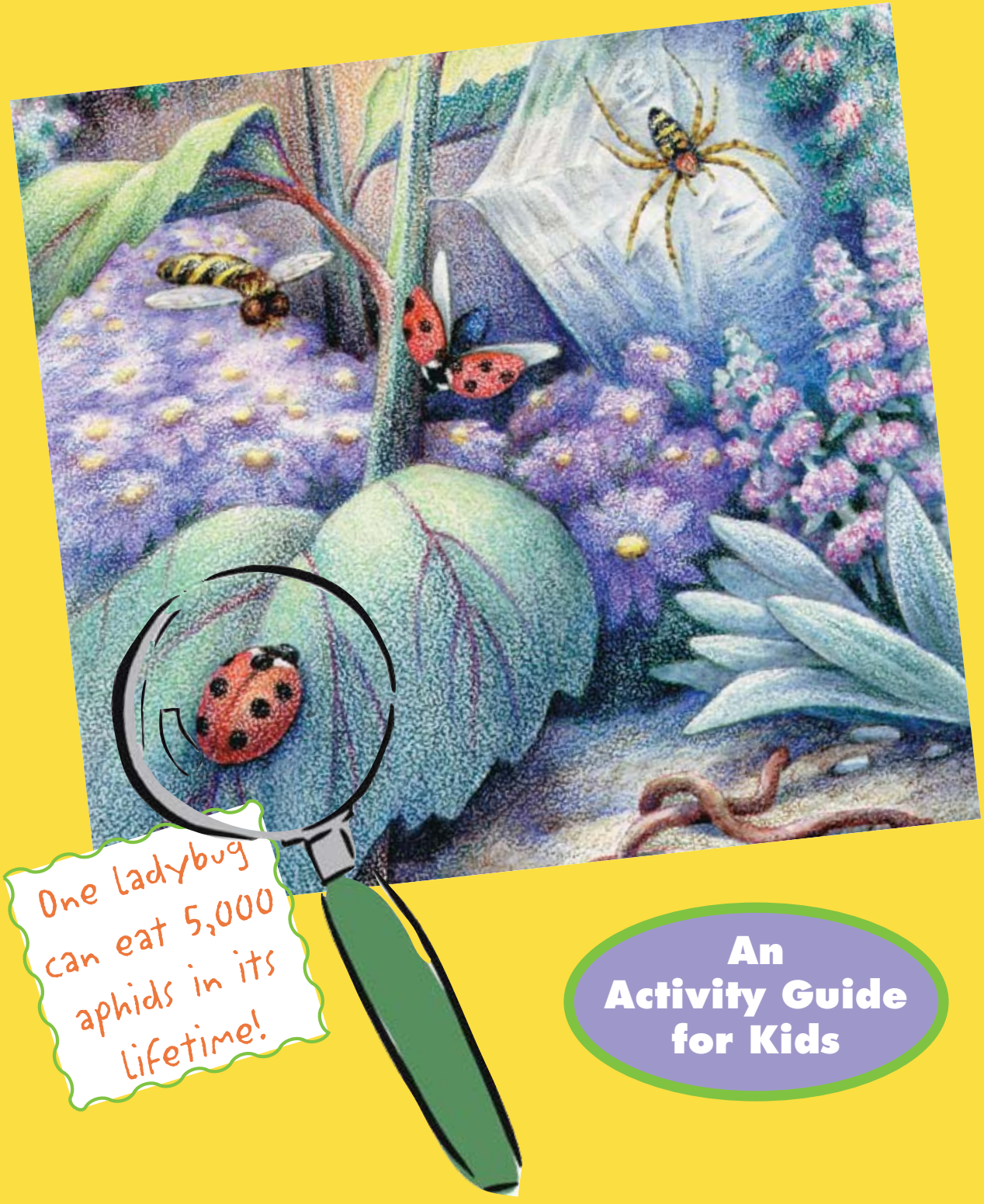
Pest or Pal?

Are bugs helpful or harmful—find out



An Activity Guide for Kids

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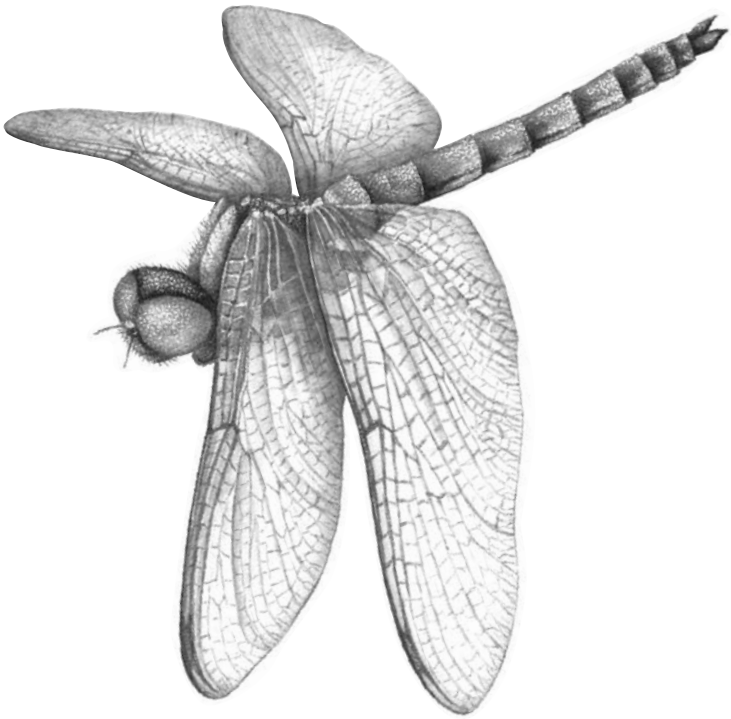

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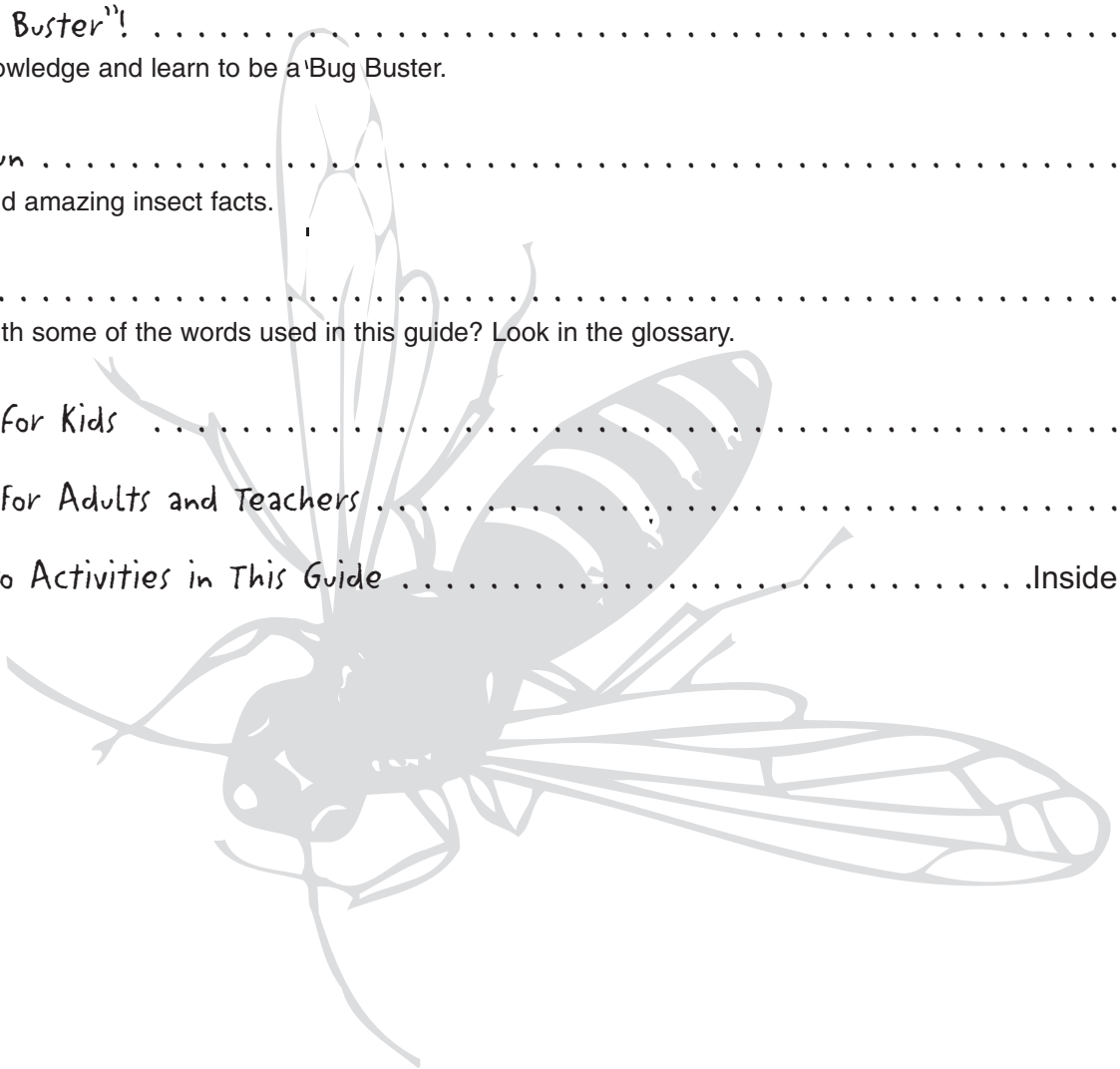
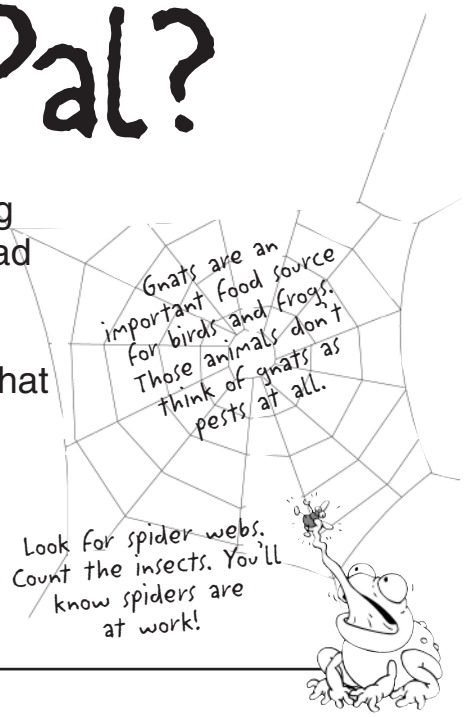


Insects: Pest or Pal?

The world has more insects than all other living things combined. They visit flowers and spread pollen so plants can produce fruits and vegetables. They eat dead plants and animals and create healthy soil. Some insects eat other insects that damage plants. These helpful insects are our **pals**.

However, some insects are a nuisance and can be harmful. We call them **pests** when they hurt, damage, destroy, or make us or animals sick.



Find the **pests** and **pals.**

A **Fill in the blanks below with the correct name:**

ant, bee, cockroach, snail, mosquito, spider, wasp, ladybug

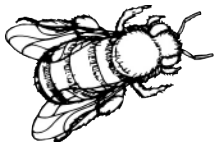
B **Circle the picture if it's a Pal, cross it out if it's a Pest.**

❶ It eats pests, like aphids, that can damage plants.

_____ _____ _____ _____ _____ _____

❷ It chews holes in leaves.

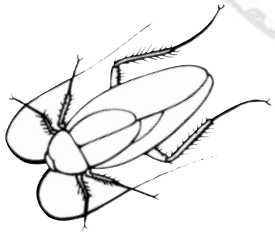
_____ _____ _____ _____ _____



❸ It pollinates flowers and crops.

_____ _____ _____

❹ It invades your kitchen at night looking for food.

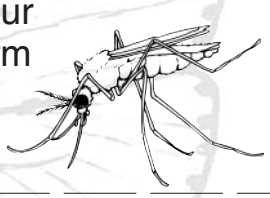


_____ _____ _____ _____ _____ _____ _____ _____ _____

❺ It preys on other insects that may harm plants.

_____ _____ _____ _____ _____ _____

❻ Its bite can give your dog or cat heartworm disease.

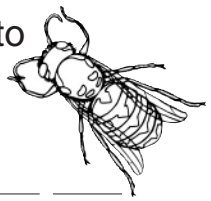


_____ _____ _____ _____ _____ _____ _____ _____

❼ It shows up at your picnic.

_____ _____ _____

❽ It catches pests to feed its young, but will sting if threatened.

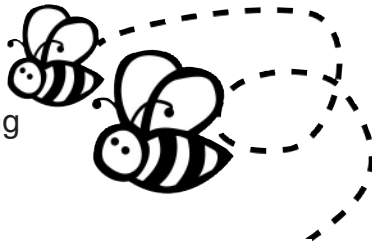


_____ _____ _____ _____

This book shows some ways to fight the pests with least harm to the earth and its creatures.

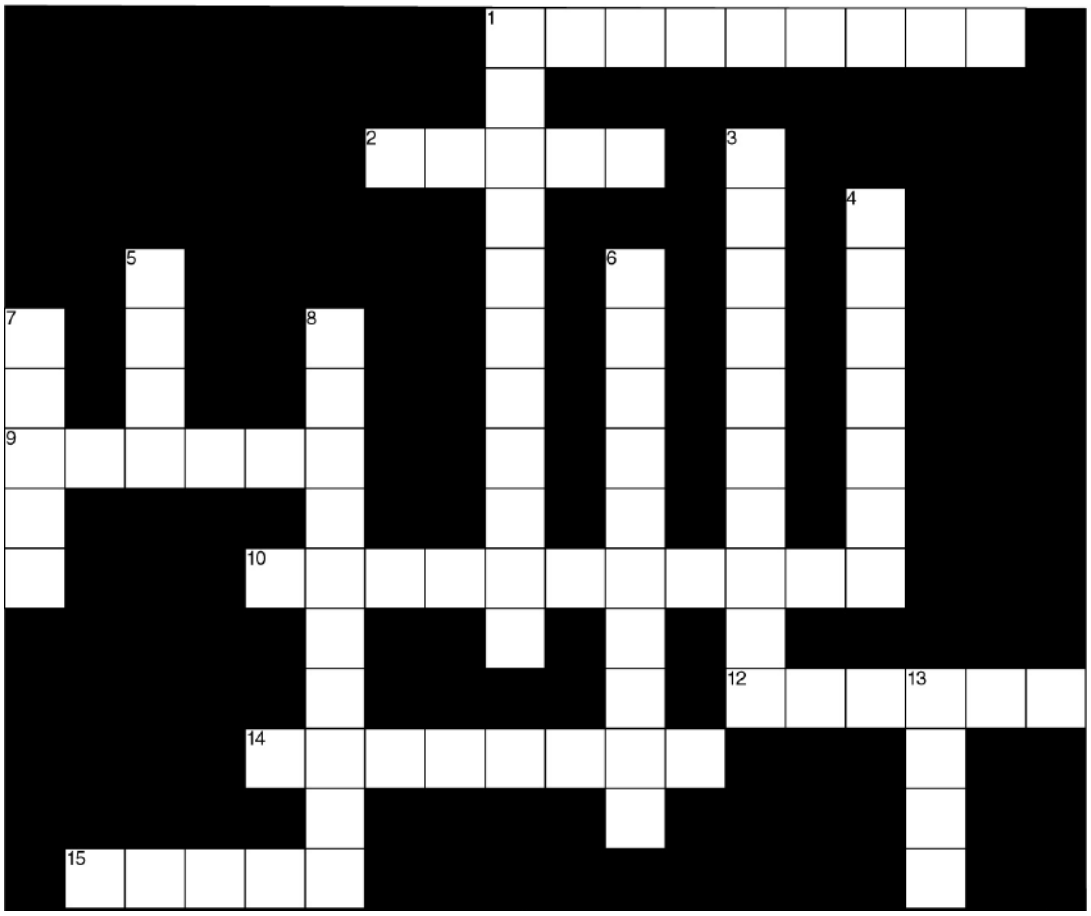
(See answers inside back cover.)

Who Am I?



Some bugs help us. Some bugs pester us. If you think all bugs belong in bug zappers, think again! All bugs are part of the web of life.

Use words from the word bank below to do this puzzle.



Word Bank

- Aphids
- Bees
- Boxelder
- Butterflies
- Carpenter
- Cockroaches
- Fruitflies
- Gnats
- Houseflies
- Mosquitoes
- Moth
- Spiders
- Sowbug
- Ticks
- Wasps

Across:

1. Large black ant that nests in wood.
2. They get on you to suck your blood.
9. They harm plants by sucking sap.
10. Beautiful insects that drink nectar and pollinate flowers.
12. Outdoor creepy-crawly that eats rotten plant matter, turning it into soil.
14. Red and black bugs that eat tree leaves and seeds but don't kill trees.
15. They sting, but also kill harmful insects.

Down:

1. They eat almost anything, they like the dark, and they are hard to get rid of.
3. Tiny, flying insects that breed in fruits and vegetables.
4. They have eight legs and eat insects.
5. It eats holes in wool and fur clothing.
6. They spread germs with their feet. Frogs eat them.
7. Small, flying bugs. The female's bite is itchy.
8. They give itchy bites. Bats eat them.
13. They sting, but also make food that humans eat.

Did You know? *Over one million species of insects have been discovered, and scientists think there might be ten times that many that have not yet been named!*

Learn what some of these bugs look like by visiting one of the web sites listed on pages 21 and 22.

Fighting Pests with the 3 Ps

Many scientists are trying to find ways to fight pests without using poisons. One way is to use the natural enemies of pests or the three Ps!

Predators hunt and kill pests for food.

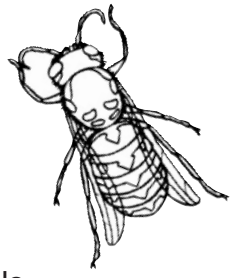
Parasites live on or inside pests and may kill them.

Pathogens cause disease in pests. Pathogens are germs like bacteria or viruses.

The 3 Ps in Action

In the examples below, which of the 3 Ps is fighting pests?

1 Tiny insects, called scale, are attacking the plants in your schoolyard. Poison insect killers (insecticides) would kill the scales, but might also harm other creatures and could make people sick. A tiny, stingless wasp the size of a pin-head, is put to work. It lays its eggs inside the scale. The wasp larva hatch and grow inside the scales. That kills the scales.



P_____

2 Mosquitoes can give you an itchy bite and can spread diseases to both humans and animals. Now we can use a germ to manage mosquitoes! A microscopic bacteria can kill the larva, or young, of a mosquito before it can become a flying adult.

P_____

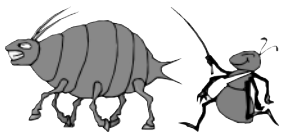
3 In the 1880's, California's orange trees were almost destroyed by a pest called the cottony cushion scale. Scientists brought in a ladybug from Australia to eat the scales. These tiny heroes saved the trees.

P_____

Try This!

Imagine you are one of the 3 Ps.

Make a poster to advertise yourself.

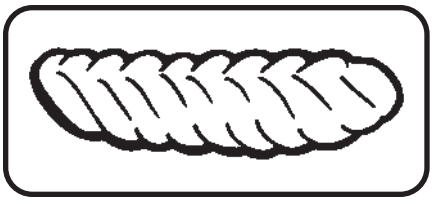


A Bug's Life

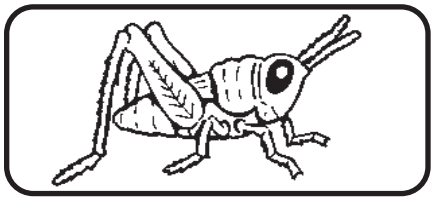
Before you swat or squish a bug…stop and think! Is it a pest or a pal? That caterpillar eating your leaves might grow up to be a butterfly - an important pollinator. Many insects go through amazing changes during their life cycle. Scientists call this series of changes metamorphosis.

Some insects, like dragonflies and grasshoppers, go through only three stages. The young, called nymphs, look like smaller versions of the adults when they hatch and grow.

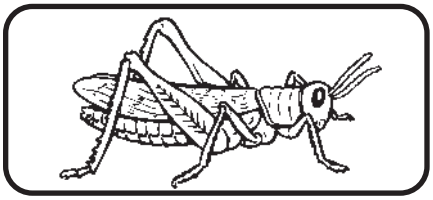
Grasshopper Egg



Grasshopper Nymph

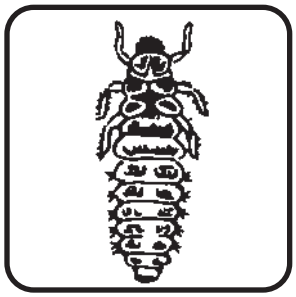


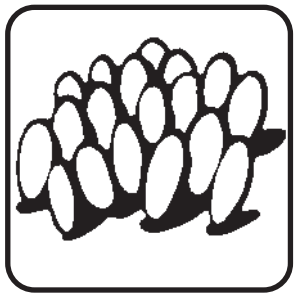
Grasshopper Adult

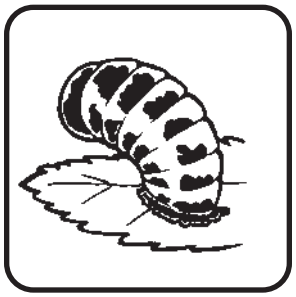


Some insects, like ladybugs and butterflies, go through four different stages: egg, larva, pupa and adult. The larva hatches from an egg and sheds its skin (exoskeleton) many times as it grows. When it becomes a pupa, the larva completely transforms until it emerges as an adult.

Here is a ladybug's life cycle. Number the life cycle stages in the right order, from egg to adult.





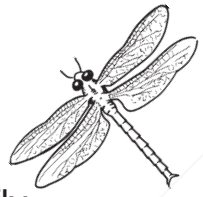


____ # ____ # ____ # ____

Did you know? *Scientists estimate that there are 200 million insects for every one person on the planet!*

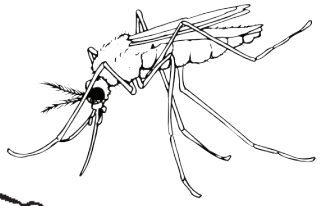
Bug Babies

Here are some 'bug babies' you might see around your home and garden. Draw a line from the adult insect to the picture of its larva or nymph.

1. Dragonfly 

2. Monarch butterfly 

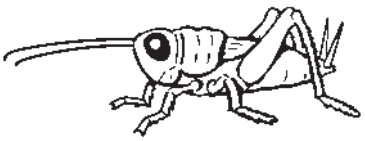
3. Green lacewing 

4. Mosquito 

d.

5. Housefly 

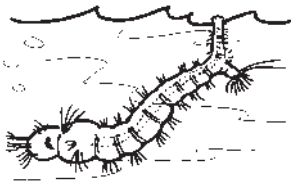
6. Cricket 

a. 

b. 

c. 

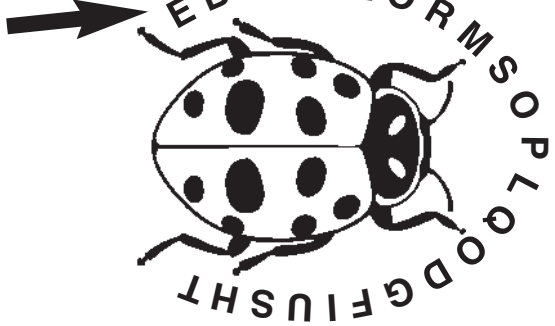
e. 

f. 

Going Buggy!

Who needs to identify bugs? We all do! Doctors need to know about pests that can carry diseases, farmers need to know about pollinators and pests of crops, gardeners need to know who is eating their plants, and your family needs to know about pests in your house and garden, and on your pets.

start here



To find out what we call a scientist that studies insects, start at the arrow and write down every other letter: ___ ___ ___ ___ ___ ___ ___ ___ ___ ___ ___ ___ ___

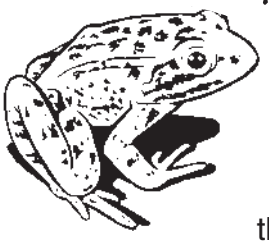
Pest Patrol Pals: The

Meet a few members of the pest patrol! These are the insects and animals that eat pests. Look for some of them when you see pests - they won't be far away!

Green Lacewings

There's a lion loose in your garden – an "aphid lion." It's the green lacewing larva, a deadly bug hunter that eats pests, especially aphids. One lacewing larva can eat 60 pests an hour! The adults are pollinators that feed on flower nectar.

Frogs and Toads

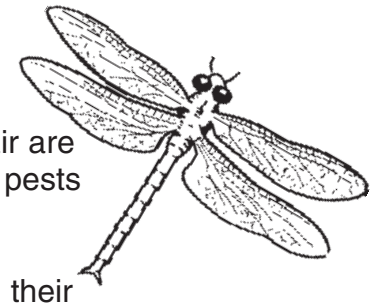


Frogs and toads are valuable pals and will eat pests like grubs, slugs, ants, flies and mosquitoes. They use their great eyesight and long sticky tongues to catch their prey. One frog or toad can eat 20,000 insect pests a year!

Bats

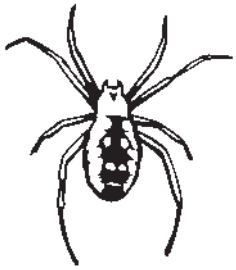
Some people are afraid of bats, but they are a great friend to gardeners. Bats pollinate flowers and eat huge numbers of pests. As they fly through the night, they locate prey by using high-pitched noises that bounce off of flying pests. One little brown bat can eat 600 mosquitoes in one hour!

Dragonflies



These dragons of the air are swift predators that eat pests like mosquitoes, flies and moths. As they fly, they form a basket with their spike-covered legs and scoop up their prey in midair. Dragonflies can eat 300 mosquitoes in a day, giving them the nickname "mosquito hawk."

Spiders



Some spiders spin webs to catch their prey, while others hunt on the ground or make clever traps and tunnels. Though they look ferocious, spiders are shy creatures that munch on pests. They will only bite people to defend themselves. If you piled up all the pests that spiders eat in a year, they would weigh more than 50 million people!

Ladybugs

Ladybugs eat fantastic numbers of pests. Both the adults and larvae feast on plant-eating bugs, like aphids. In fact, one ladybug can eat 5,000 aphids in its lifetime.

Natural Enemies of Pests

These garden pals protect our plants without harming people, wildlife or the environment.

Hoverflies

If you see a bee or wasp in your garden, look closer – it might be a hoverfly. With their yellow and black stripes they look like slender bees, but they can't sting. Hoverfly adults are pollinators. The larvae are hungry predators, and one tiny hoverfly larva can eat 400 pests in two weeks!

Ground Beetles

Hiding under wood and rocks in your garden are fierce predators called ground beetles. At night these hungry hunters use their powerful jaws to munch on garden pests like snails and slugs. Ground beetles can eat 500 pests in their lifetime.

Pest Patrol Word Search

Here is a list of some of the bugs and animals that eat pests. Try to find and circle all the words in the puzzle.

WORD LIST

spider	lacewing	yellowjacket
dragonfly	hoverfly	robber fly
frog	bat	toad
ant lion	bird	wasp
mantis	ladybug	beetle

Q	W	A	N	T	L	I	O	N	C	S	N
L	D	G	F	M	A	N	T	I	S	P	L
A	B	X	E	G	C	A	K	L	V	I	O
D	E	H	O	V	E	R	F	L	Y	D	Q
Y	E	L	L	O	W	J	A	C	K	E	T
B	T	D	A	S	I	F	B	V	C	R	Z
U	L	J	L	K	N	U	A	R	D	Y	U
G	E	M	A	S	G	C	T	D	Y	J	E
D	F	G	D	R	A	G	O	N	F	L	Y
P	R	O	B	B	E	R	F	L	Y	A	F
T	O	A	D	Z	B	I	R	D	T	N	Y
N	G	T	O	K	S	H	W	A	S	P	M

Did You know?

Insects and animals aren't the only members of the pest patrol. There are 450 different kinds of plants that catch and kill pests!

What's all the BUZZZZzz?

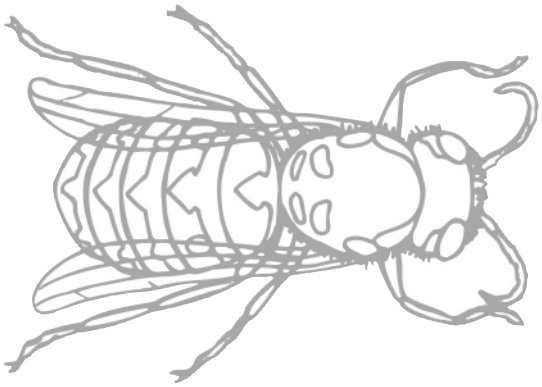
Have you thanked a bee today? After all, 80% of our fruit and vegetable crops are pollinated by bees! They also give us honey to eat and wax for use in candles, polish, make-up and medicine.

How to Tell a Bee from a Yellowjacket.

- Honeybees carry pollen in a basket of stiff hairs on each hind-leg. They are hairy all over, and when they rest, their wings are flat.
- Yellowjackets, a type of wasp, have narrow waists and do not have pollen baskets. When they rest, their wings fold back and look narrower than a bee's wings. Yellowjackets also pollinate plants and eat pests in the garden.

Label and color the honeybee and the yellowjacket.

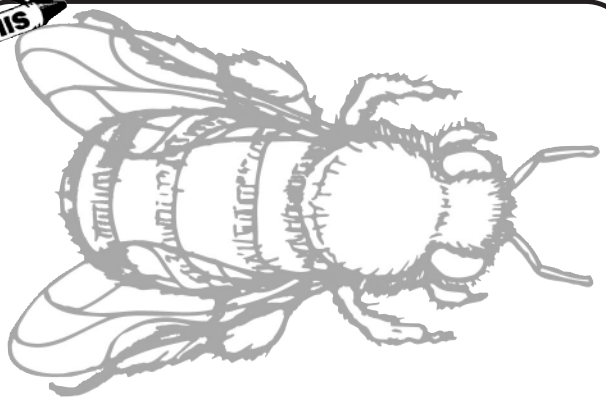
A



_____

COLOR THIS

B



_____

Bee Math

Solve these math problems to answer the questions:

1. How many bees are in an average hive?
10,000 x number of fingers on 1 hand = _____

2. How many miles an hour do bees fly?
Number of months in a year + 3 = _____

3. How many pounds of honey does a small colony of bees need to store to survive the winter?
Number of pennies in a quarter + 10 = _____

Least Toxic Tips

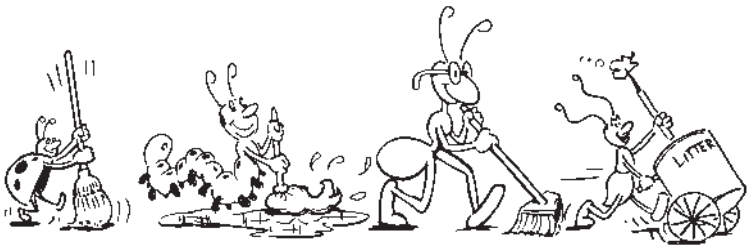
Prevent Stings!

Honeybees and yellowjackets sting only to defend themselves, NOT to attack. Here are some tips for keeping them from 'bugging' you:

- ✶ Don't use scented products like perfume, lotions and soaps that might attract them.
- ✶ Don't wear brightly colored clothes.
- ✶ Keep food and soda cans covered.
- ✶ If bees or yellowjackets come around, hold still and don't frighten them.
- ✶ If a bee or yellowjacket lands on you, don't panic and swat at it! Just blow at it gently and it will move.

Did You know? *To make one pound of honey, honeybees will visit 2 million flowers and travel 55,000 miles — a distance equal to 2 trips around the earth!*

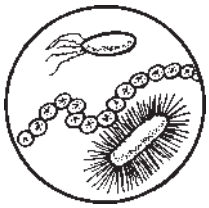
THE CLEAN-UP CREW



Fallen leaves, dead plants and animals, banana peels and apple cores - what might seem like garbage to us is a feast for the clean-up crew! Beneath your feet, in leaf litter and in soil, are millions of hardworking critters called decomposers. They eat decaying plants and animals and return nutrients to the soil. They are nature's recyclers and are experts at creating healthy soil.

Unscramble the words to learn some fascinating facts about some members of the clean-up crew.

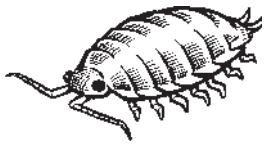
1 In one year, an acre of _____ (oswmr) will plow 50 tons of soil and produce 5 tons of poop, called castings, which are full of nutrients that plants need.



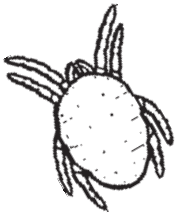
2 In one teaspoon of healthy soil there might be more _____ (tecaibra) than there are people on earth, but you would need a microscope to see them.

3 A _____ (leidmepli) has hundreds of legs and can curl into a tight coil to protect itself from predators.

4 A _____ (tnsiplraig) has a forked 'tail' that pops open so it can leap a hundred times its own length.



5 Pill bugs and _____ (bsuwosg) are related to crabs and lobsters and breathe with gill-like structures. Only a pill bug, sometimes called a roly-poly, can roll into a tight ball to protect itself.



6 _____ (temis) have 8 legs like spiders, and are so tiny 25 of them can fit onto a one-inch line.

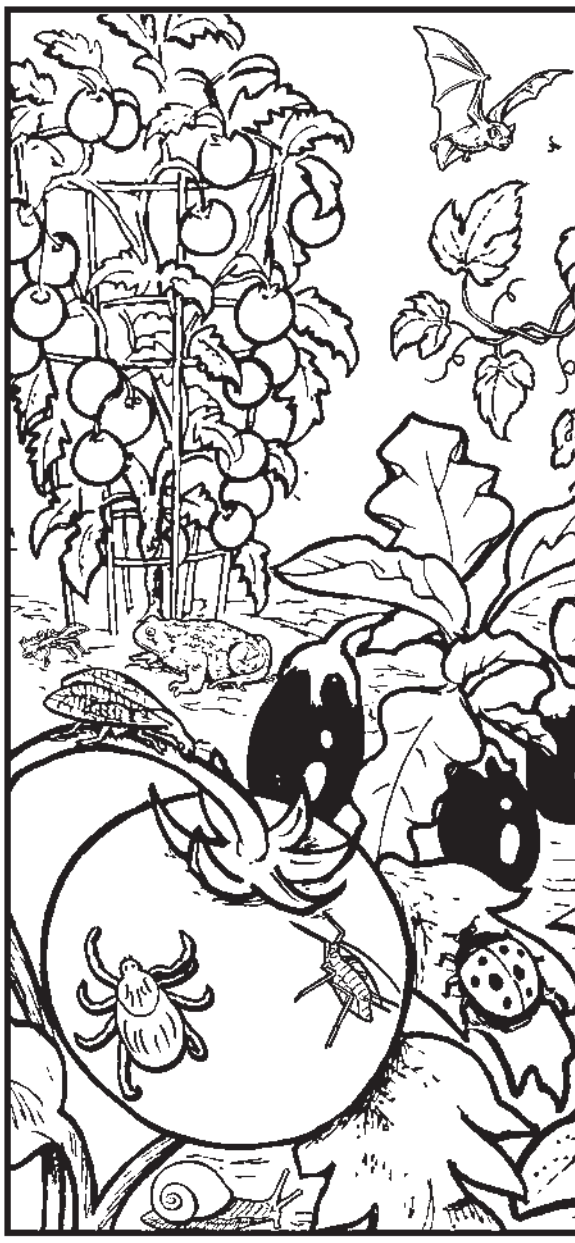
WORD BANK
Bacteria, springtail, worms, mites, millipede, sowbugs

Did You know? *Worms can turn your old food into fertilizer. To learn how to make a worm bin, go to http://www.ebfarm.com/Kids/WormComposting.aspx*

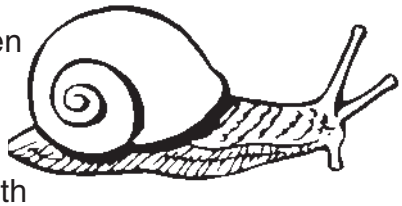
Pests tha

(And How to B

Snails, slugs, ants, aphids and
Try to find and cross out all of the
animals that m



Slimed by Snails and Slugs



A shiny slime trail through the garden is your clue that snails and slugs have been eating holes in your plants. They produce a slippery liquid, called mucus, that helps them glide over surfaces. They have a special 'tongue' covered with thousands of tiny, sharp teeth that scrape off pieces of plants. Snails carry coiled shells on their back, but most slugs don't have shells.

Snails and slugs need lots of moisture to survive, so they mainly come out at night or on cloudy days. They eat living plants, but they also help to break down decaying plant material.

How to Bug 'em Back:

- ✔ Use a flashlight to collect snails and slugs at night. Squish them or drown them in soapy water.
- ✔ Set out upside-down flower pots or wooden boards as traps.
- ✔ Water early in the morning so there is less moisture at night to attract them.
- ✔ Keep your garden free of toxic pesticides and safe for the beetles, birds, frogs and toads that eat snails and slugs.

Ticked Off

Ticks are pests that live off blood. While feasting on people and animals, ticks can pass along a sickness called Lyme Disease.

Ticks live in the woods and tall grass. They can sense body heat and carbon dioxide – a gas living things breathe out – to find prey. When people and animals brush up against them, ticks hop on and place a barbed mouthpiece into your skin.

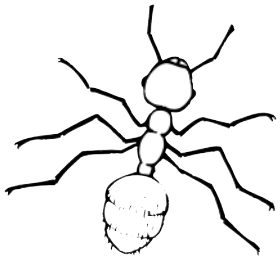
How to Bug 'em Back:

- ✔ Wear long-sleeved shirts, and tuck your pant legs in your socks.
- ✔ Wear light-colored clothes so you can see ticks.
- ✔ After a walk, check your clothes and body for ticks.
- ✔ Pull any ticks off with tweezers. Don't leave any body parts in your skin.

t Bug You

Bug 'em Back!)

ticks have invaded this garden!
pests. Then circle all the bugs or
ight eat pests!



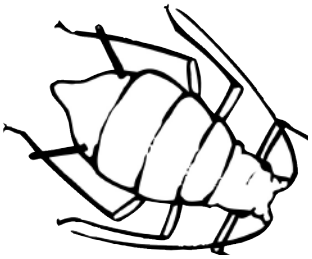
Ant Antics

There are more ants on earth than any other animal! Ants can be helpful insects – they eat pests and dead animals, they can pollinate plants and spread seeds, and their tunnels let air and water into the soil.

Ants become pests when they invade your house looking for food and water. In the garden, they love to eat the sweet juice that aphids and other sucking insects give off. They protect these pests and stop good bugs from eating them. As they travel, ants leave a scent trail that other ants follow using their antennae. Their ability to work together in colonies make ants great survivors.

How to Bug 'em Back:

- ✔ Put food away in tight containers and keep counters clean and dry.
- ✔ Keep tight fitting lids on garbage cans.
- ✔ If ants come into your house or classroom, use soapy water to kill the ants and destroy their scent trails.



Aphids Suck!

Aphids are tiny insects that stick their needle-like mouths into plants to suck out the sap. They take away the plant's nutrients and they can give the plant diseases. Aphids attract other pests to plants because they release a sweet, sticky juice called honeydew. Insects, like ants, love to eat the honeydew.

How to Bug 'em Back:

- ✔ Squish aphids on leaves, or spray them off with water.
- ✔ Buy ladybugs and set them free in your yard to eat the aphids.
- ✔ Grow plants, like marigolds, that attract the good bugs that eat aphids.

Did you know?

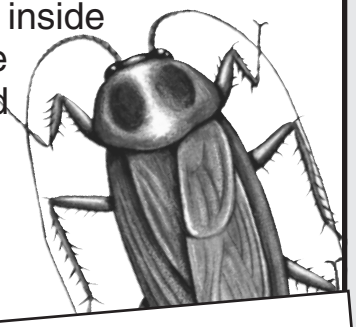
One female aphid can have 50 babies a week. If it weren't for the Pest Patrol Pals, all these babies would survive and reproduce – and in one year there would be a layer of aphids all over the earth 93 miles deep!

Midnight Raiders:
Cockroach Invaders

Cockroaches love living with people. Homes give them lots of food and cozy spaces to rest and breed. But no one wants cockroaches in their home. They smell bad. They run all over at night. They can cause allergies, too.

When roaches are outside, they help clean up debris by eating dead plants and animals. Frogs, lizards, birds and mice catch and eat cockroaches, helping to control them.

To get rid of roaches inside your house, think like a roach. What would make you leave a cozy human home?



Cockroach Menu

What's yummy to a roach? Search for the hidden words to find out. Then make sure the roaches won't get to these goodies in your home!

V	R	N	U	J	Y	Q	S	P	C	G	D	J	H	H	J	R	Z	T
F	I	N	G	E	R	N	A	I	L	C	L	I	P	P	I	N	G	S
P	M	B	T	S	J	H	W	G	U	G	D	U	Y	D	R	R	I	Y
Z	G	E	V	K	B	S	T	D	I	K	I	G	Z	O	G	V	B	O
C	Z	S	G	V	O	O	P	I	Q	V	P	Z	I	C	R	G	A	W
Q	W	X	L	V	S	D	O	E	C	L	E	H	R	W	E	E	M	W
H	T	H	U	B	E	D	E	K	A	B	V	Y	W	I	A	C	I	G
Y	A	G	E	I	Q	Z	Y	J	B	N	H	O	M	P	S	R	K	L
U	X	U	O	W	I	Q	V	L	I	I	U	L	D	L	E	S	M	C
S	R	E	N	A	C	S	O	A	P	M	N	T	I	F	I	K	U	C
Q	C	X	N	D	F	Y	T	C	K	X	Z	D	B	L	M	P	N	R
U	L	L	P	S	C	W	K	H	X	Q	U	H	I	U	G	C	H	U
O	S	P	O	L	X	O	B	C	Y	U	O	J	W	N	T	X	Q	M
U	W	P	E	U	V	W	M	G	F	N	N	W	E	C	G	T	K	B
Z	H	U	A	P	E	T	F	O	O	D	P	F	M	L	F	S	E	S
P	Q	D	O	R	M	M	Y	D	B	A	Z	X	F	R	H	P	Y	R

Word Bank: peanut butter; fingernail clippings; crumbs; pet food; glue; bookbindings; grease; soap

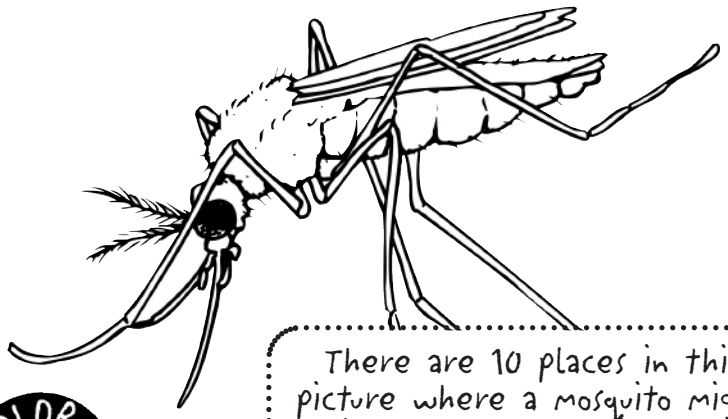
Least Toxic Tips
to Get Rid of Roaches

- Fix leaky pipes and faucets. (Cockroaches need water.)
- Take out the garbage every day.
- Keep food in closed containers.
- Don't leave dirty dishes in the sink overnight.
- Wash food from cans before recycling.
- Plug up cracks and holes.
- Clear clutter out of warm, dark places so roaches can't hide.

Did You know?

Cockroaches are great escape artists. They can run 3 miles an hour, swim, and slip through a crack as thin as a quarter!

Go on a Mosquito Patrol!



A mosquito's bite can make you itch. It can also spread disease and make you sick. Only female mosquitoes bite you – they need blood to help their eggs develop.

Mosquitoes lay their eggs in still or slow moving water. The larva, called a wiggler, hangs just below the water's surface and breathes through a tube at the end of its abdomen.

Fight the Bite

One mosquito can produce 150 babies in 1 tablespoon of water!

To stop mosquitoes from breeding, get rid of any standing water around your house:

- ✔ turn over empty pots and saucers.
- ✔ dump water from toys.
- ✔ change water often in birdbaths and pet bowls.

And don't forget: make sure window screens are 'bug tight'.

There are 10 places in this picture where a mosquito might find water to lay its eggs. Try to find and cross out all 10.

Skeeter Scat Least Toxic Tips

- Don't over-use insect repellents.
- Wear light, loose clothing to cover your skin.
- Stay inside one hour before and after sunset when mosquitoes are most active.

Did You know? *Birds, frogs, bats, dragonflies and fish will eat mosquitoes. One type of dragonfly can stuff 100 mosquitoes in its mouth at one time!*

What's a Weed?

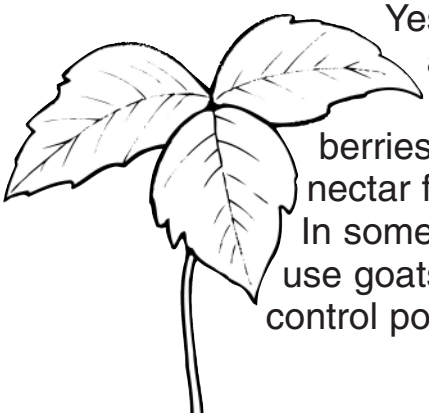
A weed is simply a plant growing where we don't want it. Weeds steal sunlight, growing space, and moisture from plants we do want. Most weeds spread by seeds. Pull weeds before they set seeds. Then you'll have fewer weeds in the future.

Weeds can be Pests and Pals!

Milkweed can be a pest when it grows in fields of crops. But it is the only plant monarch caterpillars will eat. Without milkweed, what would happen to monarchs?

You can help monarchs survive by planting native milkweed in your yard.

Poison oak is a pest when it grows where we hike or play. It can give you an itchy rash. Is poison oak good for anything?

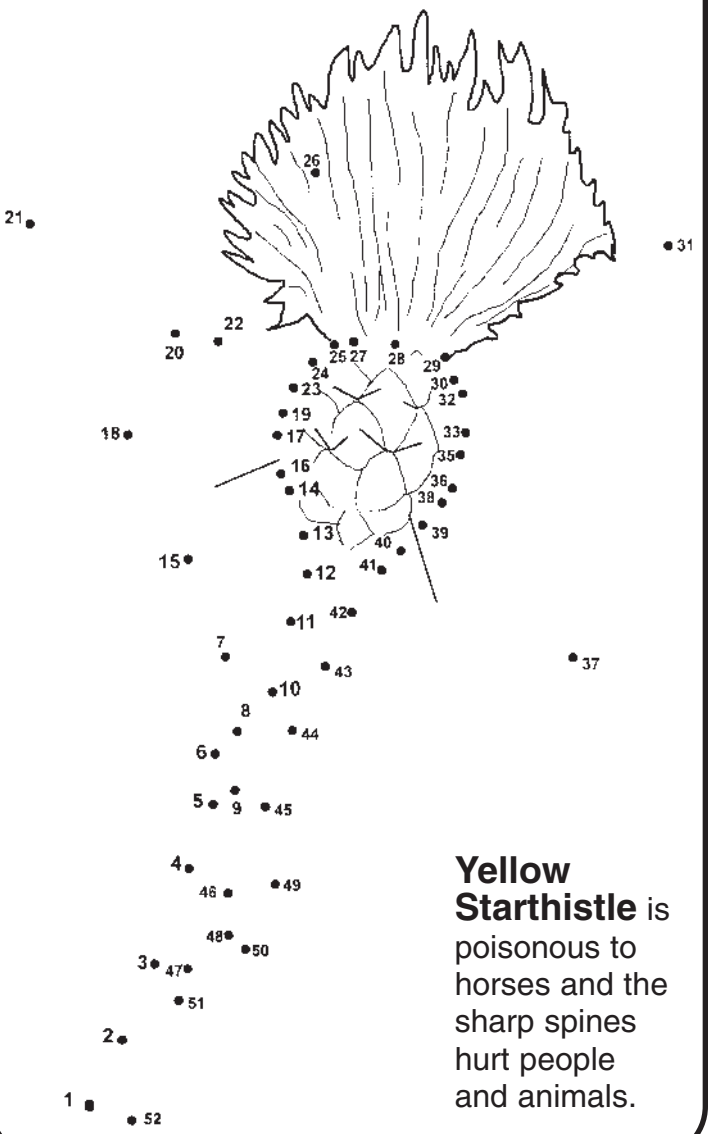


Yes! Some animals and birds eat the berries. Bees sip nectar from the flowers. In some areas, people use goats to eat and control poison oak.

Here are two insect pals that will eat Yellow Starthistle. When we use insects or diseases to control pests, we call it "biological control."

Yellow Starthistle

Connect the dots to draw California's #1 weed pest



Yellow Starthistle is poisonous to horses and the sharp spines hurt people and animals.

Seed Weevil

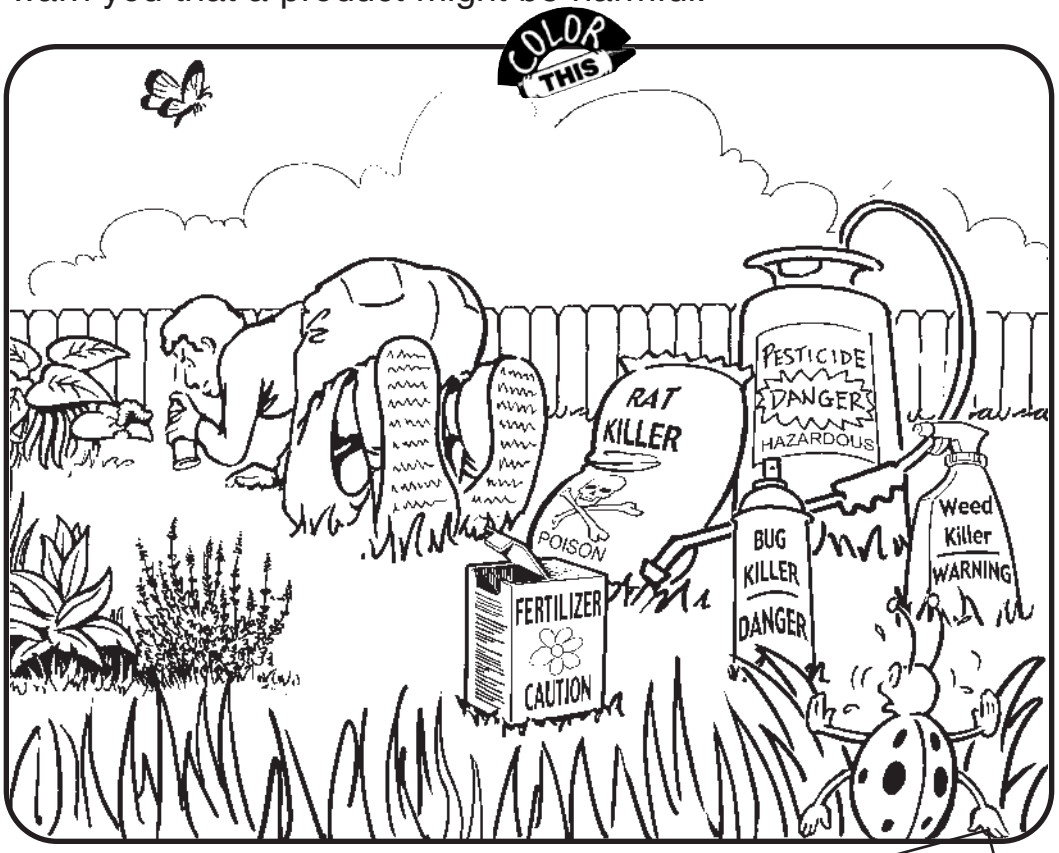
Seed Fly

Pesticides are Poisons

Sometimes people buy and use pesticides. Pesticides are chemicals that get rid of pests. They are poisons. If we touch, breathe, or swallow some pesticides they can make us sick.

When used in the garden, toxic pesticides can kill the good bugs along with the pests. Pesticides can also wash off yards into storm drains, creeks and bays where they can harm wildlife.

Find the pesticides in the picture and circle any words that warn you that a product might be harmful.



Can you think of three ways to control pests without using toxic chemicals? (For tips, see pages 10 and 11).

1. _____
   _____
   _____
2. _____
   _____
   _____
3. _____
   _____
   _____

What Do You Think?

1. Do lawns and parks really need to be totally weed free?
2. How do some insects help your lawn and plants? Do you really need to get rid of ALL insects?
3. Can you put up with fruits and vegetables that aren't perfect–when they are grown without pesticides?

Pesticide Safety Tips

- ✔ Wash and scrub fruits and vegetables before you eat them.
- ✔ Take shoes off at the door or wipe them on a mat so you don't track pesticides into the house.
- ✔ Ask adults to keep pesticides locked up in a secure place.
- ✔ Be careful around products that are sprays– you don't want to breathe in these chemicals.

Protecting Pets

Your pets rely on you for protection! Some pesticides can harm your pets. Many of these chemicals can make them very sick.

When pets walk on lawns where pesticides have been used, they pick up the chemical on their paws and fur. They swallow these chemicals when they lick themselves. Also, some poisons such as snail bait may look like food to your pet.

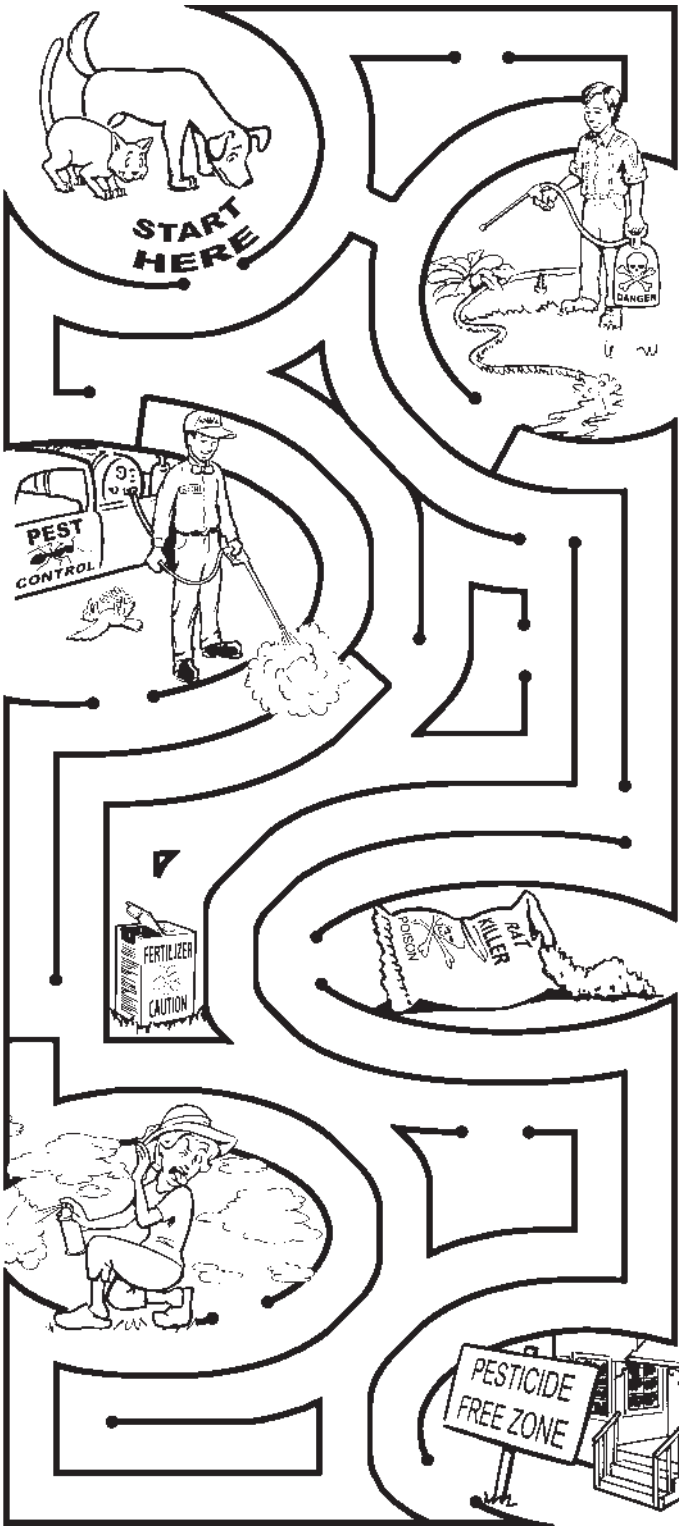
Here are some tips for keeping pets safe:

- ✔ Keep pets off of lawns where pesticides might be used.
- ✔ Keep pesticides stored where pets can't find them.
- ✔ Never use pesticides near your pet's food and water.
- ✔ Ask your pet's doctor for ways to manage fleas and ticks without toxic pesticides.
- ✔ Remind your family that they can manage pests without poisons – for tips see the Resources on page 22.

Did You know?

Some snail baits are available that won't harm your pets. Tell your family to use only products that are less toxic to people and pets.

Help these pets find their way home safely.

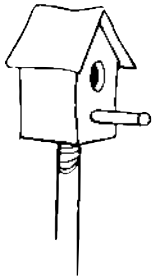


a	b	c	d	e	f	g	h	i	j	k	l	m	n	o	p	q	r	s	t	u	v	w	x	y	z
26	25	24	23	22	21	20	19	18	17	16	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1

Outsmart those pests!

Do pests bug you? Keep them from getting into your home, yard, or garden in the first place.

Use the code to fill in the blanks. You'll see ways to outsmart pesty insects, weeds, and diseases.



1 Put up ____ ____ ____ ____ ____ ____ ____ ____ ____ ____.
25 18 9 23 19 12 6 8 22 8

and provide plants with berries. These attract birds to feast on insects that harm plants.

2 Welcome ____ ____ ____ ____ ____.
7 12 26 23 8

They eat ____ ____ ____ ____ ____
8 15 6 20 8

that eat and damage plants.

3 Clean up

____ ____ ____ ____ ____ ____.
24 9 6 14 25 8

Wipe up spills. Keep rooms clean.

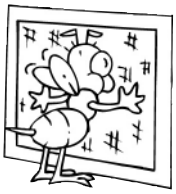
4 Put

____ ____ ____ ____ ____ ____ ____
20 26 9 25 26 20 22

and recycling into containers with tight-fitting lids.

5 Put ____ ____ ____ ____ ____ ____ ____
8 24 9 22 22 13 8

on doors and windows. Keep insects out!



6 Plant

____ ____ ____ ____ ____ ____ ____
21 15 12 4 22 9 8

with lots of pollen and nectar to attract ladybugs and other insects that eat pests.

Be a "Bug Buster!"

Choosing ways to manage pests without using poisons is part of a process called Integrated Pest Management or IPM. Become an IPM expert. Match each pest problem with the least toxic way to solve it.

Draw a line to connect each question with the correct answer.
Need help? Look throughout this book to help you find the answers.

1. You see yellow starthistle in your yard. What do you do?
2. How do you keep ants and roaches out of your home?
3. What should you do to avoid tick bites?
4. How do you keep mosquitoes from using your yard to lay eggs?
5. You see too many snails in your garden. How do you get rid of them?
6. There's a big spider on a plant in your garden. What do you do?

A. Tuck your pant legs into your socks when walking in tall grass or areas where these insects may live.

B. You squish them or put them in a bucket of soapy water.

C. Have an adult dig it up and throw it away.

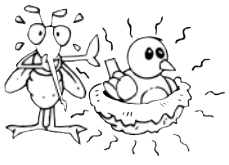
D. Make sure there are no open containers with water, where these biters can breed.

E. Keep food in closed containers, clean up crumbs, and take the garbage out every day.

F. Leave it alone. It's eating lots of pests.

With the right information and tools, we can solve our pest problems without using poisons... AND be friends to Earth and nature!

That's IPM!

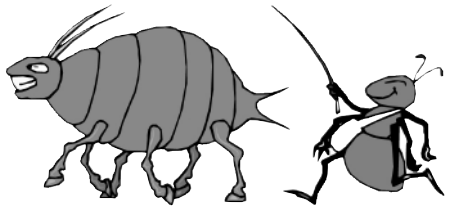


Did You know?

Starlings and some other songbirds use natural pest-killers. They line their nests with special plants that give off chemicals that help keep tiny, blood-sucking animals away from their young.

Just For Fun

Bug Jokes



What medicine would you give a sick ant?
Ant-ibiotics

What do you call a rabbit that was raised by an insect?
Bug's Bunny

What do you get when you cross a millipede with a parrot?
A walkie-talkie

Which bug needs a bath?
A Stinkbug

What's the difference between a coyote and a flea?
A coyote howls on the prairie - a flea prowls on the hairy.

Why did the insect get kicked out of the park?
It was a litterbug

Amazing Bug Facts

Spider silk looks fragile, but it is stronger than steel thread of the same thickness, and can hold 4,000 times the weight of a spider.

Scientists have discovered fossils of huge dragonflies that lived over 300 million years ago and were the size of small hawks.

There are 350,000 different types of beetles - almost one-third of all the types of insects that have been discovered.

Ants can lift 50 times their own weight – that is like a human lifting a rhino.

Fleas are such strong jumpers that if they were the size of a human, they could jump over a skyscraper.

The praying mantis is the only insect that can turn its head around to look behind itself.

The world's longest insect is a 13" walkingstick from Malaysia.

There are 3,500 kinds of cockroaches. One type likes to hide in electronic devices, like TV's. Cockroaches have even been found living on spacecraft!

The bombardier beetle can shoot a stream of boiling hot liquid at its enemies.

Glossary

Abdomen – The rear section of an insect's body which holds the stomach.

Biological Control – Managing pests by using their natural enemies, such as insects, animals, bacteria and viruses.

Bug – General term for insects. Scientists actually use the term "bug" to refer to insects with two pairs of wings and "beak" mouthparts for piercing and sucking plant juices or other insects.

Castings – "Worm poop" that puts nutrients back into the soil.

Caterpillar – What a moth or butterfly looks like in the larval stage of its life cycle.

Decomposers – Organisms that break down dead plants and animals, returning nutrients to the soil.

Entomologist – A scientist that studies insects.

Exoskeleton – The hard, outer shell of an insect.

Honeydew – A sweet liquid produce by some sucking insects like aphids.

Insect – An organism with three body parts (head, thorax, abdomen) and three pairs of jointed legs. Most numerous type of creatures on earth.

Integrated Pest Management (IPM) – Choosing among various ways to treat pest problems. The goal is to cause the least harm to the environment and living things.

Larva – The second developmental stage for an insect that has a four-stage life cycle: egg, larva, pupa, adult.

Metamorphosis – The series of changes insects go through during their life cycle.

Native – A plant or animal that is an original inhabitant of a specific area.

Natural Enemy - Something existing in nature that kills or eats an organism.

Nectar – The sweet liquid produced by flowers to attract pollinators.

Nutrients - Substances that organisms need to live and grow.

Nymph – A young insect that has not yet developed into its adult stage. Nymphs look like adults but lack fully-formed wings.

Organism – A living plant or animal.

Parasite – An organism that lives off another organism in a way that harms it.

Pathogen – Something that causes disease or death in an organism.

Pest – Something that shows up where you don't want it. Examples can include weeds, insects, mold, rodents, and bacteria.

Pesticide – A substance used for keeping pests away, killing them, or reducing their numbers.

Poison – A substance that kills, injures, or impairs an organism through chemical action.

Pollination – The transfer of pollen from the male part of one flower to the female part of another flower.

Predator – An organism that kills and eats other organisms.

Prey – An animal that another animal hunts for food.

Pupa – The third stage in a four-stage life cycle in which the insect changes from a larva into an adult.

Thorax – The middle part of an insect's body where the legs and wings attach.

Toxic – A word that means "poisonous in certain amounts."

Web of Life – The complex connections between all living things that rely on each other for food, nutrients, and energy.

Weed – An unwanted plant.

Resources for kids

Books

Bug Bites: Insects Hunting Insects…And More!, Diane Swanson, Whitecap Books, 1997.

Bug Hunter, David Burnie, KD Publishing, Inc., 2005

Bug Scientists, Donna Jackson, Houghton Mifflin, 2004.

Bugs for Dinner: The Eating Habits of Neighborhood Creatures, Sam and Beryl Epstein, Macmillan Publishing, 1989.

Helpful and Harmful Insects, Molly Loian & Bobbie Kalman, Crabtree Publishing, 2005.

Insect Fact and Folklore, Patricia Kite, Millbrook Press, 2001.

Insects, National Audubon Society First Field Guide, Scholastic, 1998.

Insect Wars, Sara Van Dyke, Franklin Watts, 1997.

What About Ladybugs? Celia Godkin, Sierra Club Books, 1995.

On the Web

CityBugs
http://www.cnr.berkeley.edu/explore

eNature, National Wildlife Federation
http://www.enature.com/home/

Insecta Inspecta World
http://www.insecta-inspecta.com/

Katerpillars (and mystery bugs) – Kid's Site
http://www.uky.edu/Agriculture/Entomology/ythfacts/entyouth.htm

Koday's Kids Amazing Insects
http://www.ivyhall.district96.k12.il.us/kkhp/1insects/bugmenu.html

Yucky Roach World
http://yucky.kids.discovery.com/flash/roaches/

Resources for Adults and Teachers

Books

BZZZ! The Intimate Bond Between Humans and Insects,
Josie Glausiusz, Chronicle Books, 2004.

Controlling Pests and Diseases, Rodale's Successful Organic Gardening,
Patricia S. Michalak, Rodale Press, 1994.

Garden Insects of North America: The Ultimate Guide to Backyard Bugs,
Princeton University Press, 2004.

Good Bugs for Your Garden,
Alison Mia Starcher, Algonquin Books, 1995.

Incredible Insects, Ranger Rick's Naturescope Series,
Judy Braus, Editor, National Wildlife Federation, 1991.

Insectigations, Cindy Blobaum, Chicago Review Press, 2005.

Slugs, Bugs and Salamanders: Discovering Animals in Your Garden,
Sally Kneidel, Fulcrum Publishing, 1997.

The Organic Gardener's Handbook of Natural Insect and Disease Control,
Barbara W. Ellis and Fern Marshall Bradley, Rodale Press, 1996.

On the Web

Audubon
www.Audubon.org/bird/at_home/alternatives.html

Beyond Pesticides
www.beyondpesticides.org

Bio-Integral Resource Center
www.birc.org

Bug Guide
http://bugguide.net

Building a Bat House
www.batcon.org

Environmental Working Group
www.foodnews.org

Exploring California Insects
www.bugpeople.org

California School IPM Program
www.schoolipm.info

Northwest Coalition for Alternatives to Pesticides
www.pesticide.org

Pesticide Action Network
www.pestecideinfo.org
www.panna.org

Who Wants to be an IPM Super Sleuth?
(The IPM Institute of N. America)
www.ipminstitute.org/supersleuth.htm

For extensive information on managing pests and choosing less-toxic products visit:

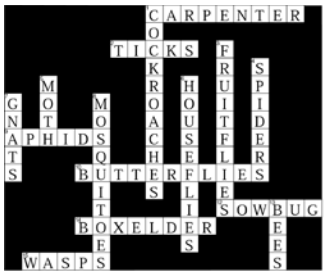
www.ourwaterourworld.org

Answers

Pest or Pal, p. 1

1. Pal ladybug
2. Pest snail
3. Pal bee
4. Pest cockroach
5. Pal spider
6. Pest mosquito
7. Pest ant
8. Pest wasp

Who Am I, p. 2



Fighting Pests with the Three Ps, p. 3

1. Parasite
2. Pathogen
3. Predador

A Bug's Life, p. 4

(in order of appearance)
#2, #4, #1, #3

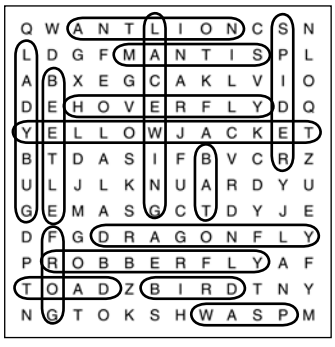
Bug Babies, p. 5

1. c
2. e
3. d
4. f
5. b
6. a

Going Buggy, p. 5

Entomologist

Pest Patrol Pals Word Search, p. 7



What's all the Buzz?, p. 8

A. Yellow Jacket
B. Honey Bee

Bee Math, p. 8

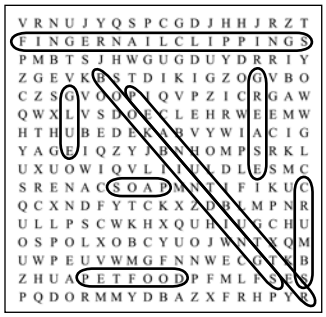
1. 50,000
2. 15 miles an hour
3. 35 pounds

The Clean-up Crew, p. 9

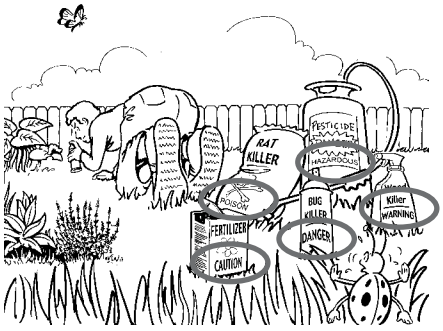
1. worms
2. bacteria
3. millipede
4. springtail
5. sowbugs
6. mites

Pests that Bug You, p. 10-11

Midnight Raiders, p. 12



Go on a Mosquito Patrol, p. 13



Pesticides are Poison, p. 15

Protecting Pets, p. 16

Outsmart those Pests, p. 17

1. birdhouses
2. toads, slugs
3. crums
4. garbage
5. screens
6. flowers

Be a "Bug Buster!", p. 18

1. c
2. e
3. a
4. d
5. b
6. f

Know your pests and pals!

dragonfly

yellow star thistle

Peek into the secret world of insects and plants and learn how you can take action to protect the health of your school, home, pets, and environment.

lady bug larva

aphid

snail

spider

poison oak

worms