/sq.ft.

0-5 grubs: rest easy

Fewer than five grubs per square foot is a low population. You don't need to treat.

6-9 grubs: think about your lawn

Is your grass dense, with a healthy, robust root system? If so, it can probably withstand grub populations of 6-8 per square foot, or more. On the other hand, if animals such as skunks, raccoons, birds, and moles are digging up the turf to feed on the grubs and this bothers you, consider treating highly populated areas.

10 or more: they may cause damage

Ten or more grubs per square foot will likely cause damage, especially if the lawn is otherwise stressed. In most circumstances, you'd be justified treating where populations are this high. Several weeks after treating, sample in a few locations to determine whether treatments were effective.



A sampling of grubs found when scouting. Research in New York State has shown that only 20 percent of home lawns and golf course fairways require treatment.

Compensating for grub damage

Many characteristics of a lawn determine how well grass grows. You can, however, help your lawn to compensate for loss of roots by watering it regularly and reseeding damaged areas.