

# Science of Life Explorations



## IPM and the Decision Making Process

### Decision #1 Lawn Grubs

Integrated Pest Management is a way of making good decisions about pest problems. This lesson will review some of what you've learned about IPM and pests.

Pests can be insects, weeds, diseases and other things that are causing a problem because they are where they are not wanted. IPM uses six steps to decide the best way to handle a pest situation.

This activity will show you how to use the 6 steps of IPM to find out if you have a GRUB problem in your lawn.

Grubs are the larvae of some beetles called SCARAB beetles, such as the Japanese beetle, the june bug, and chafers. Beetles are one of the largest families of insects.

Review Questions:

What are the six steps of IPM?

Why should we properly identify a pest before we treat it?

Why is it important to know the life cycle of the pest?

As you practice using the six IPM steps to make a pest treatment decision, you will learn the skill of good decision making. You will be able to use good decision making for other things in your life also.

What is a decision?

Can you learn to make a good decision?

How can learning good decision-making skills help you?

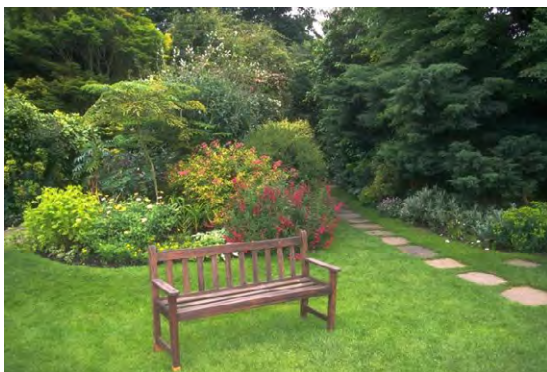
- IPM Step #1 - proper identification (of the situation or pest)
- IPM Step #2 - learn the pest and host biology
- IPM Step #3 - sample the environment for pests
- IPM Step #4 - determine action threshold
- IPM Step #5 - choose treatment tactics
- IPM Step #6 - evaluate results

## Problem #1 - Can IPM improve a home lawn?

Your uncle has a large lawn but he is not happy with it. He just retired and wants a perfect, lush green lawn. He doesn't know much about lawn care and thinks all insects are bad. He's been talking about buying some chemicals to treat the weeds in his lawn and get rid of all the "bugs", although he hasn't actually seen any insects.

*Lawn or TURF? Turf is what we call special grasses that are grown just for the purpose of walking on or playing on.*

*Generally we call sports grass 'turf' and home grass 'lawn'. Because we are talking about your uncle's yard, we will use the word lawn.*



Did you know?

The grass family (Poaceae) includes thousands of species and range in size from small annuals to giant bamboo grown as timber. Grasses provide the majority of plant food for humans and both wild and domesticated animals. Think of all the foods derived from the cereal grains rice, wheat, barley, oats and corn.

Unlike most grasses, turfgrass has been cultivated to tolerate foot traffic (walking on it), specific climates and most importantly, to be cut often. Despite this, turf can become stressed when it is mowed at too low a height, or lacks water during extended dry weather.



Your uncle has seen beautiful, lush, green grass on television and in advertisements. Golf greens and sports fields are professionally managed--with a lot of time and money. To expect that quality in a home lawn is not very practical.

The best way to have a healthy lawn is to understand how grass grows and provide its basic needs. A healthy lawn may not be perfect, but usually, it will not need pesticides.



## IPM Steps for the lawn: Step #1 Proper Identification

Your uncle isn't sure he has an insect problem because he has never really seen any insects in his lawn, and doesn't know which ones are pests and which are not. He does know that he has weeds. Let's use the first IPM step to help him make good lawn care decisions.

Turf insects? The biggest culprit in home lawns is grubs, but it takes a lot of grubs to cause problems. Grubs are the larval stage of certain beetles called SCARAB beetles, Grubs can cause damage to lawns. Does that mean everyone should treat their lawns to rid them of grubs? No.



Eggs and newly hatched grubs of Japanese beetles

The larval stage of a beetle is called a grub. This photo below shows a 'third-INSTAR' larva.



This pupa above will become an adult

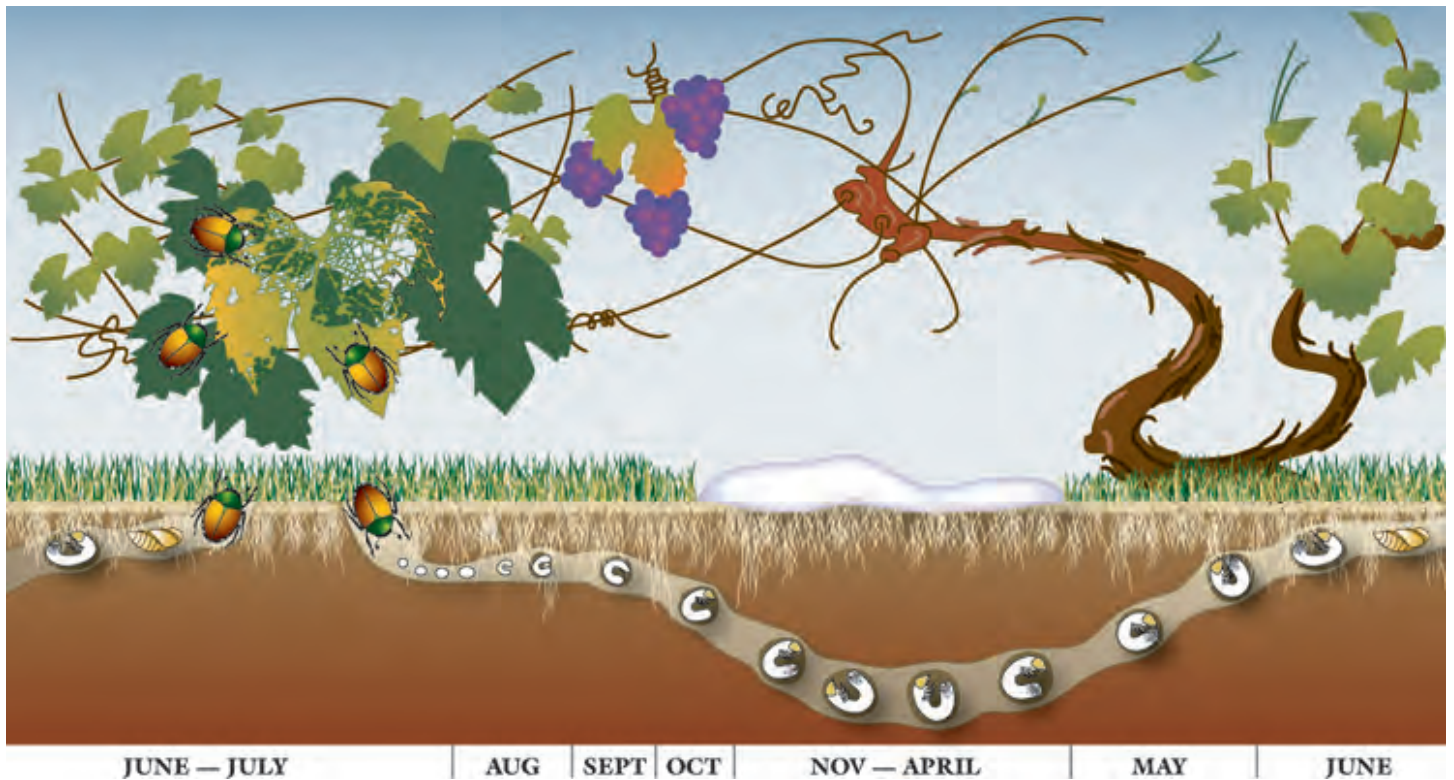
The adult Japanese beetle is a metallic-green and copper color. It can cause a lot of leaf damage to a variety of plants.



## Step #2 Learn pest/host biology

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 and grapes.

In June and July, female beetles spend two-to-three weeks laying up to 60 eggs in the soil. Depending on soil moisture and temperature, eggs hatch about two 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. This is the best time to treat grubs if you are sure they are present and causing damage.



### SCARAB BEETLE life cycle

From late August through October, in New York State, grubs molt into a second and then a third instar. As they grow, grubs consume more roots. With fewer roots, it's hard for affected grass to get enough water. Damaged grass will slowly die off.

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

In the spring, grubs 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 aren't harmed by insecticides. In late June or early July, beetles emerge from the pupae and crawl out of the soil, completing the cycle.

## Step #3 Sample the environment -

You can reduce lawn damage by locating high grub populations before they cause damage if you examine samples of lawn soil. This sampling is referred to as SCOUTING.

When to sample: Seek out grubs in early August. 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. Mark some areas with X's. These will be your sampling sites. Grab a hose or container of water, a piece of cardboard, and a shovel. Go to one of the sampling sites marked on your map and start SAMPLING.

To determine how many grubs you have in your lawn you can use a flat spade to cut back a sample of turf. Peel the turf back like a piece of carpet. Examine the contents on the cardboard. Count the grubs in the top 3 inches of soil. Replace the turf, firm it down and water well.



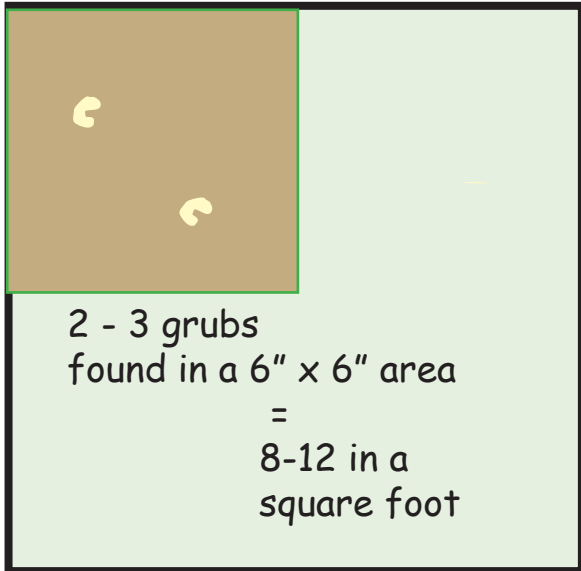


The **THRESHOLD** for treatment of grubs is usually given as a number of grubs found per square foot. If you take a 6" X 6" sample (1/4 of a square foot), you would have to multiply that by four to get the average number of grubs in a square foot. Take multiple samples throughout the lawn area to determine which areas may need treatment.



## Step #4 determine action threshold

How many grubs are too many? Research in upstate New York has shown that only 20 percent of home lawns and golf course fairways actually have enough grubs to worry about. By sampling first, we can avoid unnecessary pesticide use.



0-5 grubs: rest easy: Fewer than five grubs per square foot is a low population. Your lawn should be fine.

6-9 grubs: think about your lawn. Is your grass dense, with a healthy, robust root system? (Is it getting watered by rain or sprinkler?) If so, it can probably withstand grub populations of 6-9 per square foot, or more.

10 or more: Ten or more grubs per square foot will likely cause damage, especially if the lawn is already stressed. An adult may need to apply an insecticide or biological control when populations are this high. (Several weeks after treating, sample in few locations to determine whether treatments were effective.)

*Did you know?*

*Symptoms of grub damage in a lawn appear as large, irregular sections of brown turf that detach from the soil without much effort. Unlike turf damaged by drought or excessive fertilizer, the turf peels away easily, 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 damaged areas appear.*

*Did you know?*

*Sometimes grub damage appears in the spring, but spring is not the time to treat grubs. If you need to treat, do so in late summer, after you sample, when grubs are SUSCEPTIBLE to biological and chemical treatments. If you have grub problems year after year, your yard may need a PREVENTIVE insecticide in July.*

## Step #5 choose one or more treatment tactics

IPM tactics are the ways you can treat a pest problem

1. cultural methods (the way you take care of the plant or area)
2. physical methods (putting up a barrier to keep a pest out)
3. genetic methods (using science to increase pest resistance)
4. biological methods (using natural enemies to reduce pest problems)
5. chemical methods (using pesticides to reduce pests)
6. regulatory methods (following rules that aim to reduce pests)

Here are some tactics to reduce grub pests:

Natural enemies kill grubs! In the soil, microscopic worms known as nematodes live and breed. Some nematodes infect and kill grubs, thereby reducing populations. They can be purchased and are applied with water, as a non-chemical treatment during August to early September (biological tactic).

A natural enemy of Japanese beetle grubs is called Milky spore disease. It can be applied as a powder but is often at work in your soil naturally. If you see sick or dying grubs, it may be best to let nature do its work (biological tactic).

Chemical treatments must be used carefully, only by adults who read the labels, or by professionals (chemical tactic).

Keep your lawn healthy by cutting at 3 inches, fertilizing in the fall, and watering during droughts. This helps to reduce the effect of grub damage (cultural tactic).

*Did you know?  
You can help your lawn compensate for loss of roots by mowing properly, watering during drought and reseeding damaged areas. Mow grass at 3" and use sharpened blades.*

## Step #6 evaluate results

In the case of your uncle's lawn, no insecticide was used because there were no grubs found. This is an example of how IPM reduces pesticide use.

1. Why should we properly identify a pest before we treat it?

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2. Grubs can be found in many lawns. Most lawns do / do not need treatment.

3. The larval stage of a beetle is called a:

grub

maggot

pupa

worm

4. IPM Step #5 is choosing a treatment tactic. Tactics are methods you can use to treat a pest problem. Name one method mentioned in this booklet

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5. Lawn grasses generally grow all year long in our northeastern climate:

true

false

## Voabulary

attractant - a scent, sound or activity which causes an animal, insect or person to come toward the source

colony - the term for the nest or extended 'family' of a group of ants

cultural -relating to the way things commonly are, or in IPM, the way a site or area is taken care of

hazard - something that may cause damage by chance

instar - the periods between molts of larvae

livelihood - the way someone provides an income to pay for living expenses

preventive - taking steps to stop something before it gets to be a problem

sampling - taking deliberate counts or samples of a site or area to find out the population, if any, of a pest

sanitation - the efforts to keep something clean to reduce sickness or pests

scarab beetle - a family of beetles which includes the Japanese beetle and the chafer

scouting - the IPM term for sampling or looking for a pest to determine what it is and how it is affecting the site or area

susceptible - being easily affected or influenced by something; often it is due to being in a weakened state

threshold - the amount of something that can be tolerated; changes are desired when the threshold is passed

turf - a certain kind of grass grown for walking on or playing on; also can mean a top layer of soil containing grass and its roots

Pg 3 Review the 6 IPM steps as you begin. The first scenario students will face is how to improve a home lawn. It is not practical to expect a perfect lawn without a lot of time, money and, often, the use of pesticides. Students will learn that improving how we care for a lawn is a non-chemical way to have a better, healthier lawn.

Pg 4 The grass family is very large and includes grains; only a small portion are the familiar grasses we know as turfgrass.

Pg 5 Advertising sells products by trying to influence the way we think. It is the same for lawn care as it is for clothing, electronics and food. It's true, grubs are turf pests, but they do not cause problems in all lawns and therefore do not require treatment in all lawns. The IPM steps remind us to first identify any possible pests and then decide if there are enough pests to be a problem worth treating.

Students will learn about the scarab beetle life cycle and how/when grubs cause damage.

Pg 6 We often see scarab beetles, (European chafers, Japanese beetles, "June Bugs") in large numbers in July. This is their mating season. Eggs hatch and tiny grubs emerge in August. After only a few weeks of feeding are they large enough to see--and--close enough to the surface to find. They will continue to eat and grow in size (they have three instars) until they go deeper in the soil to overwinter.

Pg 7 Here is an example of how to sample for grubs in your lawn. The best time to do this is in mid to late August.

if you choose, the sampling technique shown can be practiced any time the soil is not frozen. Note: It is not uncommon to find grubs in spring, especially in soft garden soil.

Pg 8 Knowing the 'threshold' for damage is important in pest management. Finding a grub in your soil does not mean you have a grub problem!

Pg 9 Grub sampling is usually done with the same tool that cuts the “hole” in a golf green. It is called a cup-cutter and removes about 1/10th of a square foot of soil. Scouts examine this small circular plug of soil and then multiply the number of grubs found by 10 to determine if they are ‘over threshold’.

For math applications, have your students calculate varying numbers of grubs in the 6” by 6” area and how this multiplies out for a square foot. “X” x 4 = \_\_\_ per square foot. Example: 4 grubs in a 6” by 6” area represents 4 x 4 or 16 grubs in a square foot.

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1. Why should we properly identify a pest before we treat it?

We need to be positive a pest is present and causing a problem before we treat it.

2. Grubs can be found in many lawns. Most lawns do / do not need treatment.

3. The larval stage of a beetle is called a:

grub

maggot

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worm

4. IPM Step #5 is choosing a treatment tactic. Tactics are methods you can use to treat a pest problem. Name one method mentioned in this booklet

natural enemies such as nematodes for grubs; milky spore disease (applied as a powder); chemical treatment by a licensed adult; cultural tactic such as no pesticide but improving the lawn’s health to better resist damage.

5. Lawn grasses generally grow all year long in our northeastern climate:

true

false