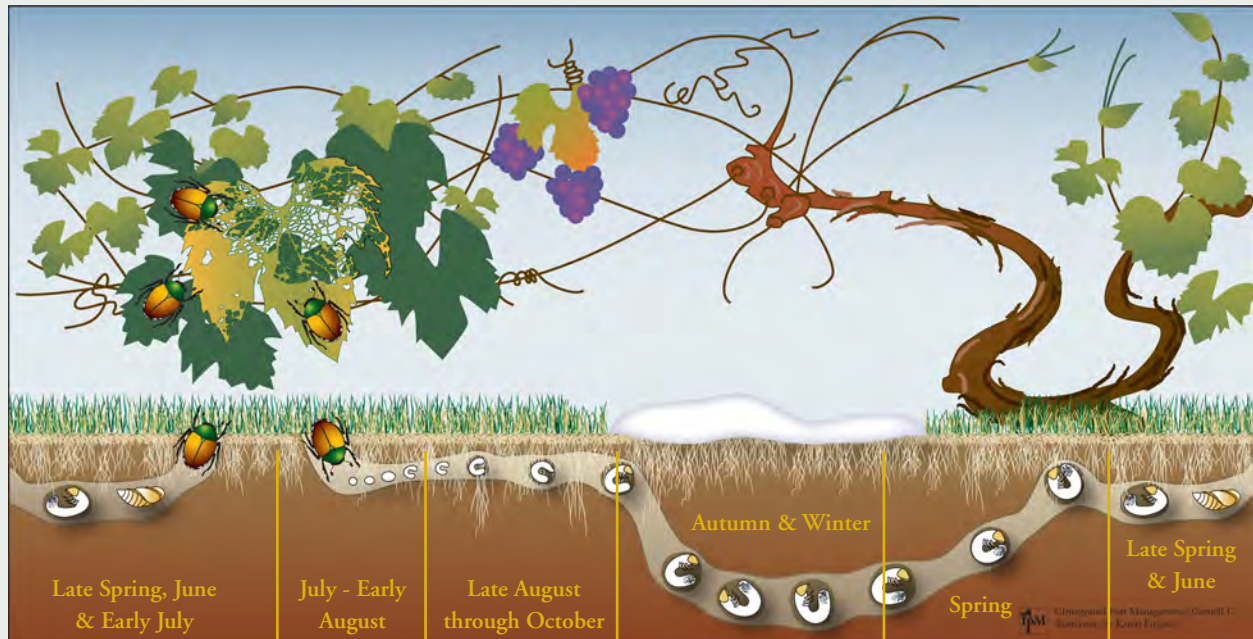


## A Grub's Life: Egg to Beetle

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. 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.



**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.

**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. If possible, control high populations at this stage, before feeding on turf roots is noticeable.

**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.

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

**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.

**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.

## Should you treat?

If your grub counts exceed the damage thresholds, you might want to consider treating for them. Your decisions will depend on **when** you find the grubs. If treating, target only the areas where grub populations exceed the suggested thresholds, or where you've had a bad history of grubs.

**In August:** The grubs are still small and have not caused a lot of damage yet, and are more susceptible to insecticides. In New York State you could use beneficial nematodes, imidacloprid (Merit), or trichlorfon (Dylox)—these are listed from least to most toxic. Note that on Long Island, imidacloprid may only be used if applied by a certified pesticide applicator. In other states, other products such as clothianidin (Arena) and thiamethoxam (Meridian) may also be available, check with your local cooperative extension office.

**In September:** It's too late to use most products. Beneficial nematodes or trichlorfon (Dylox) may be used.

**In October:** It's too late, though trichlorfon (Dylox) may still be effective in the first half of the month.

**Late October-July:** It's too late to treat last year's population—attacking them is a waste of time and money. If you've had a history of high grub populations and/or damage on your lawn, you may want to protect your lawn for the upcoming generation by applying one of the newer, softer pesticides that are best applied preventatively. These can be applied most any time from May-July, and for New Yorkers include imidacloprid (Merit) and chlorantraniliprole (Acelepryn). Long Islanders must note that imidacloprid may only be applied by a certified pesticide applicator and they may not use chlorantraniliprole. In other states, clothianidin (Arena) and thiamethoxam (Meridian) may also be available. Check with your local cooperative extension office.

**Disclaimer:** Please read pesticide labels prior to use. The information contained here is not a substitute for a pesticide label. Trade names used herein are for convenience only; no endorsement of products is intended, nor is criticism of unnamed products implied. Laws and labels change. It is your responsibility to use pesticides legally.

Always consult with your local Cooperative Extension office for legal and recommended practices and products.  
[www.cce.cornell.edu/learnAbout/Pages/Local\\_Offices.aspx](http://www.cce.cornell.edu/learnAbout/Pages/Local_Offices.aspx)

This brochure is published by the New York State Integrated Pest Management Program (NYS IPM), which is funded through Cornell Univ., Cornell Cooperative Extension, the New York State Dept. of Agriculture and Markets, the New York State Dept. of Environmental Conservation, and USDA-NIFA. Revised by J. Grant, NYS IPM, from original text by J. Lamboy, J. Grant, C. Koplinka-Loehr, and M. Haining, NYS IPM; and M. Villani, Cornell University. Illustrations and design by K. English, NYS IPM. Unless otherwise noted, photographs by J. Ogradnick, NYSAES Photo. Cornell Cooperative Extension provides equal program and employment opportunities. Printed on paper containing recycled content. NYS IPM Publication No. 412. 2M DPS 8/12



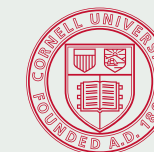
[www.nysipm.cornell.edu/publications/grubs](http://www.nysipm.cornell.edu/publications/grubs)

# GRUBS IN YOUR LAWN?



a guide for lawn care  
professionals and  
homeowners

NEW YORK STATE  
**IPM**  
Integrated Pest Management  
PROGRAM



Cornell University  
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, because most of the roots are gone.

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.

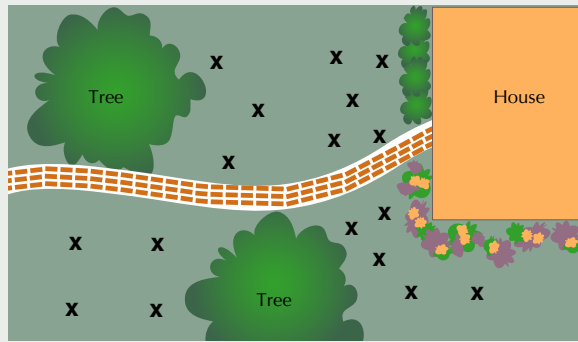
### When to sample

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.

### 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 Xs 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 Xs 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 cup cutter, bulb planter or a shovel, and go to one of the sampling sites marked on your map.



Draw a simple map and mark sampling sites.

### How to sample

#### Method 1: bulb planter or cup cutter

Use a bulb planter or a cup cutter (golf course tool) to remove a core of soil and grass. Examine the contents on a 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, and then move to your next sampling site. Scouting for grubs helps you decide whether to treat—but first, watch for natural controls.



Sampling with the cup-cutter (bulb-planter) method. Photo: J. Grant, NYSIPM



## 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.



Eggs and newly hatched grubs



Grub larva, third stage (instar)



Pupa (becoming an adult)



Adult Oriental beetle. Photo: M. Reding & B. Anderson, USDA Agricultural Research Service, Bugwood.org



Adult Japanese beetle. Photo: USDA ARS Photo Unit, USDA Ag. Research Service, Bugwood.org



Adult European chafer beetle

## 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

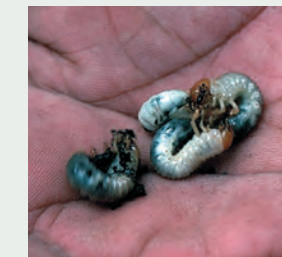
Fewer than five grubs per square foot is a low population. You don't need to treat.

### 6-9 grubs: think about your lawn

Is your grass dense, with a healthy, robust root system, and can you irrigate? 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, providing good fertility, and reseeding damaged areas.

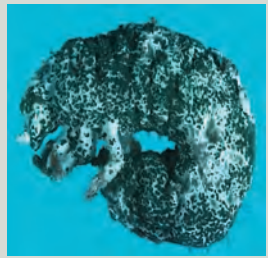
Seeding is most successful in the fall. However, grubs will eat seed too. Therefore, if grub numbers are high, you can delay seeding until spring or do an additional seeding in thin areas in the spring.

## 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. 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.



A grub infected with milky spore disease.



A grub infected with *Metarhizium*, a fungus.



Parasitic nematodes inside a grub.