



Spray Away?

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Statement of Purpose

In the 1960's and 1970's, people began to worry about the harmful effects of pesticides and other poisons. Pesticides are needed to manage many pests of man, his crops and animals. To help protect soil, water and air (the environment), man no longer uses some pesticides.

Integrated Pest Management, (IPM), is an effective, but less harmful way of managing pests of all kinds. An IPM user looks at the whole picture — the pest, the host, and the environment. Then following IPM methods, the user chooses one or several ways to manage the pest.

Most pesticides are made from the same materials as gas and oil. Gas and oil are also used to apply pesticides. Through IPM, wiser use of pesticides helps to save energy.

The purpose of this project is for you to learn the basic ideas of IPM. You should be able to manage pests safely, using less energy and at a lower cost.

To Help You

As you read this publication, watch for words written in ***bold italics***. Look in the section “To Help You” in the back for an explanation of these words.

Acknowledgements

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Name _____

Date _____

Before You Begin

Please complete the questions below before you begin **Spray Away?**

Some of the questions will tell your leader something about you. Other questions will help your leader find out what you already know about pest management. Answer each question as well as you can, but don't worry if you can only answer a few. This is not a test, and you will not receive a grade for it. Take about ten minutes to work on these questions. When you finish this book complete the questions at the end. Your leader will be able to compare the two and show you how much you have learned.

I. Questions About You

1. What is your name? _____
2. How old are you? _____
3. What grade are you in? _____
4. How many years have you been in 4-H? _____
5. In what county? _____
6. Are you in a community 4-H Club,
or are you in a school or other 4-H group? _____
7. List the 4-H projects you are taking this year:

II. Questions about what you know.

Beside each of these statements, write whether you think it is true or false.

- _____1. Pesticides are poisons used to kill pests.
- _____2. Pesticides have no big advantages over other methods of pest management.
- _____3. A population contains organisms of many different species.
- _____4. The agency that enforces regulations about pesticides is called the Environmental Protection Agency.
- _____5. Some pesticides are more poisonous than others.
- _____6. A person can apply any pesticide he wants to, at any time he wants to.

Choose the **best** answer or completion to each of these questions.

- _____ 7. All of these are problems with pesticides except
(a) Misuse
(b) Pollution
(c) Control of Pests
(d) Nontarget organisms
- _____ 8. On a pesticide label, you will find information about all of these except
(a) Name of the pesticide
(b) A "signal word"
(c) First aid for exposure to the pesticide
(d) Using pesticides in a pest management program
- _____ 9. Pesticides which are very dangerous are labeled with the word
(a) Caution
(b) Danger
(c) Hazard
(d) Warning

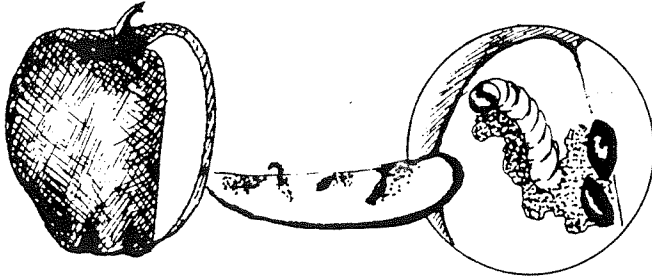
Write a word from the list in each blank space to complete each statement below. You will not use all of the words on the list.

Compete	Environment
Agriculture	Needed
Beneficial	Pesticides

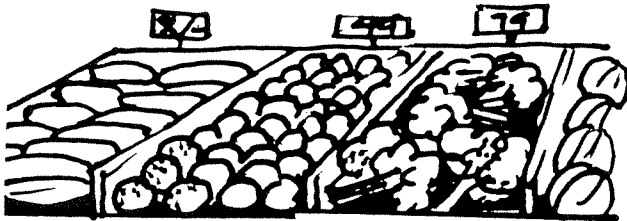
10. Pesticides are of great value in _____ .
11. Misusing pesticides can be dangerous to the applicator and the _____ .
12. Pesticides should be used as they are _____ .
13. When pests use the same resources that man does, they _____ with man.
14. Secondary pest outbreaks and return of large pest populations are both related to the killing of _____ organisms.

The Value of Pesticides

Before you bite an apple or another piece of fruit, do you ever wonder if you are going to find a worm? Are you sure that what you eat won't have bugs in it?

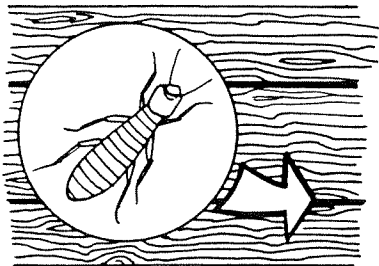


When your neighbor put in a lawn, did you wonder why more grass came up than weeds? Have you ever bought vegetables in the grocery store? Did you wonder why they were so healthy-looking and appetizing?

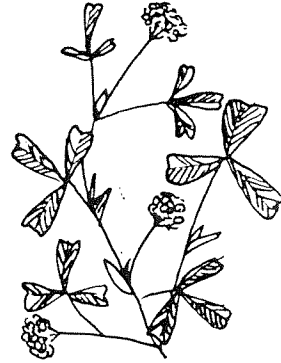


These are examples of the benefits of a very common type of chemical — **pesticides**. Pesticides are *poisons* used to kill **pests**. There are many different types of pesticides.

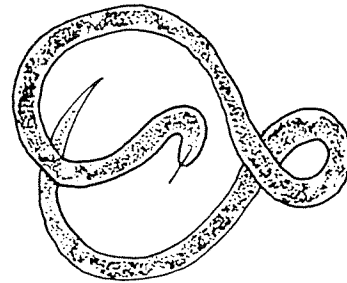
Insecticides are used to kill insects.



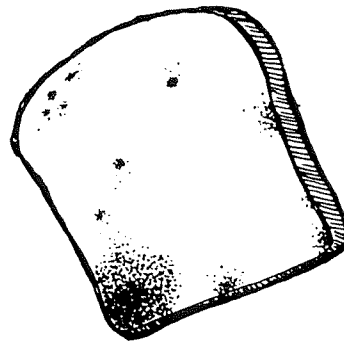
Herbicides are used to kill **weeds**.



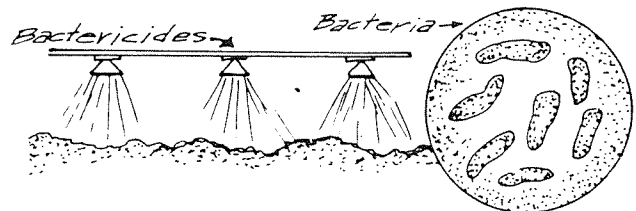
Nematicides are used to kill **nematodes**.



Fungicides are used to kill fungi (**mold** and **mildew**).



Bactericides are used to kill **bacteria**.



Rodenticides are used to kill rodents.

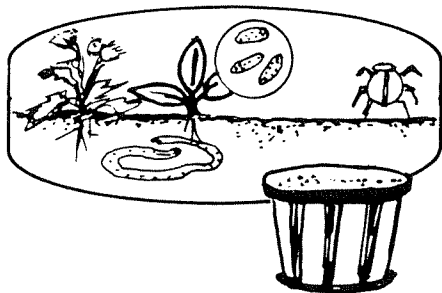
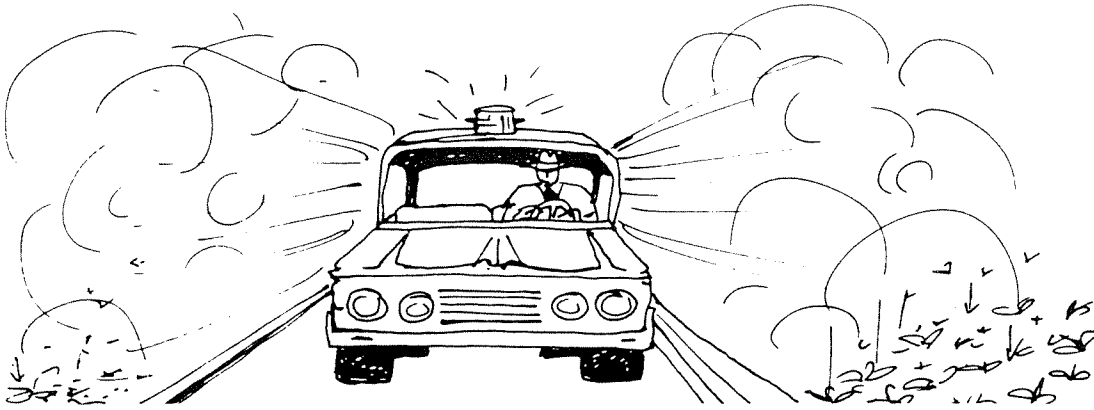


Other kinds of pesticides are used to kill other kinds of pests. Can you think of one plant, one warm-blooded animal, and one insect that are pests?

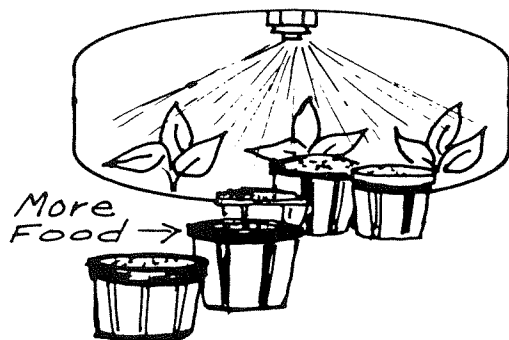
1. _____
2. _____
3. _____

Man has been helped by use of pesticides. Pesticides have helped to control diseases which affect man and his animals and crops.

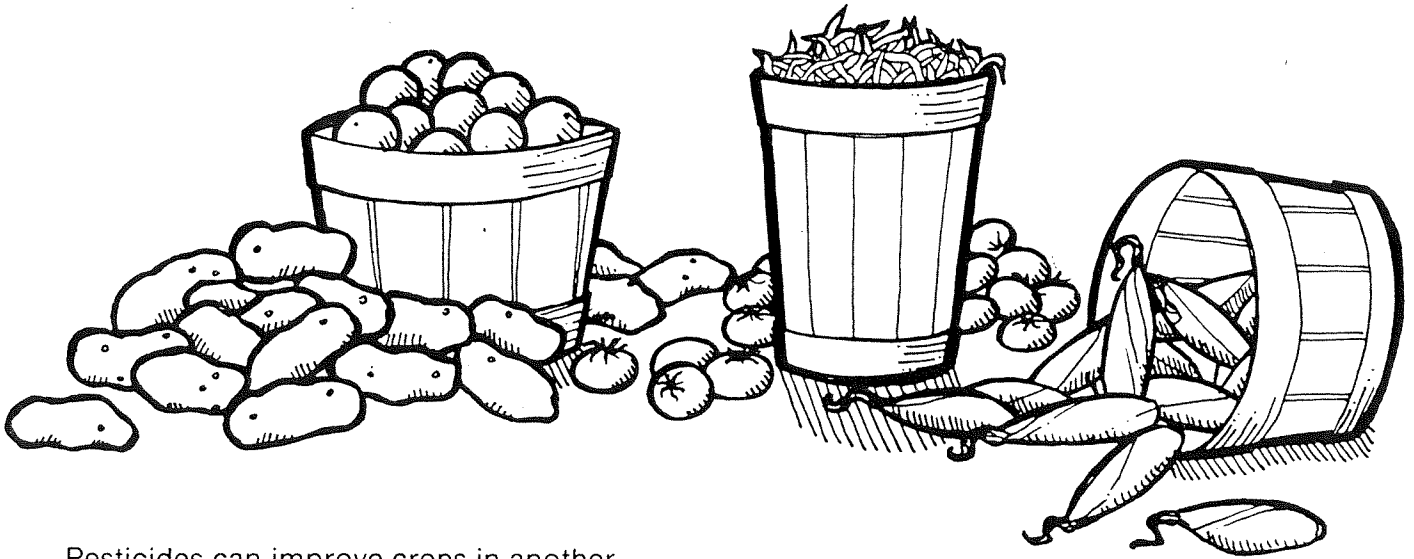
Insecticides kill mosquitoes, flies, fleas, and other insects that carry diseases. This has helped prevent the spread of disease.



Pesticides have also been of great value in **agriculture**. Pesticides have enabled farmers to produce more and better food than they ever could in the past.



When pests damage crops, they are using the same resources man uses. In this way, these pests are **competing** with man. Pesticides can reduce the number of pests on the crop. This helps save the crop. Fewer pests may increase the *quantity* of food farmers can grow.



Pesticides can improve crops in another way. Some pests do not destroy the crop. They just damage it so it cannot be used. By reducing the number of pests on the crop, pesticides can reduce the damage to the crop. In this way, pesticides can improve the *quality* of food a farmer can grow.

Pesticides have one big advantage over other methods of pest management. When a pesticide is applied, it usually kills the pest rapidly. Other methods require a longer period of time to take effect.

List some ways you think pesticides have made your life better.

Monitoring Pesticide Results — Counting Pests

To do this activity, you will need to find pests around your home that need to be controlled. Some pests may be:

- fleas or ticks on a pet
- roaches or ants in the kitchen
- pests in a vegetable garden
- weeds in a lawn
- pests on any agricultural crop, such as citrus, corn, soybeans, etc.
- pests on ornamental plants

List some other pests you can find around your home.

Select one kind of pest. Choose one that your parent or another adult will be controlling with a pesticide. Figure out a way to count the pest. Some possibilities are as follows:

Fleas — Count all the fleas you can see on your dog or cat for 30 seconds. It is easiest to count the fleas on your pet's stomach.

Ticks — Inspect your pet carefully, especially around its neck, ears, and legs. Count the ticks you find.

Roaches — Get some roach traps from the grocery store. Leave one in a dark place in your kitchen for several days. Count the roaches.

Ants — Make up a mixture of corn syrup and water. Put a little in a jar lid and place it in a dark place in your kitchen for 24 hours. Count the ants in the lid. Repeat this three or four times during the week.

Weeds — Measure a square in the lawn that is three feet long on each side. Count the number of weeds in the square. Repeat 3 or 4 times in different parts of the lawn.

Vegetable, crop, and ornamental pests — How you count one of these pests will depend on what pest it is. If you select weeds, you may choose to count them like you would in a lawn. If the pest is a disease, you may choose to count infected leaves per plant, or infected plants per square yard. If the pest is an insect, you may choose to count insects on one leaf, insects on one plant, or infested plants in one square yard. You may even figure out something else that will work better. Your leader can help you take several counts.

1. What pest did you choose? _____

2. Why is it a pest? _____

3. What method did you use to count? _____

If you chose a pest that you only counted once, answer question 4.

If you chose a pest you counted more than once, answer question 5.

4. How many of the pest did you count? Total _____

5. List the numbers of the pest you counted for each sample.

Sample 1 _____

Sample 2 _____

Sample 3 _____

Sample 4 _____

Add the total number of pests you counted. _____

Divide the total number of pests by the number of samples. This will give you an average number of pests. _____

After the pest *population* is treated with a pesticide, count the number of pests again. Use exactly the same method to count the pests the second time as you did the first time.

Answer either question 6 or 7.

6. How many of the pest did you count?	Total _____
7. Sample 1	_____
Sample 2	_____
Sample 3	_____
Sample 4	_____
Total	_____
Average number	_____

8. Compare your count before you treated with your count after you treated. Do you think the use of this pesticide is an effective way to manage this pest? _____

Why or why not? _____

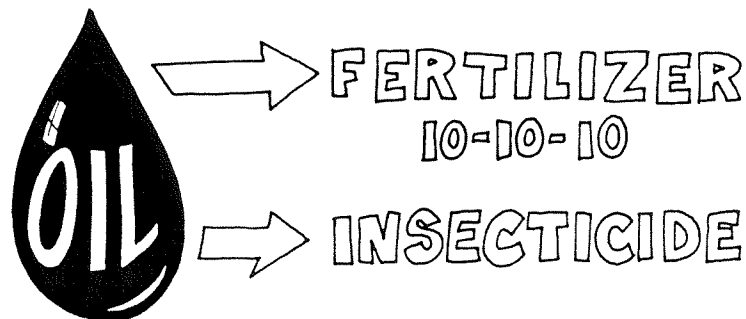
If not, what other type of pest management do you think might work? _____

Where Do Pesticides Come From?

When you walk into a garden center or farm store, you'll probably see shelves full of pesticides. Hundreds of different products made by many companies are for sale. Did you ever wonder where all of these came from?

Pesticides can be grouped according to what they are made from. One group is **Inorganic**. They are made from minerals like

copper, zinc, and sulfur. An example would be copper fungicide. The other main group is **Organic**. They are either **botanical** or **synthetic**. Examples of botanical pesticides are pyrethrins and nicotine. Synthetic pesticides are man-made, usually from petroleum (oil). They all contain the elements hydrogen and carbon and one or more other elements. This is by far the largest group of pesticides. Examples are 2,4-D, Captan, and Malathion.



Making and selling pesticides is not an easy task. Manufacturers can spend years of testing and millions of dollars just to get a single product on the market.

Many chemicals look promising as pesticides at first. Most don't make it to the garden store shelf. They turn out to be too hazardous or costly. Many are just not effective.

In order to be sold, a pesticide must be tested and registered by the U.S. Government. The Environmental Protection Agency (EPA), has been established to do this. Once all of

the necessary testing and reviewing is completed, the pesticide can then be sold.

The amount of energy used in making and applying pesticides is not very large. It is only a small part of the total amount of energy used in your home or in agriculture.

One kind of energy used in making and applying pesticides is *petroleum* energy. As petroleum energy becomes scarcer, petroleum-based pesticides will become more expensive. Pesticide-users will look for less expensive ways to control pests.

Pesticide Forms

Some pesticides can come in a ready-to-use form. Others may require dilution in water. The directions for use will tell you how to use the pesticide. Some common ways pesticides are made and used are listed below.

Liquid Forms

1. Emulsifiable Concentrate (EC or C)

These are very common forms of liquid pesticides. They are mixed with water to form **emulsions**. They don't need much **agitation** in the spray tank.

2. Flowables (F or L)

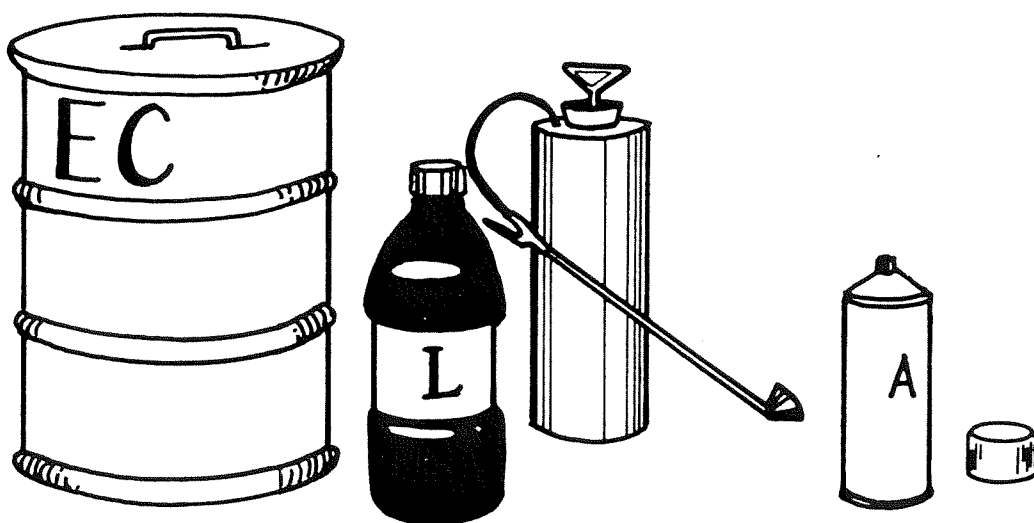
These are finely ground solids mixed with a liquid so that they can be poured. When mixed with water, they form **suspensions**, not emulsions. They require moderate agitation. These are also applied as liquid sprays.

3. Aerosols (A)

The liquid pesticide is forced out of the container by a **propellant**. These are used a lot as indoor insect "bombs" or "foggers."

4. Liquid Gases (Fumigants)

These are generally gases that turn to liquid form under pressure. When they are released, they turn back into a gas. These are commonly used to "sterilize" soil or "fumigate" houses.



Dry Forms

1. Dusts (D)

These are ready to use, finely ground, dry particles. They are put on dry.

2. Granules (G)

These are similar to dust, but not as finely ground. These also are meant to be put on or used dry, not mixed with water.

3. Wettable Powders (WP)

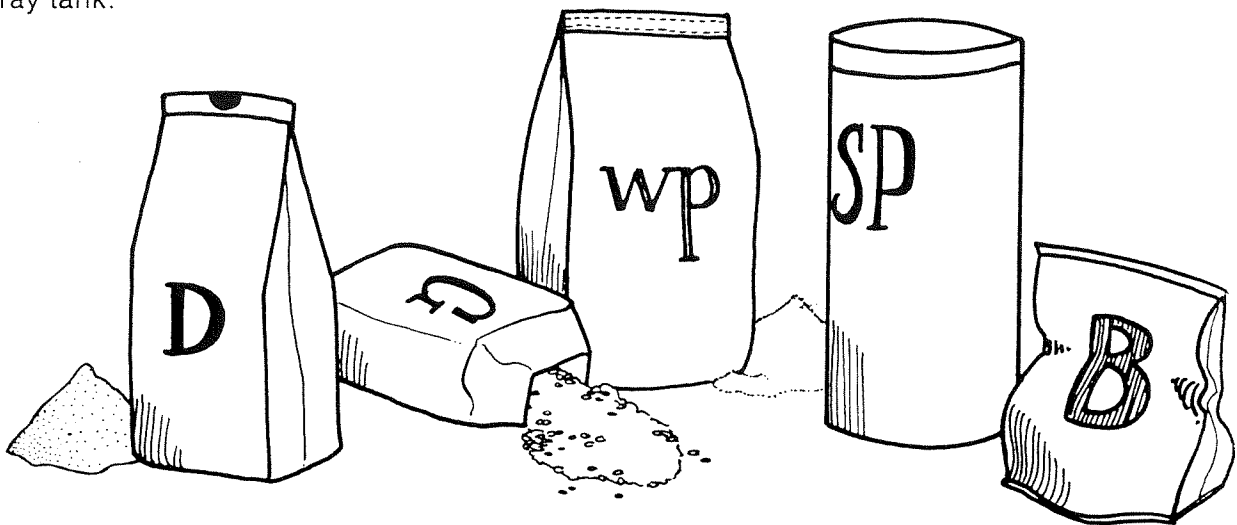
These are dry, but are meant to be mixed with water. When mixed, they form a suspension. These need a lot of agitation in a spray tank.

4. Soluble Powders (SP)

These are also dry but meant to be mixed with water. However, when mixed, these dissolve to form **solutions**.

5. Poisonous Baits (B)

A bait is a poison mixed with an attractive, edible substance. The bait attracts and the poison kills the pest. Baits are often used for rodents (rats and mice). Some baits can be mixed with water, but most are meant to be used dry.

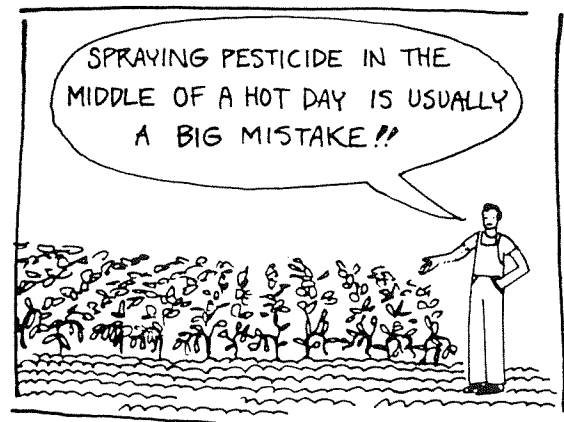
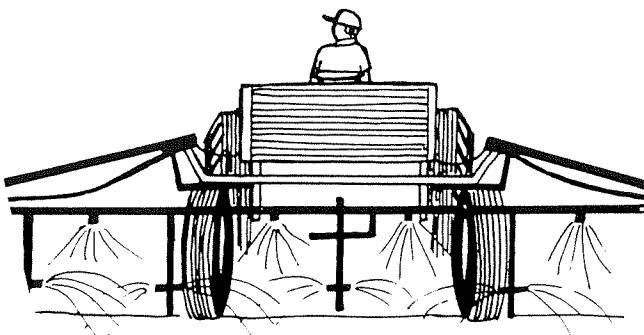


Problems with Pesticides

Pesticides are easy to get and to use. Their effectiveness is easy to see. But, many people have forgotten that there are other ways to manage pests. Pesticides have caused some problems.

1. Misuse of pesticides

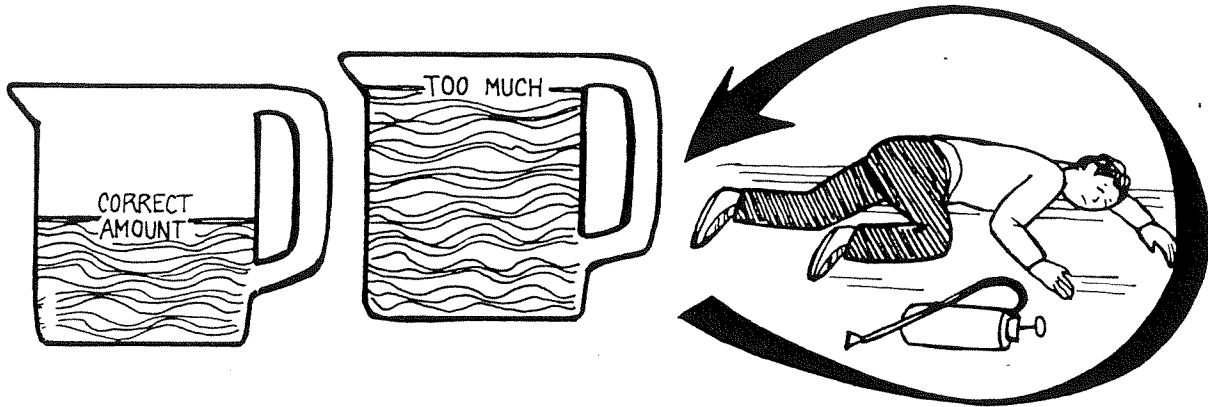
Pesticides can be misused in several ways. If someone applies a pesticide without reading the label, he may choose the wrong pesticide or may apply it at the wrong time. The pesticide may not kill the pests, or it may kill what he is trying to protect.



Even someone who reads the label may not follow the directions. He may decide that if what the label says to use is good, twice as much pesticide would be twice as good. Applying more pesticide than the

recommended amount is wrong. It endangers the **applicator** and the **environment**.

Misuse of pesticides can lead to other problems.

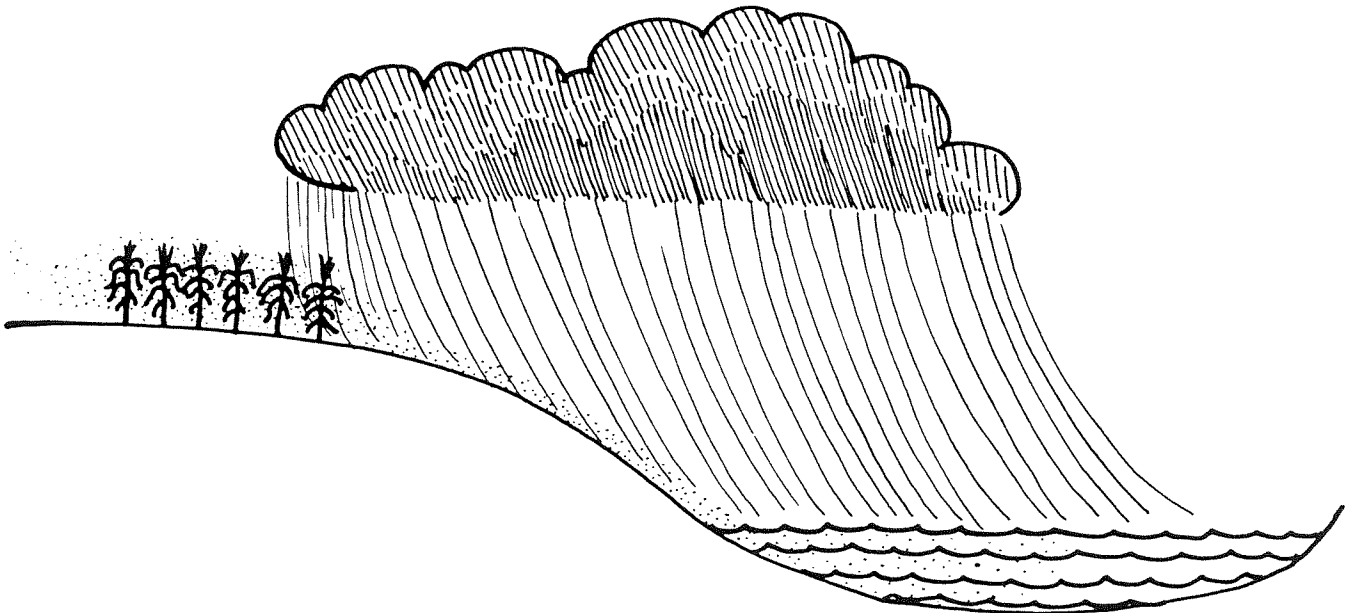


2. Contamination of the environment

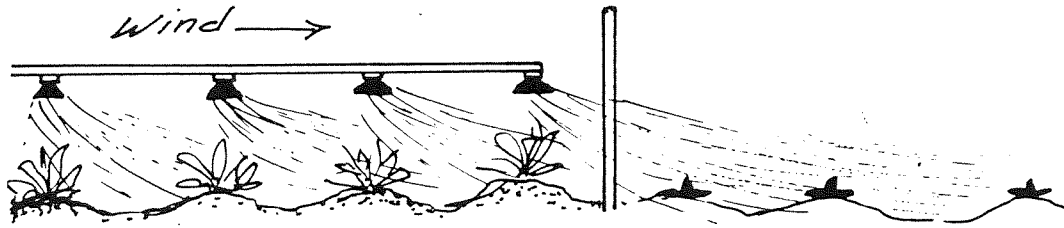
Pesticides can pollute streams, rivers, lakes, and even the ocean where they can kill fish and other aquatic life.

Rain may wash pesticides into the water from nearby fields that have been sprayed.

Careless pesticide users may accidentally contaminate streams and lakes. In some cities, homeowners have poured pesticide down their drains. Streams and lakes that receive drainage waters have become polluted.



Pesticides applied to crops may contaminate other nearby fields and crops if they are applied on a windy day.



Some pesticides may be dangerous to wildlife. Small animals near sprayed fields may be poisoned. Flesh-eating birds like vultures or eagles may eat small animals

poisoned by pesticides. Some pesticides then can cause these birds' egg shells to be very thin. The eggshells break before they hatch and the young birds inside die.



3. Resistance to pesticides

Some pests may become resistant to some pesticides.

For instance, the first time pests are sprayed with a pesticide, most of the pests may be killed. However, the next time they are

sprayed, some of the pests may be left alive. The pesticide may have lost its effectiveness to kill the pest. The pesticide has not changed, but the pest has developed resistance to the pesticide.

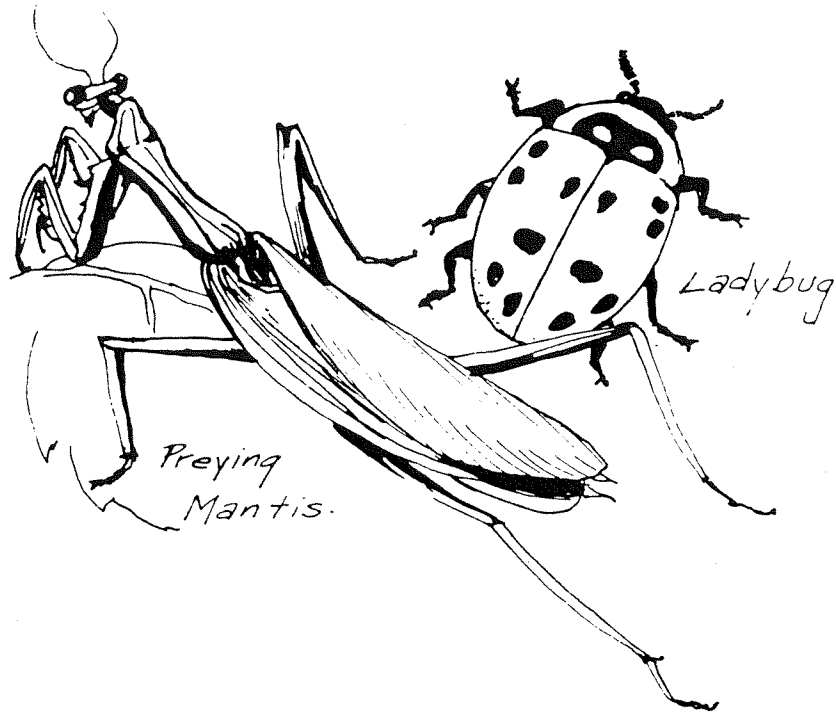


4. Nontarget organisms

Some organisms help to manage certain pests. For example, ladybugs and praying mantises eat other insects that may damage plants. Cats around a farm help manage rats and mice. These are **beneficial** or good organisms.

Pesticides used to kill pests may also kill beneficial organisms. In some cases, the beneficial organisms would be able to manage the pest if the pesticide were not applied.

Killing nontarget beneficial organisms is harmful!

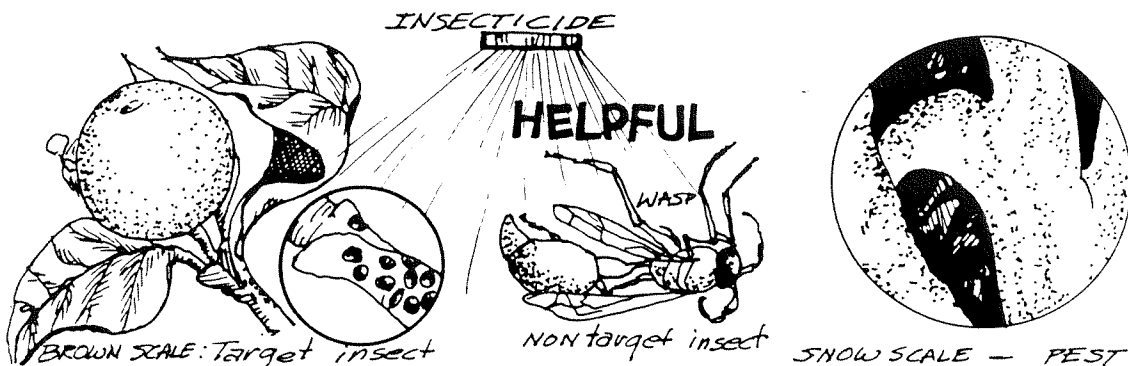


5. Secondary pest outbreaks

Once in a while, using a pesticide can cause some organism to become a pest. Here is an example of how this happens.

In some areas, an insect called **soft brown scale** is a pest on citrus. It is often controlled by spraying with an insecticide.

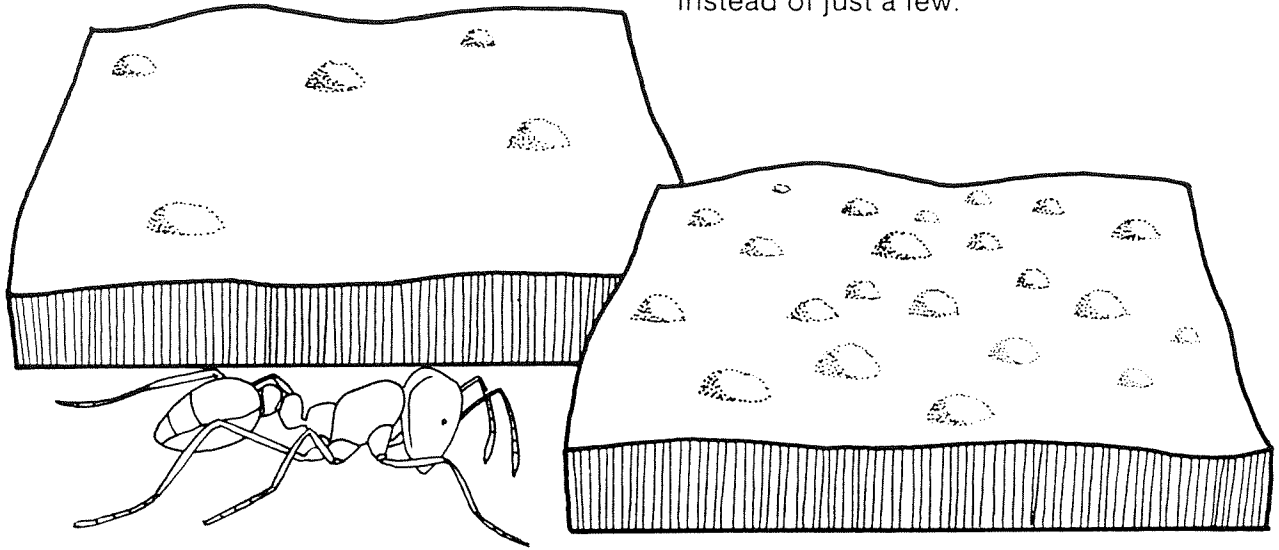
The insecticide may also kill a wasp that feeds on another insect called **snow scale**. Then, there are fewer wasps to eat the snow scale. The number of snow scale insects can increase and snow scale becomes a pest on citrus trees.



6. Resurgence

The resurgence of a pest population may also occur. When pests are sprayed with a pesticide, many of the pests are killed. However, the pest population doesn't remain small for long. Other organisms which compete with or eat the pest may be killed, too. Then the number of pests increases very quickly.

An example was the resurgence of fire ants after they had been treated with the insecticide Mirex. Before an area was treated, there were only a few fire ant nests per acre. When the area was treated with Mirex, not only the fire ants, but many other ants were killed. Some of the other ants were competitors with fire ants. Fire ants from outside the area moved in and built new nests much faster than other species of ants. Soon there were many fire ant nests per acre instead of just a few.



Make a Scrapbook

Read your local newspaper for articles about the problems with pesticides. Cut out the articles and save them in a notebook. Separate them by what kind of problem they are about. Such as contamination, or the energy crisis.

Try to get at least one article about each kind of problem. You may want to look in magazines as well as your local paper.

Make a list of the pesticides mentioned in each article.

1. Misuse

2. Contamination

3. Resistance

4. Secondary outbreaks

6. Resurgence

5. Nontarget organisms

Do any of the pesticides appear in more than one category?

Helping Solve the Problems — Regulations, Labeling, and Safety

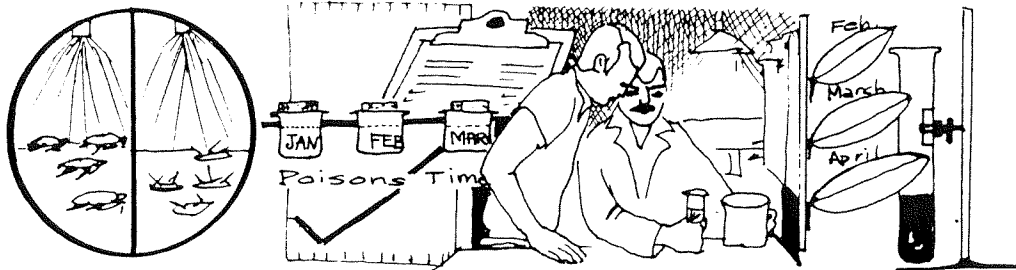
The government has developed regulations to reduce the problems with pesticides. The agency that enforces these regulations is the Environmental Protection Agency, usually called EPA.

Only pesticides that the EPA approves can be sold in the United States. The EPA must

decide whether or not to approve each new pesticide.

Scientists test each new pesticide to learn many things about it. Some of the things they test are what it will kill, what it will not kill, how long it stays poisonous after it is used, and how poisonous it is.

Based on these tests, the EPA must decide whether or not to approve each new pesticide. The EPA will not approve some pesticides because they may be too dangerous to man or to the environment.

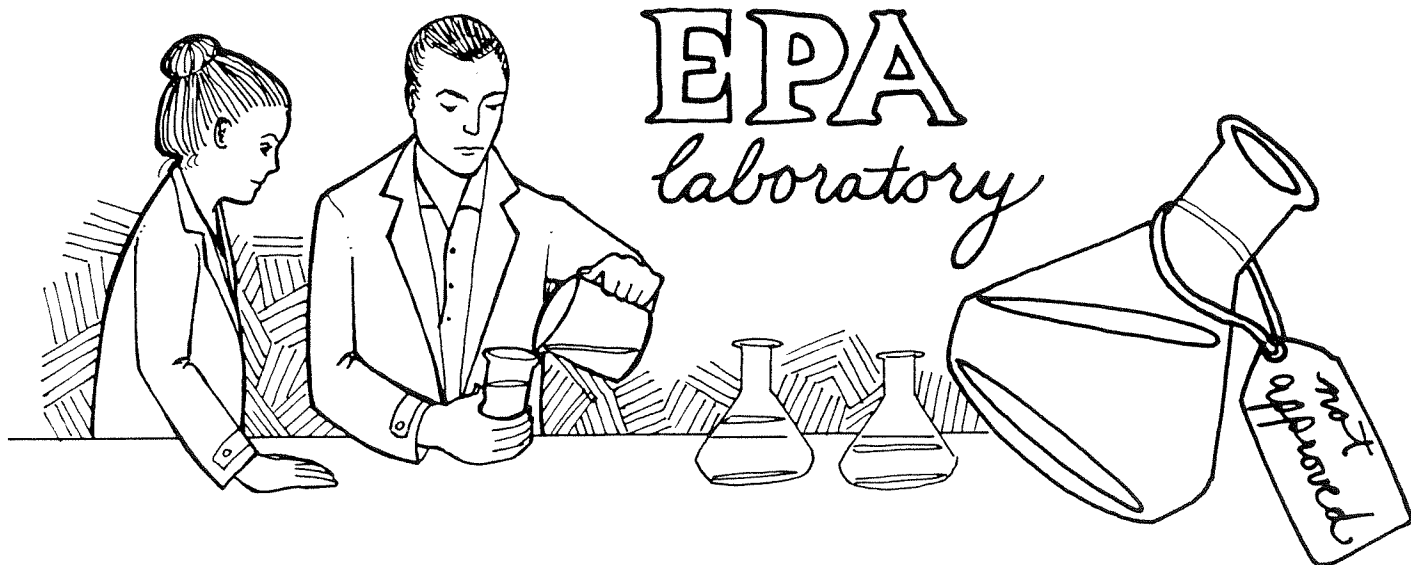


If the EPA approves a pesticide, it will be classified in one of two ways:

1. **General Use** — These are not as dangerous as “restricted use” pesticides. Anyone who walks into a store can buy “general use” pesticides.



2. **Restricted Use** — These are dangerous poisons. Only persons with special training in handling and applying pesticides can buy them. These pesticides may be harmful even when used as the label states.



Pesticide Labels

The information on pesticide labels is carefully controlled. Labels must have certain

information on them, in certain places. This information helps people use pesticides safely and correctly.

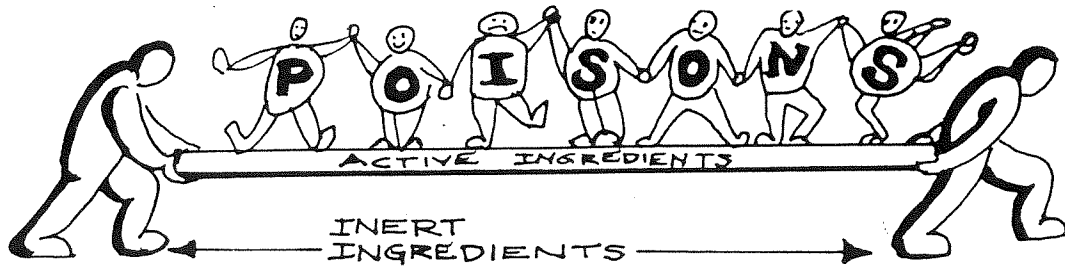
<div style="border: 1px solid black; padding: 5px; margin-bottom: 5px;"> <p style="text-align: center;">PRECAUTIONARY STATEMENTS HAZARDS TO HUMANS (& DOMESTIC ANIMALS) CAUTION</p> <p>_____</p> <p>_____</p> <p>_____</p> </div> <div style="border: 1px solid black; padding: 5px; margin-bottom: 5px;"> <p style="text-align: center;">ENVIRONMENTAL HAZARDS</p> <p>_____</p> <p>_____</p> <p>_____</p> </div> <div style="border: 1px solid black; padding: 5px; margin-bottom: 5px;"> <p style="text-align: center;">PHYSICAL OR CHEMICAL HAZARDS</p> <p>_____</p> <p>_____</p> <p>_____</p> </div> <p style="text-align: center;">DIRECTIONS FOR USE</p> <p style="text-align: center;">GENERAL CLASSIFICATION</p> <p style="font-size: small;">It is a violation of Federal law to use this product in a manner inconsistent with its labeling.</p> <p style="text-align: center;">RE-ENTRY STATEMENT (If Applicable)</p> <p>_____</p> <p>_____</p> <div style="border: 1px solid black; padding: 5px; margin-bottom: 5px;"> <p style="text-align: center;">STORAGE AND DISPOSAL</p> <p>STORAGE _____</p> <p>_____</p> <p>DISPOSAL _____</p> <p>_____</p> </div> <p>CROP _____</p> <p>_____</p> <p>_____</p> <p>_____</p>	<div style="border: 1px solid black; padding: 20px; text-align: center; margin-bottom: 10px;"> <h2 style="margin: 0;">PRODUCT NAME</h2> </div> <table style="width: 100%; border: none;"> <tr> <td style="width: 50%;">ACTIVE INGREDIENT _____</td> <td style="width: 5%;">%</td> </tr> <tr> <td>INERT INGREDIENTS _____</td> <td>%</td> </tr> <tr> <td>TOTAL _____</td> <td>100.00%</td> </tr> </table> <p style="text-align: center;">THIS PRODUCT CONTAINS LBS. OF PER GALLON</p> <div style="border: 1px solid black; padding: 10px; text-align: center; margin-bottom: 10px;"> <p style="margin: 0;">KEEP OUT OF REACH OF CHILDREN</p> <h2 style="margin: 0;">CAUTION</h2> </div> <p style="text-align: center;">STATEMENT OF MEDICAL TREATMENT</p> <p>IF SWALLOWED _____</p> <p>IF INHALED _____</p> <p>IF ON SKIN _____</p> <p>IF IN EYES _____</p> <p style="text-align: center;">SEE SIDE PANEL FOR ADDITIONAL PRECAUTIONARY STATEMENTS</p> <p>MFG BY _____</p> <p>TOWN, STATE _____</p> <p>ESTABLISHMENT NO. _____</p> <p>EPA REGISTRATION NO. _____</p> <p>NET CONTENTS _____</p>	ACTIVE INGREDIENT _____	%	INERT INGREDIENTS _____	%	TOTAL _____	100.00%	<p>CROP _____</p> <p>_____</p> <p>_____</p> <p>_____</p> <p>CROP _____</p> <p>_____</p> <p>_____</p> <p>_____</p> <p>CROP _____</p> <p>_____</p> <p>_____</p> <p>_____</p> <p>CROP _____</p> <p>_____</p> <p>_____</p> <p>_____</p> <p>CROP _____</p> <p>_____</p> <p>_____</p> <p>_____</p> <p style="text-align: center;">WARRANTY STATEMENT</p> <p>_____</p> <p>_____</p> <p>_____</p>
ACTIVE INGREDIENT _____	%							
INERT INGREDIENTS _____	%							
TOTAL _____	100.00%							

Refer to the sample label as you read the explanation of a pesticide label:

Name — The name of the pesticide is placed in this block on the label. A short statement of what the pesticide is for may be included here.

Ingredients — “Active” ingredients are those which are actually poisonous. “Inert”

ingredients are necessary for “carrying” the poison. This means that they give the pesticide the properties necessary to kill the pest. Inert ingredients may also cover or change the smell of the pesticide. By themselves, inert ingredients are not pesticides.



Signal Words — Signal words indicate how poisonous the pesticide is. If the word is “Danger,” the pesticide is very dangerous, and only a small amount will kill a person. A pesticide labeled “warning,” is not as poisonous as one labeled “Danger.” A pesticide labeled “Caution” is less poisonous

than either of the other two. ALL OF THEM ARE POISONOUS!

The statement “Keep out of reach of children” must appear on all pesticide labels.

This part of the label also lists first-aid for pesticide poisoning.

Caution
DANGER
WARNING
POISONS
danger

Precautions — This section of the label lists information about the dangers that the pesticide may pose to people, their animals, and the environment.

Directions for Use — The pesticide should be used exactly as the directions state.

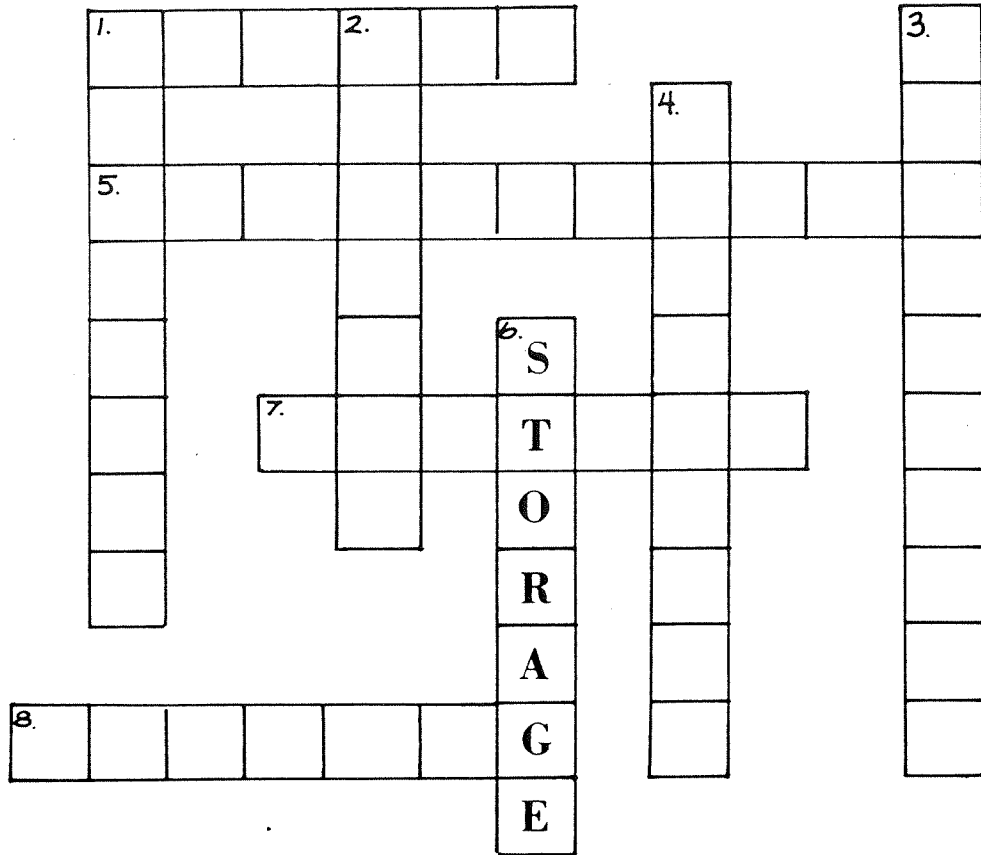
Storage and Disposal — Instructions about the storage of the pesticide, and the disposal of unneeded pesticide or the empty container are listed.

Use — Approved uses of the pesticide are listed.

Warranty Statement — This is an explanation of what the manufacturers promise that the pesticide will or will not do.

These regulations and laws are for the safety and protection of people who use pesticides.

This crossword puzzle contains words and terms related to pesticide labeling. In case you have never worked a crossword puzzle, this is how: You are given a set of clues. Each clue describes a word about pesticide labeling. Figure out what each word is. Then write it in the row of boxes that begins with the number of the clue. An example is given for you: Clue number 6 Down is "Pesticides must be kept in proper _____." The word is "storage." It has been filled in for you. If you have trouble, your leader can help you.



Across:

1. Pesticides labeled _____ are more poisonous than pesticides labeled either "Caution" or "Warning."
5. _____ tell how poisonous a pesticide is.
7. Pesticides labeled _____ are more poisonous than those labeled "Warning," but less poisonous than those labeled "Danger."
8. Pesticides labeled _____ are less poisonous than pesticides with other signal words.

Down:

1. Pesticide labels give instructions for storage and _____ of pesticides and containers.
2. _____ use pesticides can be used by anyone.
3. _____ use pesticides can only be bought by someone with special training.
4. All pesticides are _____.
6. Pesticides must be kept in proper _____.

Handling Pesticides

People who use or handle pesticides may need to wear protective clothing. They should wear long-sleeved shirts and long-legged trousers or a coverall-type garment. The pesticide label may say to wear additional protective clothing, such as:

Gloves — Needed to handle concentrated or highly poisonous materials. Gloves should be unlined neoprene (rubber) unless the pesticide label says otherwise.

Hat — Needed to protect the head. A wide brimmed water-proof hat is best. It will help protect the face and neck. It should not have a cloth or leather sweatband, which is too hard to clean if chemicals get on it.

Boots — Unlined, neoprene boots should be worn unless the pesticide label says otherwise.

Goggles or Face Shield — Goggles or a face shield should be used if there is any chance of getting pesticides in the eyes or mouth.

Respiratory Protective Devices — These protect the lungs. They may be used:

1. in an enclosed area.

or

2. when pesticide is highly poisonous.

or

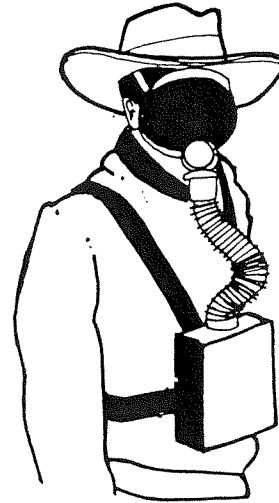
3. the user will be exposed to the pesticide for a long time.

There are several types of respiratory protective devices. They are:

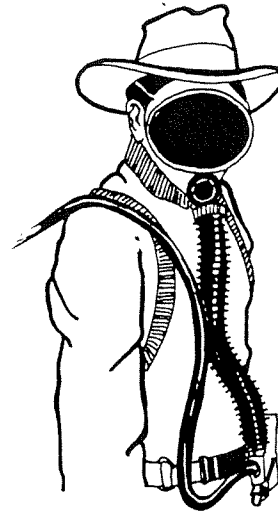
1. Chemical cartridge respirator



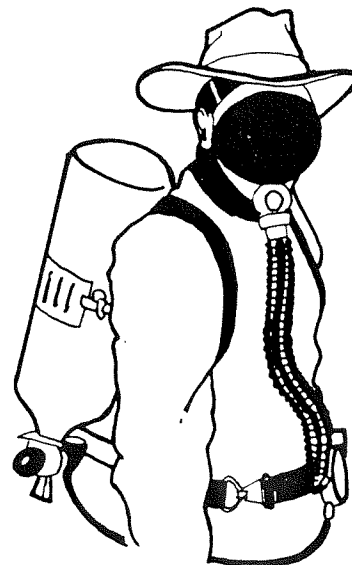
2. Chemical cannister respirator (gas mask)



3. Supplied air respirator



4. Self-contained breathing apparatus



Reading the pesticide label will help the user decide whether or not the lungs need to be protected. Your county Extension agent or other authority can give more information on pesticides.

The pesticide user should wear clean clothing daily. If clothes get wet with spray,

they should be changed **IMMEDIATELY**. Pesticide contaminated clothes must not be washed with home laundry. They should be washed and dried separately, using plenty of soap and water.

Pesticide Storage and Disposal

Unused pesticides must be stored properly to prevent damage to:

- People (especially children)
- The environment
- Pets and domestic animals
- The containers themselves

Always store pesticides in the original, tightly closed containers. Keep the labels attached. Read the pesticide label. There may be additional storage information there. Always store pesticides in a dry, weather-proof place. It is best to have a separate building just for storage of large amounts of pesticides. This area should be locked to keep out unwanted people. Warning signs should be posted to keep people away. Fire should be kept away from storage area. No smoking should be allowed. Good **ventilation** is necessary in the area.

Following these rules should help prevent storage problems.

Extreme care must also be used when disposing of pesticides. This is to keep from **contaminating** the air, water, and soil. It is important to read the label for disposal directions for leftover or spilled pesticide, and empty pesticide containers.



What's wrong with this picture?

HOW PESTICIDES ARE USED IN IPM

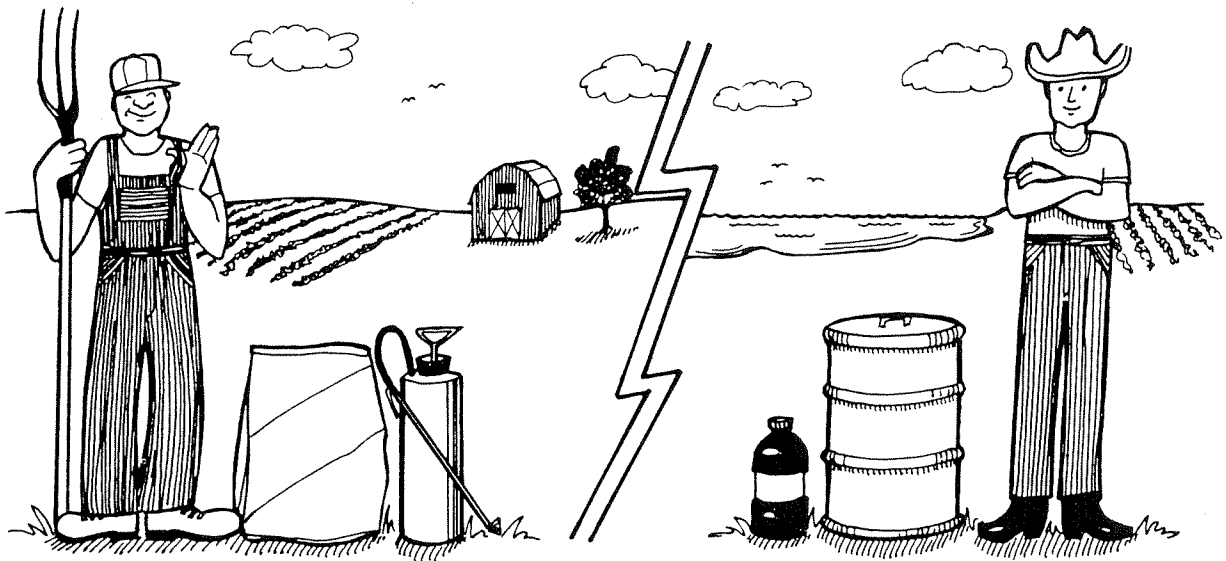
Pesticides are an important tool in an Integrated Pest Management Program. They are equal in importance to the other IPM tools that you learned about in **A Peek at Pests**:

- Mechanical methods
- Physical methods
- Biological methods
- Cultural methods
- Regulatory methods
- Host resistance

In **A Peek at Pests**, you also learned about the six step IPM process:

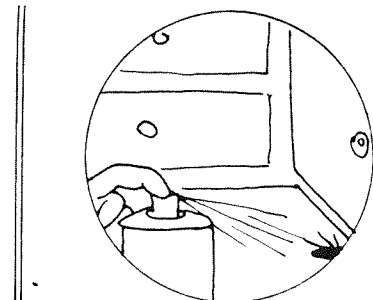
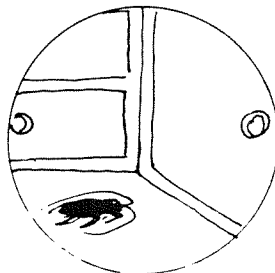
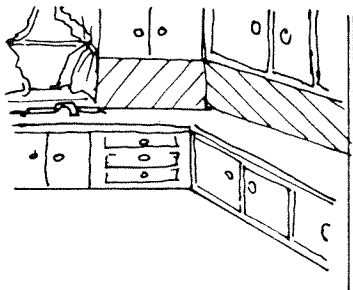
- Step 1. Identification
- Step 2. Prevention
- Step 3. Monitoring
- Step 4. Prediction
- Step 5. Decision
- Step 6. Evaluation

At Step 5, a person must decide what pest management method to use. He must consider all of the tools of IPM, and choose the one that will work best in his situation.



Pesticides will not prevent pests from occurring. They can be used to eliminate

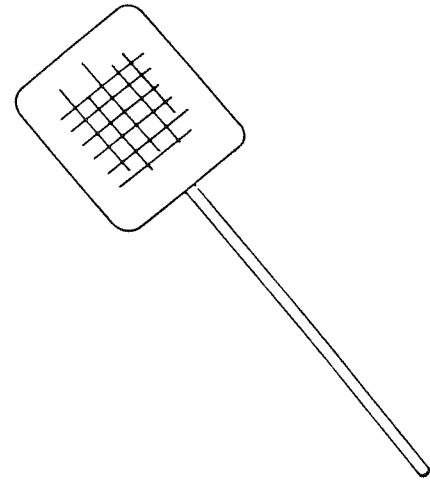
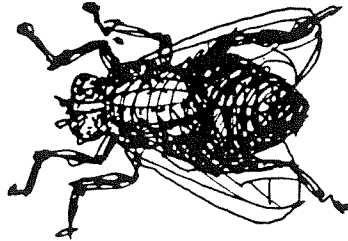
pests that already exist. In other words, they should only be used as they are needed.



Someone who considers using a pesticide needs to ask himself the following questions:

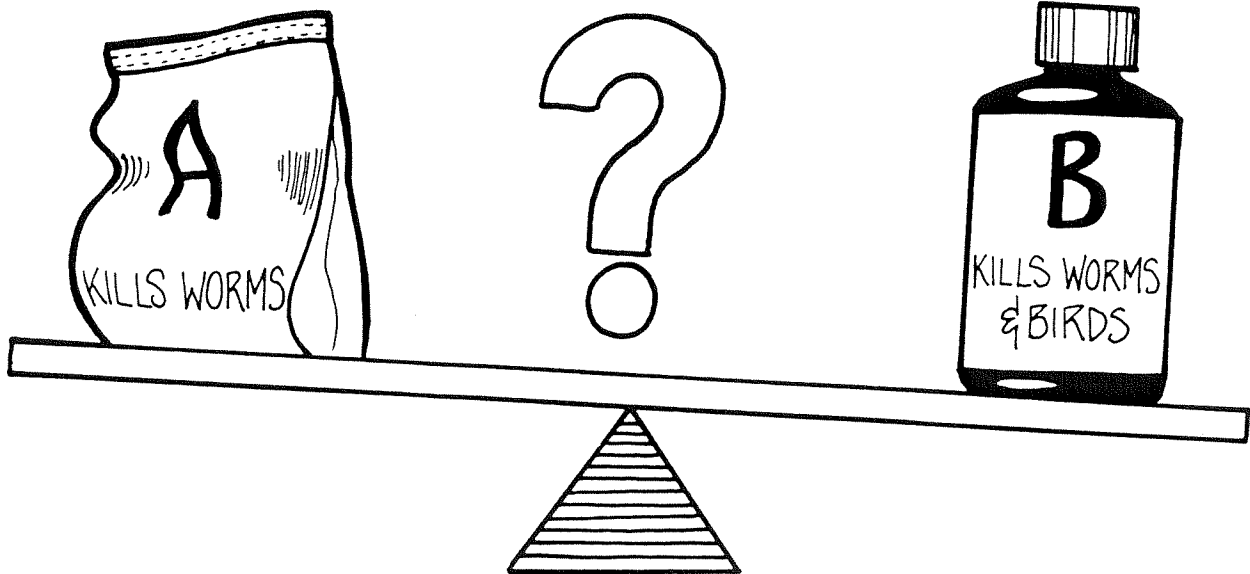
- Will another tool solve the problems?
- If so, when do I need to use it?

- How will using a pesticide affect the other tools, especially beneficial organisms?



If a person decides to use a pesticide, then he must also decide which one to apply. He must ask himself:

- Which pesticide will kill the pest?
- Which pesticide will have the fewest side effects?



The pesticide which does both is the best pesticide for the job.

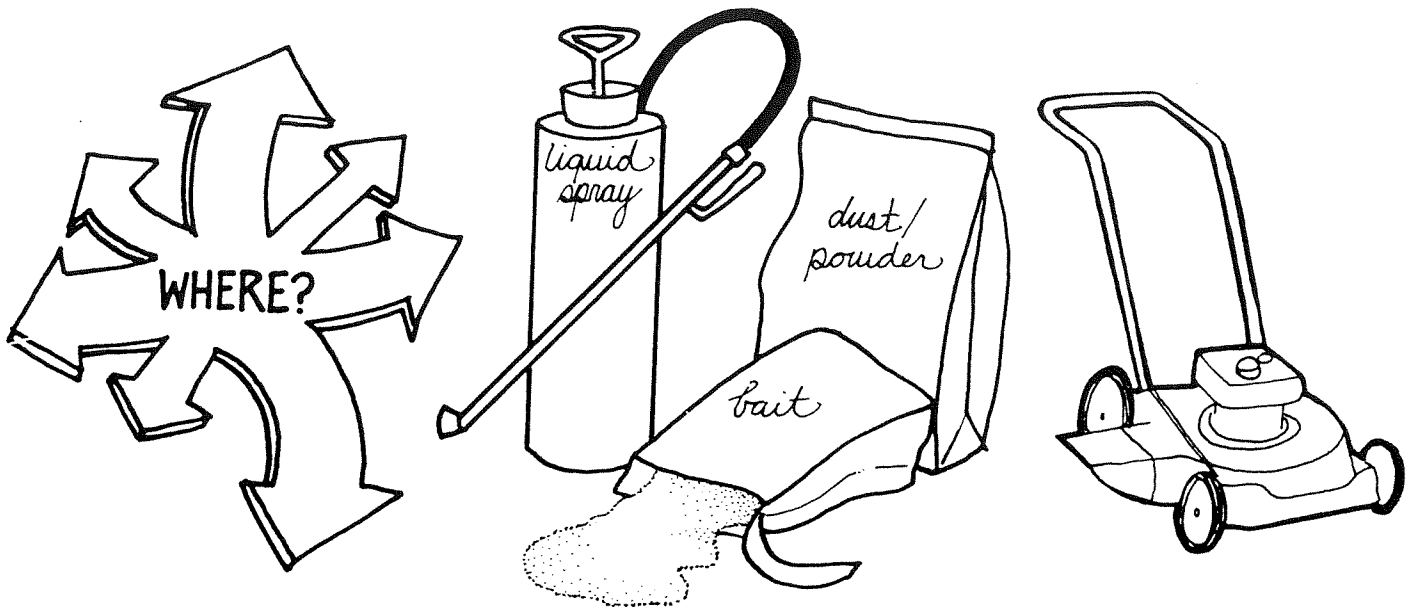
After he decides which pesticide to use, a person must decide how to apply it. The method he uses can affect how well it kills the pest and how it affects the other tools. He needs to consider:

- Where to apply the pesticide. For example, he may wish to control flies in manure in his barn. If he sprays the manure pile directly, he will kill many beneficial

organisms as well as the flies. If he sprays the ceiling, however, the flies will walk in the poison and die, but nothing else will be killed.

- What form of pesticide to use. For example, he can put poison bait out for some pests to eat, and kill them without having to apply a liquid spray.

- Other methods. He can use other tools such as mowing (a cultural method) to make the pesticide easier to apply and cut down on the amount needed.



Summing Up

As you can see, using a pesticide requires thought and preparation. Go back to the pest "counting" activity you did earlier in this unit. Ask the adult who helped you before to help you again.

1. Can either of you think of another tool that might have solved the problem? _____

What? _____

2. Call your county Extension office. Your leader can tell you the right person to ask for. Find out what other methods of management are available for the pest you chose. What are they?

Are any Extension circulars available on these methods?

3. Ask the adult who helped you before to help you try one or more pest management methods instead of pesticides. Which one did you choose? _____

Did it work? _____

Do you know why or why not? _____

You have now covered the basic information needed to carry out an IPM program. If you are interested in learning more about this process and how to use it, you can obtain the following supporting material for **Spray Away?** from your leader or county Extension agent. These include:

4-H 368 A Peek at Pests

4-H 371 Not to Me, You Don't or Plants that are Protected from Pests

4-H 373 Pests on Stage

4-H 374 ABC's of IPM or Putting It All Together

4-H 372 Cultural Controls to Manage Pests or Changing the Pests' World

4-H 370 Using Natural Enemies to Manage Pests

Conclusion

As you can see, using a pesticide requires careful thought and preparation. Not only must you know the pest, but you must select the right pesticide. You must then use this pesticide properly.

Remember, pesticides are only one tool of an IPM program. They are necessary and important, but often are not essential. Sometimes, we can do without pesticides. Use pesticides only when you must. When you do use them, read their labels and use them safely.



Name _____

Date _____

Now That You Are Finished

Now that you are finished with this book, answer the following questions. They are the same questions that you answered before you began. You are not going to receive a grade on your answers. Comparing these answers with your first answers should show you how much you have learned.

Beside each of these statements, write whether you think it is true or false.

- _____1. Pesticides are poisons used to kill pests.
- _____2. Pesticides have no big advantages over other methods of pest control.
- _____3. A population contains organisms of many different species.
- _____4. The agency that enforces regulations about pesticides is called the Environmental Protection Agency.
- _____5. Some pesticides are more poisonous than others.
- _____6. A person can apply any pesticide he wants to, at any time he wants to.

Choose the best answer or completion to each of these questions.

- _____7. All of these are problems with pesticides except
 - (a) Misuse
 - (b) Pollution
 - (c) Control of pests
 - (d) Nontarget organisms
- _____8. On a pesticide label, you will find information about all of these except
 - (a) Name of the pesticide
 - (b) A "signal word"
 - (c) First aid for exposure to the pesticide
 - (d) Using pesticides in a pest management program
- _____9. Pesticides which are very dangerous are labeled with the word:
 - (a) Caution
 - (b) Danger
 - (c) Hazard
 - (d) Warning

Write a word from the list in each blank space to complete each statement below. You will not use all of the words in the list.

Compete

Environment

Agricultural

Needed

Beneficial

Pesticides

- 10. Pesticides are of great value in _____.
- 11. Misusing pesticides can be dangerous to the applicator and the _____.
- 12. Pesticides should be used as they are _____.

13. When pests use the same resources that man does, they _____ with man.
14. Secondary pest outbreaks and return of large pest populations are both related to the killing of _____ organisms.

Glossary — To Help You

1. **Agitation** — Shaking or mixing up.
2. **Agriculture** — Growing food and fiber. Agriculture includes both growing crops like corn, wheat, peaches, and cotton and raising livestock like chickens, cattle, and hogs.
3. **Applicator** — Someone who uses or applies something, in this case, pesticide.
4. **Arthropod** — An invertebrate animal with jointed legs and segmented body parts. Examples: insects, spiders and crabs.
5. **Aquatic** — Refers to water. It can refer to a plant or animal that lives in water.
6. **Bacteria** — Microscopic organisms that live in soil or water, on plants, or in the bodies of animals or man. Sometimes bacteria causes diseases.
7. **Beneficial** — Helpful; something that is good, or that helps something else.
8. **Beneficial Organism** — A plant or animal that helps control a pest species, or helps plants or animals in some way.
9. **Botanical Pesticide** — A pesticide made from plants. They are also called plant-derived pesticides.
10. **Breeder** — One who produces and/or develops new offspring with good qualities.
11. **Carbon** — An element found in all organic substances. In chemistry, it is represented by the symbol C.
12. **Chemical Pesticides** — Poisons that are used to kill organisms that man regards as pests. Pesticides that kill insects are called **insecticides**. Poisons that kill weeds are called **herbicides**. Poisons that kill mold and mildew are called **fungicides**. Many other kinds of pesticides are available.
13. **Chlorophyll** — The green coloring matter contained in leaves. It is needed for photosynthesis to provide plant food.
14. **Compete, Competitors** — Two or more plants or animals trying to use the same resource, and each one reduces the amount of the resource that the other one can use.
15. **Compost** — Plant materials, like grass clippings and vegetable trimmings from the kitchen. To make a compost, make a pile of these things where it will be out of the way and let it rot. Then add it to the soil in the garden.
16. **Contamination, Contaminating** — When something undesirable or unclean enters an area. For example, a pesticide may contaminate streams and rivers, or anything else it may contact.
17. **Cultivation** — Plowing or tilling to improve soil for raising crops.
18. **Desired** — Wanted; wished for.
19. **Density** — The population in a known area.
20. **Dilution** — To make weaker or less strong by adding a liquid, such as water.
21. **Ecological, ecologically** — All relations between organisms and their environment. Ecology — The study of animals and plants, and the way they interact with the environment.
22. **Economical, economically** — Avoiding waste; thrifty; money-saving.
23. **Effective, effectiveness, effectively** — Producing the results wanted; working properly.
24. **Emulsion** — A mixture in which one liquid dispersed as “tiny drops,” “floats” in another liquid. An example is oil in water.
25. **Environment** — Surroundings, including anything that affects man, other animals or plants.
26. **Eradicate** — To abolish or completely get rid of; to destroy.
27. **Evaporates** — Changing from a liquid to a gas or vapor such as water to steam.
28. **Exposure** — Coming in contact with.
29. **Fossil fuels** — A naturally occurring fuel such as crude oil or natural gas. They are formed from the fossil remains of prehistoric plants and animals. They are refined into gasoline, diesel, kerosene, etc.

30. **Fumigant** — A pesticide that is applied as a gas instead of a liquid. Instead of being sprayed like a liquid, it is held in a confined space (in a house or in the soil, for example). The vapors or fumes (smell) are poisonous to the pest.
31. **Gall** — A hard, knobby "swelling" on some part of a plant.
32. **Germinate** (germinating) — The sprouting of a seed, and early growth of the tiny plant below the soil.
33. **Habitat** — Where a plant or animal lives. Examples: field, a forest, or the ocean.
34. **Host** — Any plant or animal that shelters or gives a home to a parasite or other natural enemy.
35. **Humidity** — the moisture content in the air.
36. **Hydrogen** — The lightest of all chemical elements. With oxygen, it forms water. It is also found in combination with other elements. In chemistry, it is represented by the symbol H.
37. **Infect** — To contaminate as to cause disease.
38. **Infested** — Overrun with pests.
39. **Inorganic** — Not organic; not being animal or plant.
40. **Larva** — One stage in the life of some insects. A larva hatches from an egg. When it has grown as large as it is going to, it becomes a pupa, and then an adult. Some kinds of larvae are caterpillars, or maggots, or grubs.
41. **Maggot** — The young or immature form of a fly. Maggots look like short, fat worms.
42. **Metamorphosis** — the changes that an insect or other arthropod goes through from the time an egg is laid until it becomes an adult.
43. **Mildew** — a soft, fuzzy growth, usually whitish or gray.
44. **Misused** — Used wrongly or improperly.
45. **Mold** — a soft, fuzzy growth. Molds come in many colors.
46. **Natural enemy** — An organism that kills and eats, or lives on another organism.
47. **Nematode** — A tiny worm-like organism that lives in the soil and damages the roots of plants. Nematodes may live in the soil, in water, in animals, or in plants.
48. **Nontarget** — An organism a pesticide kills that is not supposed to be killed.
49. **Nutrients** — Food; substance that promote growth and development in plants and animals.
50. **Nymph** — An immature insect that is similar to the adult it will become.
51. **Organic** — Having to do with plants or animals. Containing carbon.
52. **Organisms** — Living things; includes all animals and plants.
53. **Parasites** — An animal or plant that lives on or in another organism, from which it gets food and shelter. In **IPM**, a natural enemy that kills pests. Parasites are usually smaller than the pests. Example: fly maggots eating large caterpillars.
54. **Pathogen** — Very tiny organism that causes a disease. The three types of pathogens are fungi, bacteria, and viruses.
55. **Pest** — An organism that hurts something or is bad for something that belongs to man. A pest may be an insect, a plant, an animal, a disease, or any other kind of organism.
56. **Pesticides** — Poisons that are used to kill organisms that man regards as pests. Insecticides kill insects. Herbicides kill plants. Fungicides kill fungi, etc.
57. **Petrochemicals** — Chemicals made from petroleum (natural gas and crude oil).
58. **Photosynthesis** — formation of carbohydrates in green leaves of plants in the presence of light. The leaf cells contain chlorophyll.
59. **Pollute, Pollution** — Similar to contamination, but the term pollution refers mainly to the environment.
60. **Population** — A group of organisms, all of the same species, that lives in an area. They are capable of reproducing.
61. **Post treatment count** — The number of pests you count *after* you treat the population with a pesticide.

62. **Predators** — Natural enemies that kill and eat pests. Predators are usually larger than pests. Example: cat = predator, mouse = pest.
63. **Prefer** — To choose over another; to value more.
64. **Pre treatment count** — The number of pests you count *before* you treat the population with a pesticide.
65. **Prey** — An organism that a predator catches and eats.
66. **Propellant** — The liquid in pressurized pesticide products that forces the active ingredient from the container.
67. **Pupa** — One stage in the life of some insects. Some pupae are also called cocoons. A pupa is the “resting” stage in the insects life. An adult insect will hatch from it. Pupae — Plural of pupa.
68. **Repellant** — A chemical that an organism does not like, and that drives the organism away.
69. **Resistant, Resistance** — Withstanding attack; offering opposition to pests. Able to withstand infection or contamination. Resistance — the ability of a pest population to stay alive after it has been treated with a pesticide.
70. **Resources** — Something that a plant or animal needs. Includes water, food, oxygen (for animals). Carbon dioxide (for plants), and many other things.
71. **Resurgence** — The ability of a pest population to recover and increase in number after it has been treated with a pesticide.
72. **Sample** — Each individual “count” of pests you make during your pre-treatment and post-treatment counts.
73. **Sanitation** — Keeping clean. Removing unhealthy or dirty materials.
74. **Saprophyte** — An organism that lives on dead or decaying organic matter.
75. **Solution** — Mixture of one or more substances in another in which all ingredients are completely dissolved.
76. **Species** — One kind of plant or animal; a group of plants or animals that are alike. Man is one species. Dogs are one species. One species may have different varieties. For instance, German Shepherd and Doberman are varieties of dogs.
77. **Sterile** — Having no reproductive power. Unable to have young.
78. **Sterilized** — Made free from infecting agents or organisms. To make barren or without pests, as to sterilize soil.
79. **Suspension** — Finely divided solid particles mixed in a liquid.
80. **Symptom** — An indication or evidence of disease.
81. **Synthetic** — Artificially produced by man. Man-made. Example: alcohol for gasohol is produced from corn. Nitrogen fertilizer can be man-made from chemicals.
82. **Tolerance** — Capable of growing and producing even when subjected to a pest.
83. **Traits** — Distinguishing features or qualities.
84. **Vector** — An organism that carries pathogens from one host to another.
85. **Ventilation** — Circulating and adding fresh air.
86. **Vertebrates** — Animals that have a backbone. Such as, a fish, bird or mammal.
87. **Weed** — A plant that is growing in the wrong place. To a farmer, a flower in the middle of a cornfield may be a weed. To a home gardener, the same flower may not be a weed at all, but a very desirable plant.
88. **Wildlife** — Wild animals, including animals like birds and squirrels you might see in your own backyard.



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