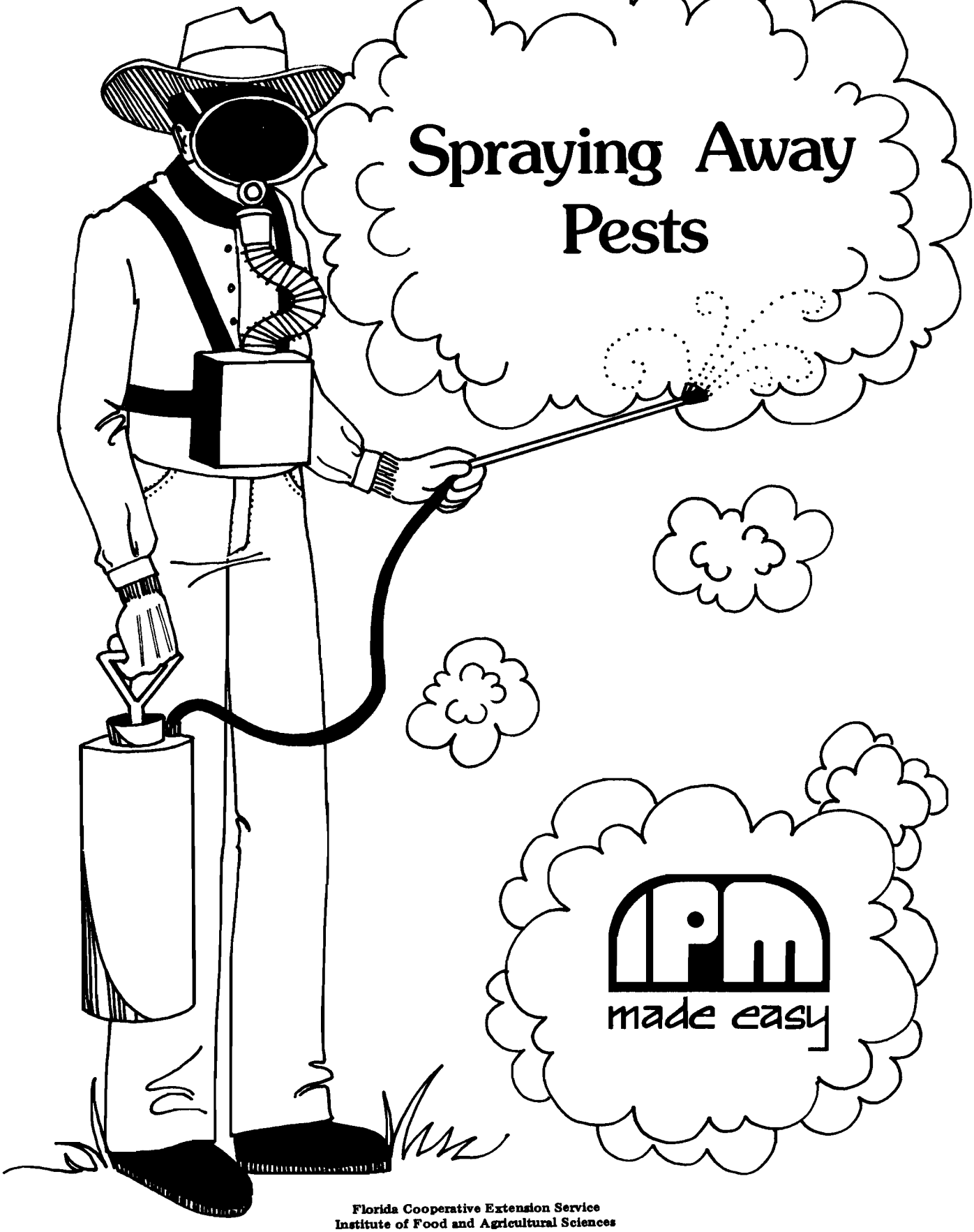
Circular 544

Spraying Away Pests



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Spraying Away Pests

C. A. Boyles, P. G. Koehler, and R. W. Gleason

To Help You

As you use this publication, watch for words written in *italics*. Look in the glossary in the back for an explanation of these words.

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, 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 book is for you to learn the basic ideas of IPM. You may learn about the safe use of insecticides, herbicides, fungicides, nematicides, and rodenticides. You should be able to manage pests safely, with less energy and lower costs.

For more information, check these publications, available from your County Extension Agent.

Pest Management — Where to Start — Circular 548
All About Pests — Circular 543
Using Natural Enemies to Manage Pests — Circular 545
Plants Protected from Pests — Circular 546
The ABC's of IPM — Circular 549
Cultural Practices to Manage Pests — Circular 547

The Value of Pesticides

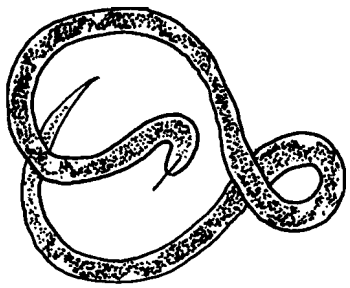
Take a bite into an apple or another piece of fruit. Do you ever wonder if you are going to find a worm? Are you sure that what you eat won't have bugs in it?

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.

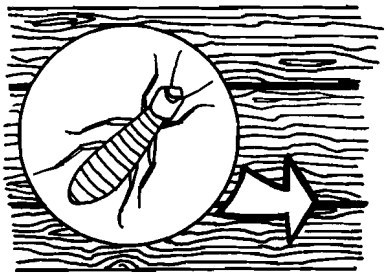
- Nematicides are used to kill *nematodes.*



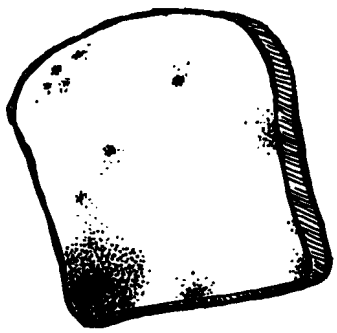
- Rodenticides are used to kill rodents (rats and mice).

There are many other pesticides in addition to those listed.

- Insecticides are used to kill insects.

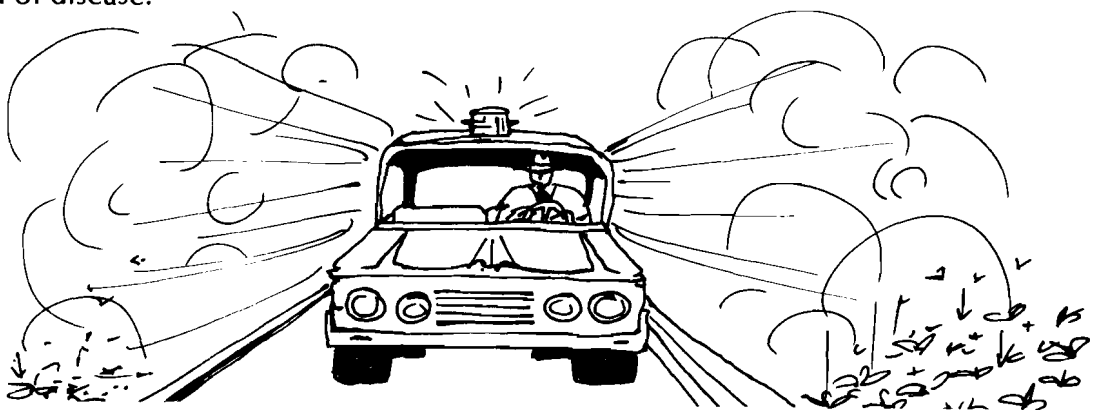


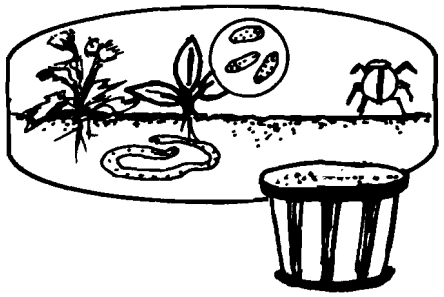
- Fungicides are used to kill fungi (mold and mildew).



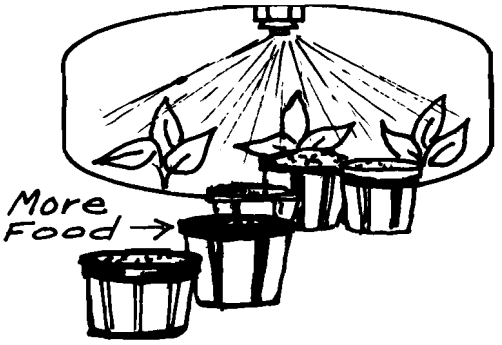
- Herbicides are used to kill weeds.

Man has benefited greatly from the use of pesticides. Pesticides have helped to control diseases which affect man, animals and crops. Insecticides kill mosquitoes, fleas, and other insects that carry diseases. This has helped prevent the spread of disease.

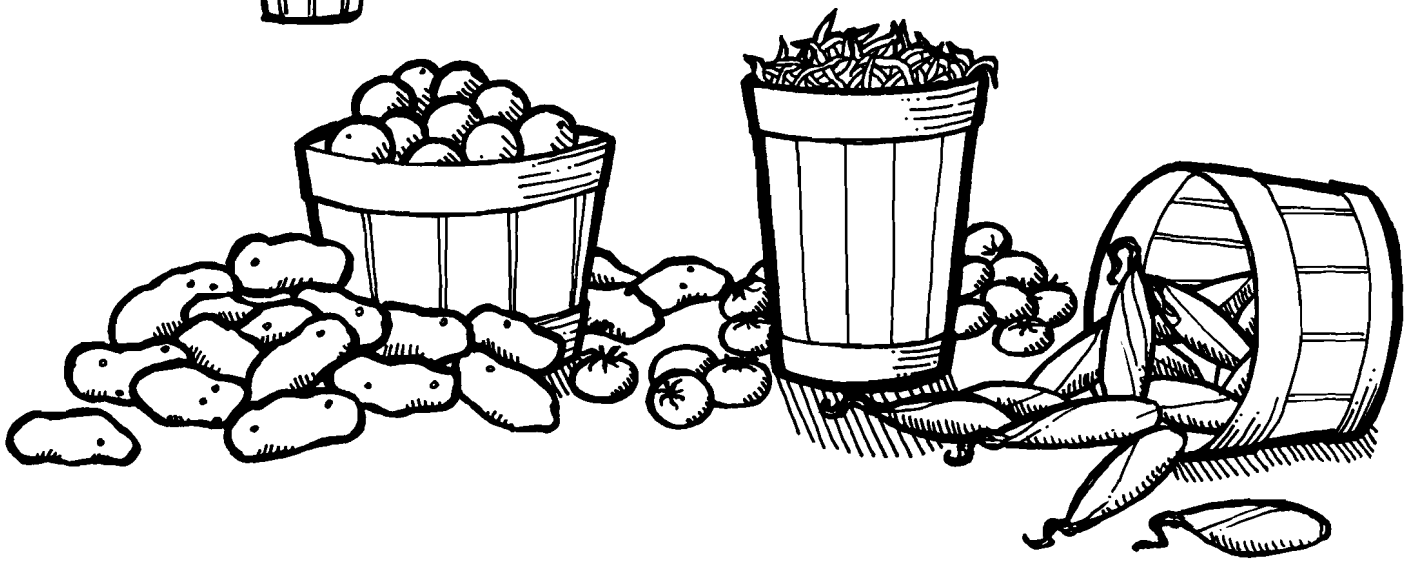




Pesticides have also been of great value in *agriculture*. Pesticides have enabled farmers to produce more and better food than they ever could in the past.

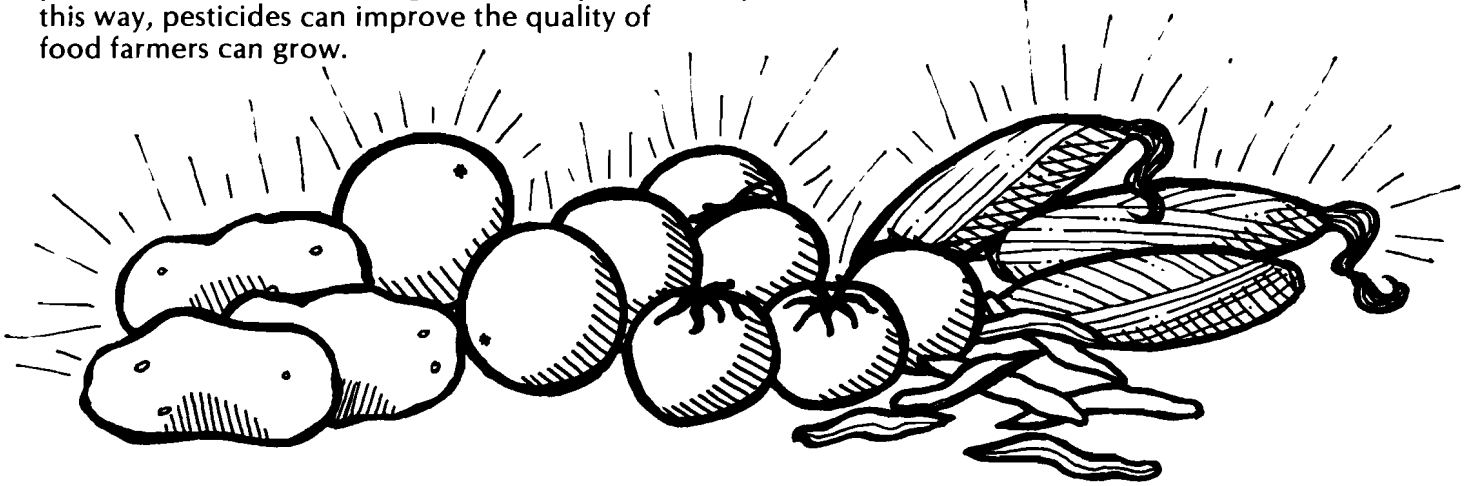


When pests damage crops, they are using the same resources man uses. In this way, these pests are *competing* with man. Pesticides can reduce the number of pests on the crop. This helps save the crop. Fewer pests may increase the amount of food farmers can grow.



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

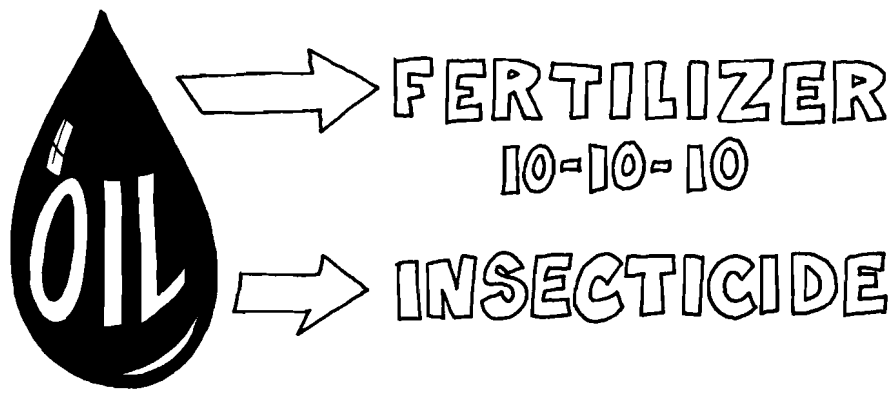
Pesticides have one big advantage over other methods of pest management. When a pesticide is applied, it usually kills the pest rapidly. Other methods may require a longer period of time to take effect.



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.

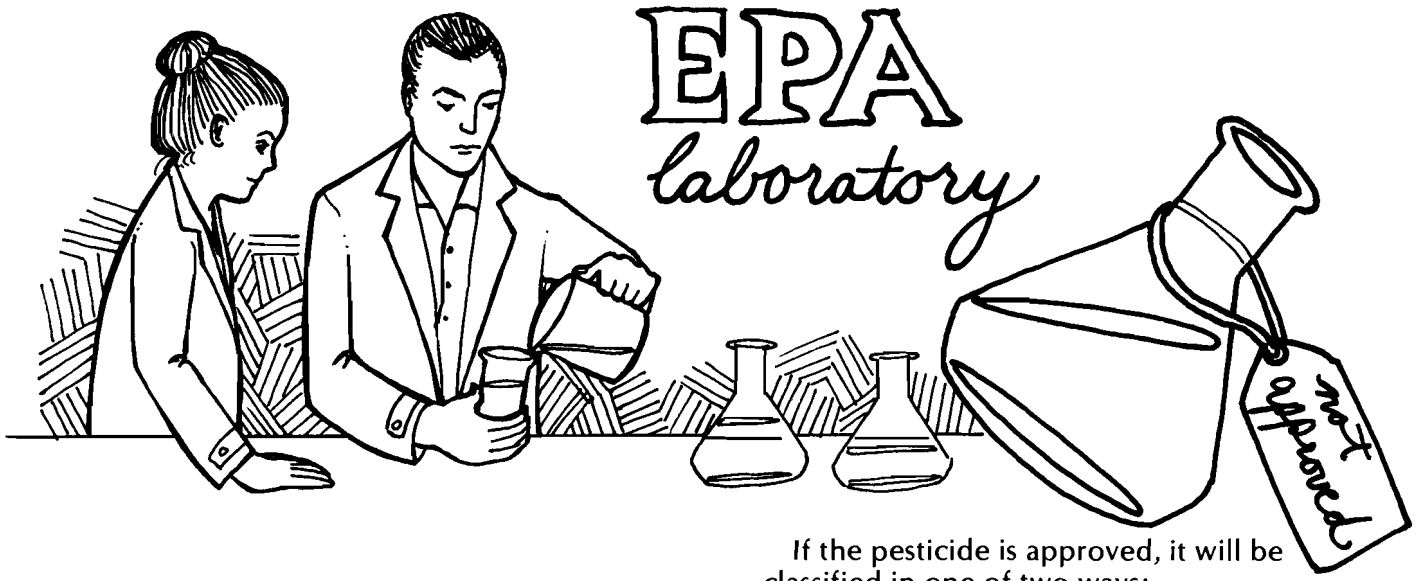
Many chemicals look promising as pesticides at first. Most don't make it to the garden store shelf. They turn out to be too hazardous or costly. Many are just not effective.

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.

Pesticide Regulations

Only pesticides that the EPA approves can be sold in the U.S. 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 find out are what it will and won't kill. They also study how long it remains on food crops and animals after it is applied. The EPA also studies how hazardous the pesticide is to man, animals, and the environment. Based on these tests, the EPA must decide whether or not to approve the pesticide. The EPA does not approve all pesticides.



If the pesticide is approved, 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. When used properly, they should not cause any harm to people.

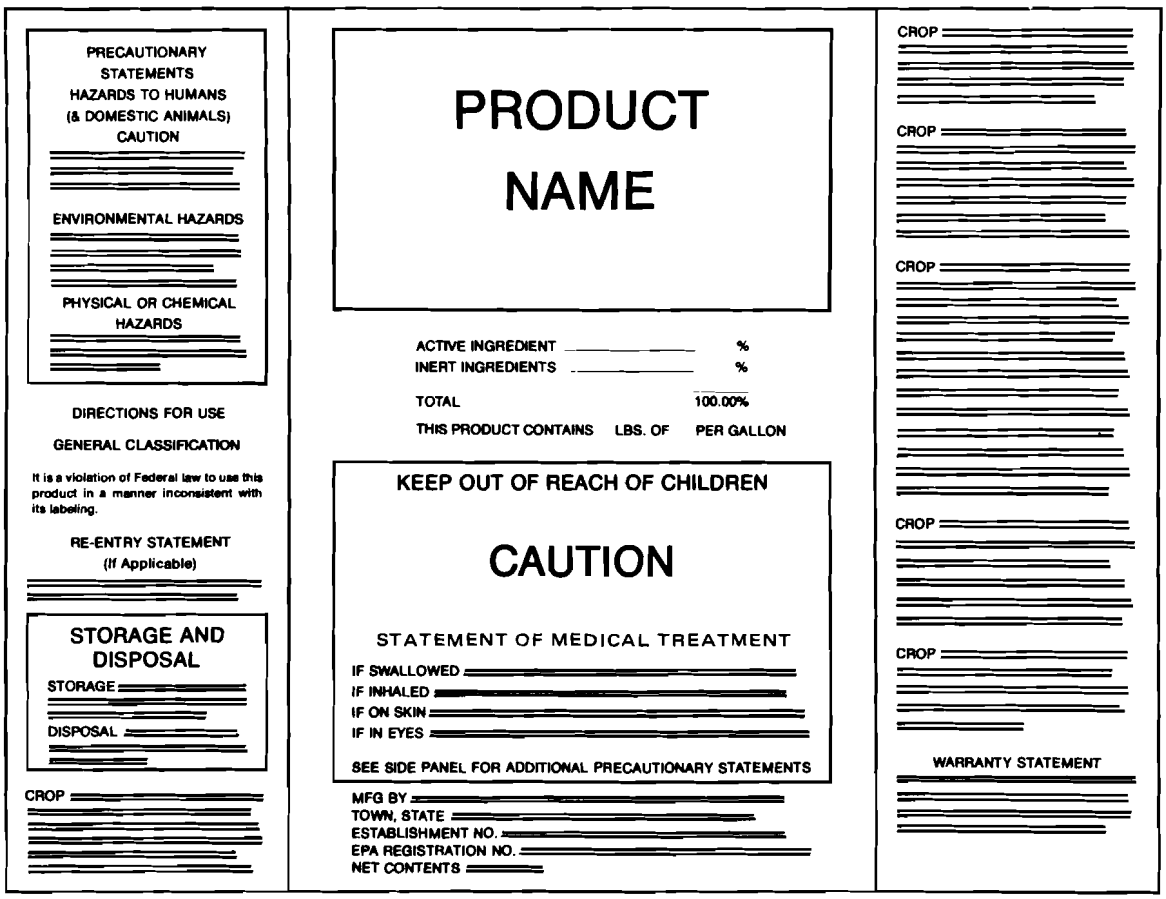
2. Restricted use — These are dangerous poisons. Only persons with special training in handling and applying pesticides can buy these. These pesticides may be harmful even when used as the label states.

The EPA can also remove some pesticides from use. This has happened to some that used to be sold.

Pesticide Labels

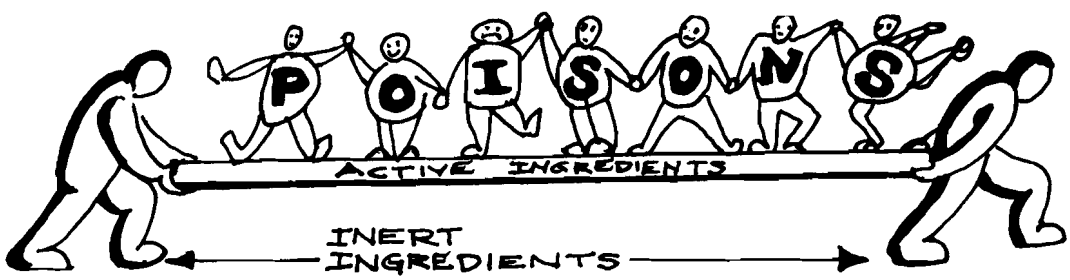
The information on pesticide labels is carefully controlled. Labels must have certain information on them, and the information must be in certain places. This information helps people use pesticides safely and correctly.

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



1. 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.

2. 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.



3. Signal Words — Signal words indicate how poisonous the pesticide is. The words that are used as signal words are "danger," "warning," or "caution." If the word is "danger," the pesticide is very poisonous 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.

4. Precautions — This section of the label lists information about possible dangers.

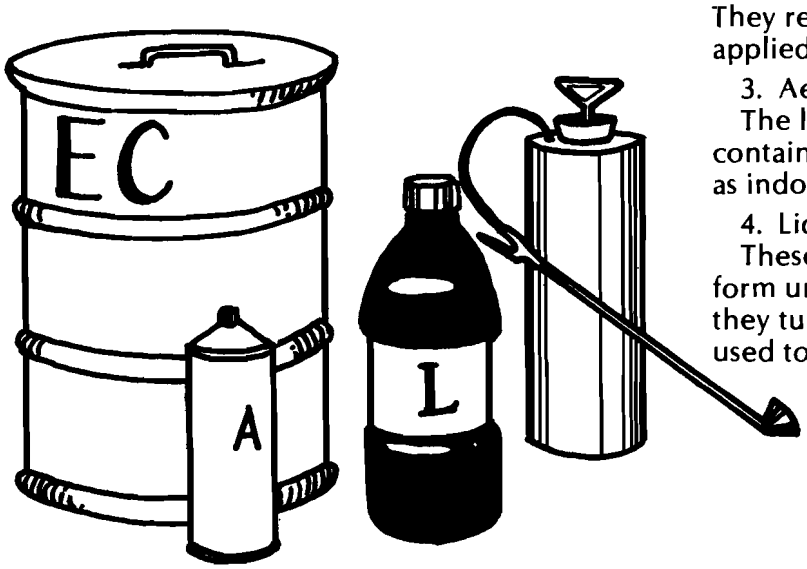
5. Directions for Use — The pesticide should be used exactly as these directions state.

6. Storage and Disposal — This includes instructions about the storage of the pesticide, and instructions on the disposal of unneeded pesticide or empty containers.

7. Use — Approved uses of the pesticide are listed.

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

9. Manufacturer — The name, address, and EPA number of the manufacturer. These regulations and laws are for the safety and protection of people who use pesticides.



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 they can be poured. When mixed with water, these 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)

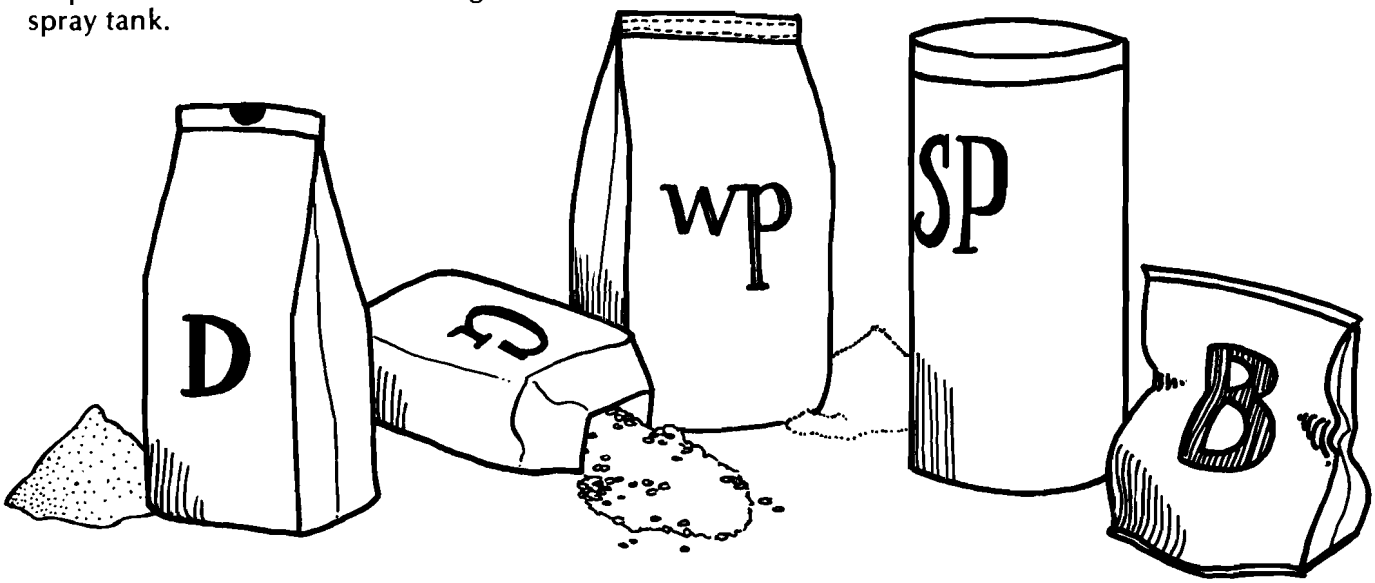
These are dry, but are meant to be mixed with water. When mixed, they form a suspension. These need a lot of agitation in a spray tank.

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.



Handling Pesticides

You may need to wear protective clothing when you use or handle pesticides. If so, wear long-sleeved shirts and long-legged trousers or a coverall-type garment. The pesticide label may tell you to wear additional protective clothing such as:

Gloves — Wear gloves when you handle concentrated or highly poisonous materials. Gloves should be unlined neoprene (rubber) unless the pesticide label says otherwise.

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

Boots — Wear unlined, neoprene boots unless the pesticide label says otherwise.

Goggles or Face Shield — Wear goggles or a face shield if there is any chance of getting pesticides in your eyes or mouth.

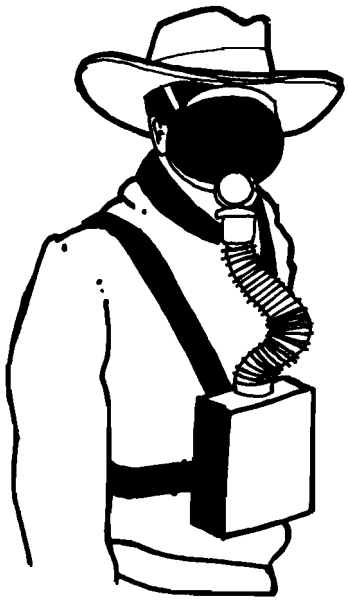
Respiratory Protective Devices — These protect your lungs. They may be used when:

You are in an enclosed area,
or
The pesticide you are using is highly poisonous,
or
You will be exposed to the pesticide for a long time.

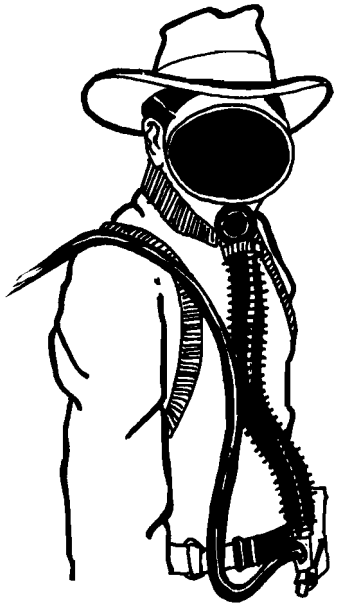
There are several types of respiratory protective devices. They are:

1. Chemical cartridge respirator

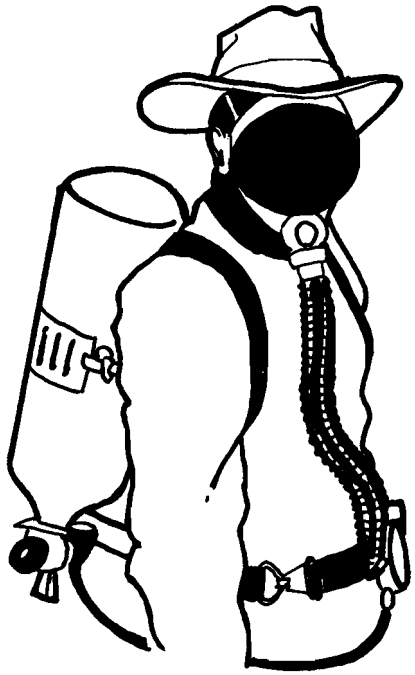
2. Chemical cannister respirator (gas mask)



3. Supplied air respirator



4. Self-contained breathing apparatus



Reading the pesticide label will help you decide whether or not you need to protect your lungs. You may ask your county extension agent or other authority if you need more information on pesticides.

Wear clean clothing daily. If clothes get wet with spray, change them **IMMEDIATELY**. Don't wash pesticide contaminated clothes with home laundry. Wash and dry them separately. Always use plenty of soap and water.

Pesticide Storage and Disposal

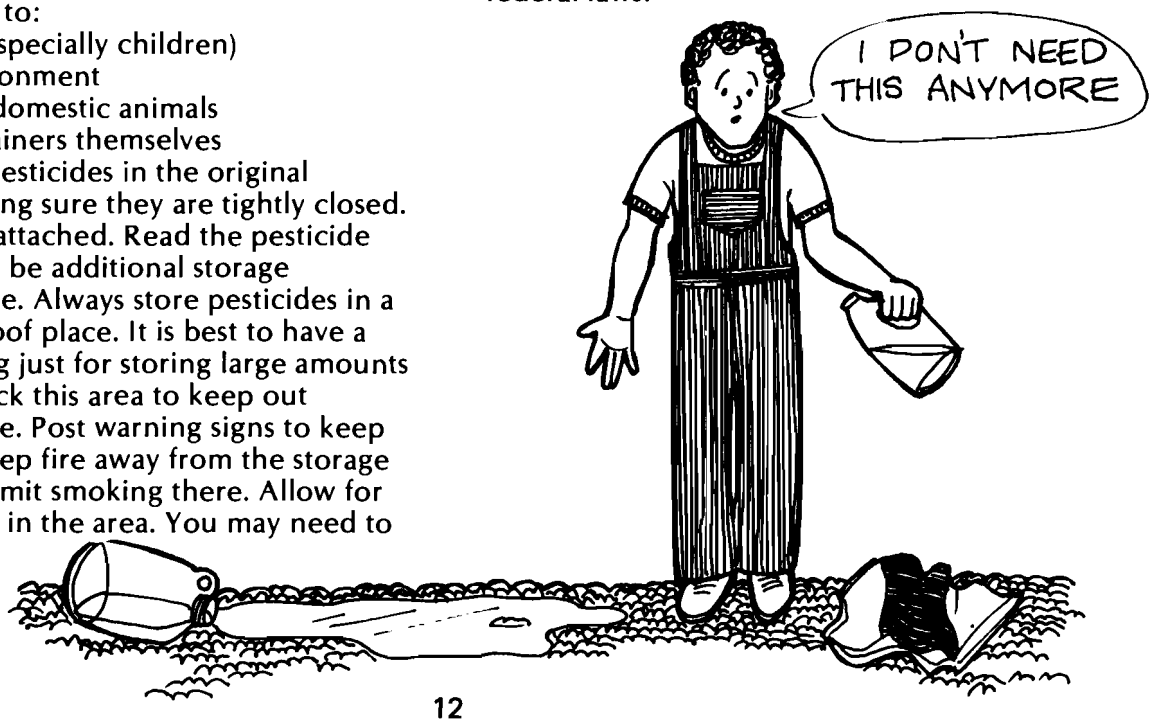
Unused pesticides must be stored properly to prevent damage to:

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

Always store pesticides in the original containers, making sure they are tightly closed. 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 storing large amounts of pesticides. Lock this area to keep out unwanted people. Post warning signs to keep people away. Keep fire away from the storage area. Do not permit smoking there. Allow for good *ventilation* in the area. You may need to wear protective clothing when working in the pesticide storage area.

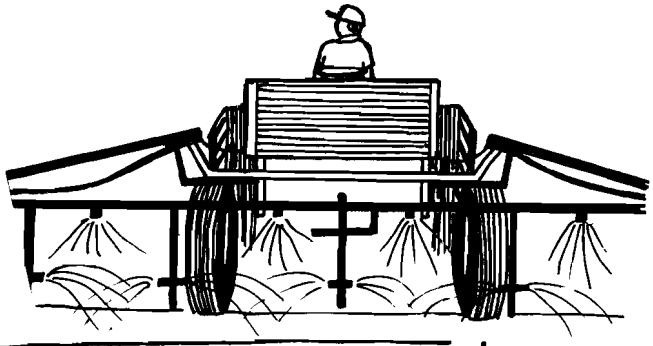
Following these rules should help prevent storage problems.

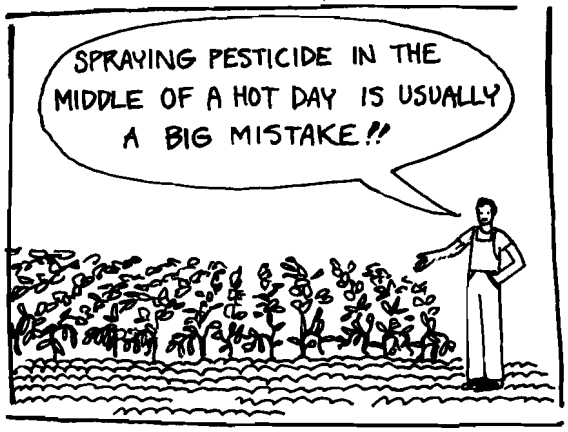
You also must use extreme care when getting rid of pesticides. This is to keep from *contaminating* the air, water, and soil. It is important to read the label for disposal of leftover or spilled pesticides and empty pesticide containers. Check with the chemical manufacturer or your county extension agent if you need help in disposing of pesticides. They may have information about local, state and federal laws.



Problems with Pesticides

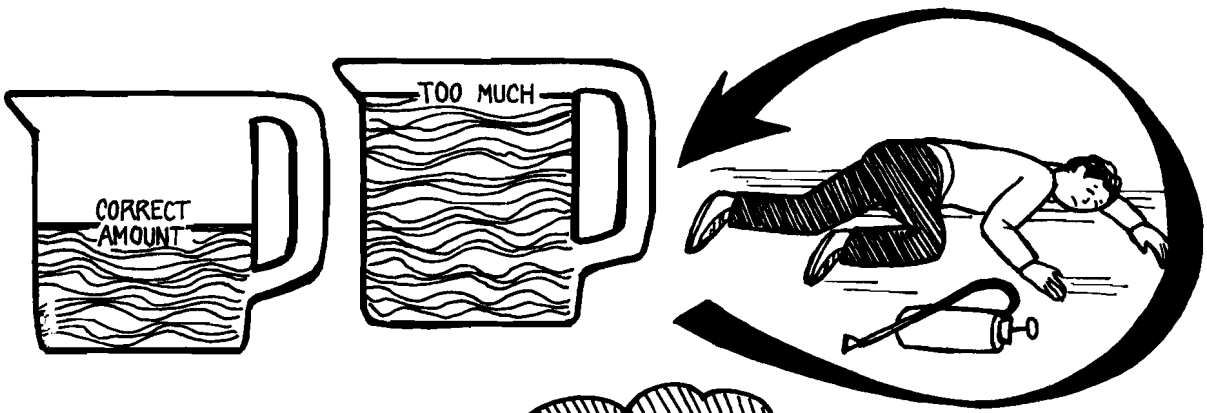
Pesticides are easy to get and to use. Their *effectiveness* is easy to see. But many people have forgotten that there are other ways to manage pests. Pesticides have caused some problems.

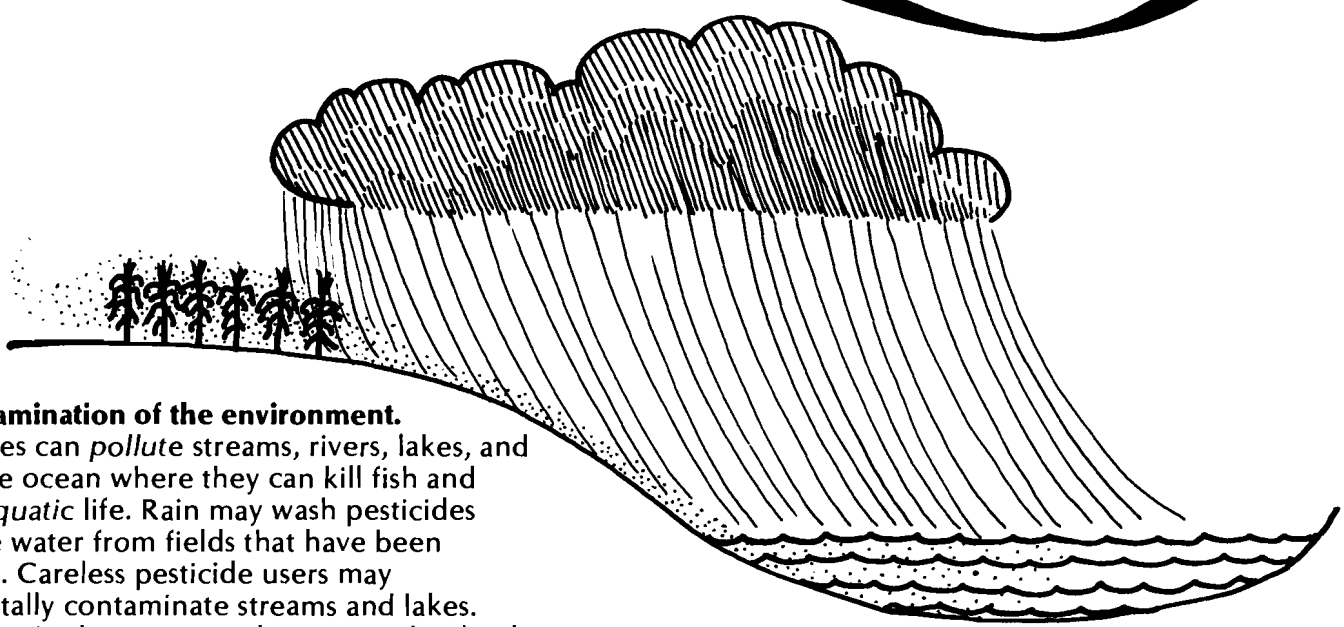




Misuse of pesticides. Pesticides can be misused in several ways. If you apply a pesticide without reading the label, you may apply too much or not enough pesticide. You may choose the wrong pesticide or may apply it at the wrong time. The pesticide may not kill the pests. It may kill what you are trying to protect.

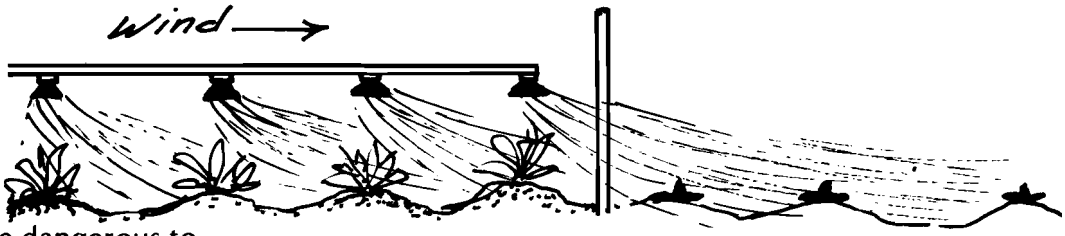
Even someone who reads the label may not follow the directions. Some people may decide that if what the label says to use is good, twice as much pesticide would be twice as good. Applying more pesticide than the recommended amount is wrong. It endangers the *applicator* and the environment. The misuse of pesticides can also lead to other problems.





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 fields that have been sprayed. Careless pesticide users may accidentally contaminate streams and lakes. Pesticides in the water can be returned to land when the water is used by man.

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 in or near sprayed fields may be poisoned. Flesh-eating birds, like vultures or eagles, may eat small animals poisoned by pesticides. Some pesticides can cause these birds' egg shells to be very thin. The egg shells break before they hatch, and the young birds inside die.

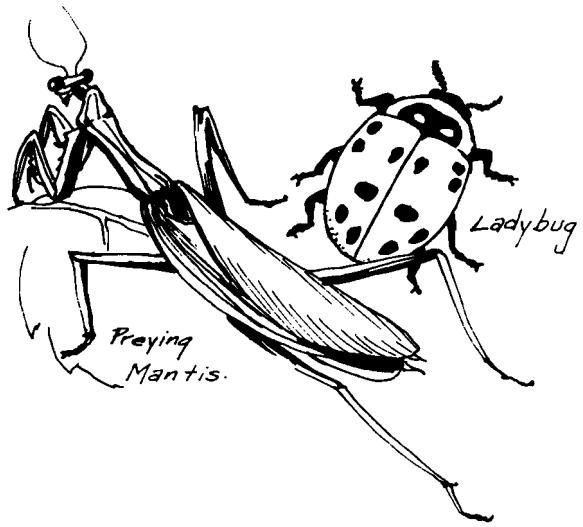
Resistance to pesticides. Some pests may become *resistant* to some pesticides. For instance, the first time pests are sprayed with a pesticide, most of the pests may be killed. However, the next time they are sprayed, some of the pests may be left alive. The pesticide may have lost its effectiveness to kill the pest. The pesticide has not changed, but the pest has developed resistance to the pesticide.

Nontarget organisms. Some organisms help manage certain pests. For example, ladybugs and praying mantis eat other insects that may damage plants.

Cats around farms can help manage rats and mice. These are *beneficial* or good organisms.

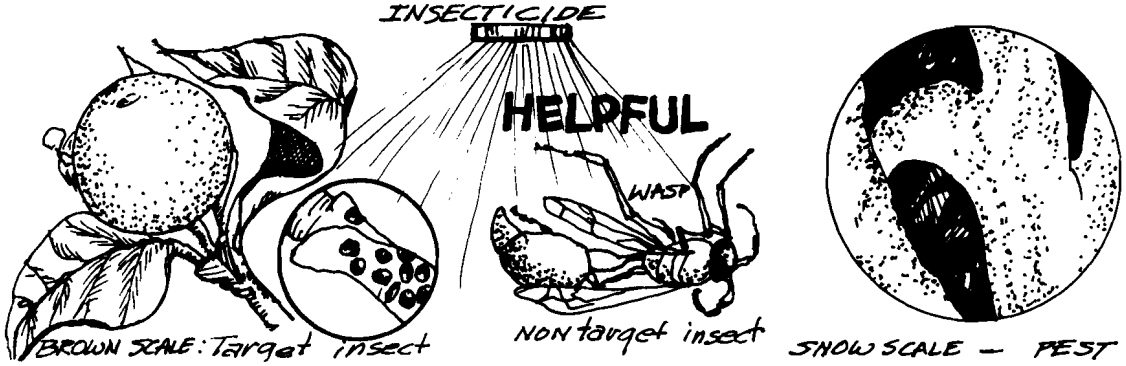
Pesticides used to kill pests may also kill beneficial organisms. In some cases, the beneficial organisms would be able to manage the pest if the pesticide were not applied. Killing *nontarget* beneficial organisms is harmful.

For more information on beneficial organisms, see **Circular 545, Using Natural Enemies to Manage Pests** or contact your local county extension agent.



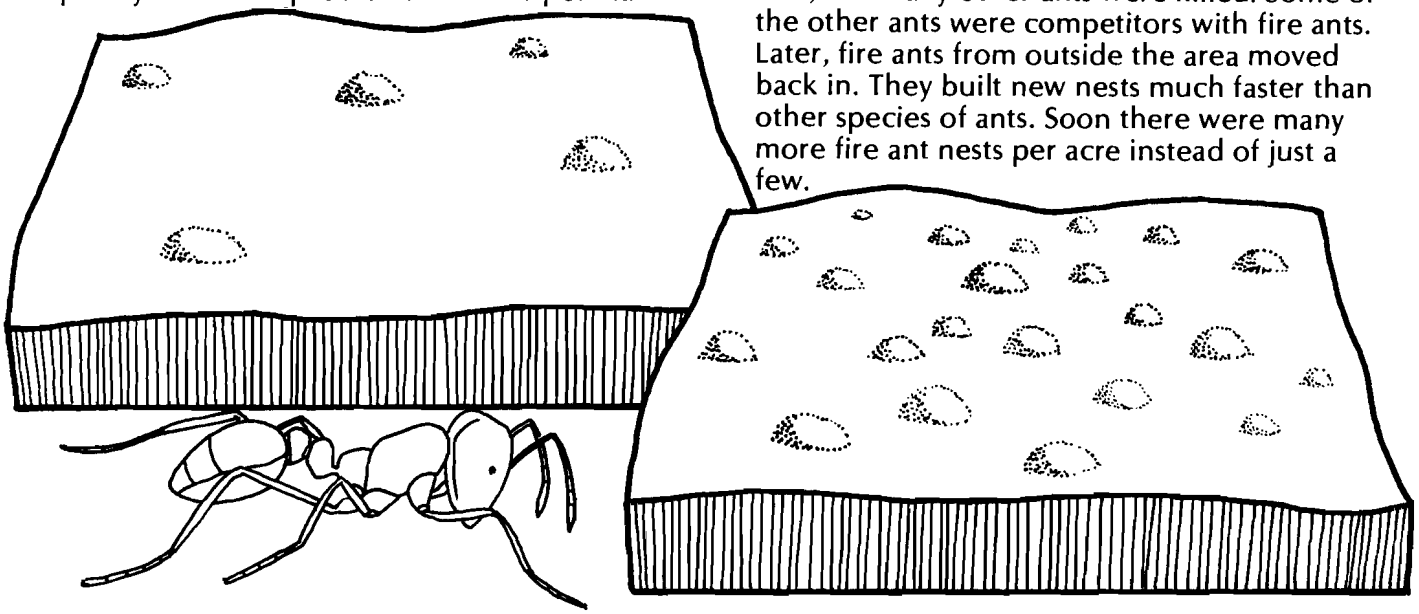
Secondary pest outbreaks. Once in a while, using a pesticide can cause some other organism to become a pest. Here is an example of how this happens.

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. Then snow scale can cause damage to citrus.

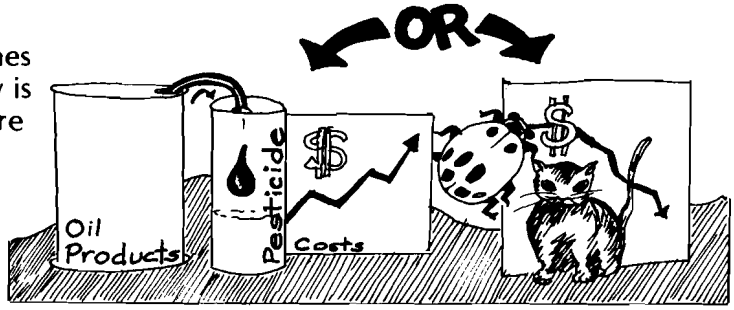


Resurgence. The resurgence of a pest population may also occur. When pests are sprayed with a pesticide, many of the pests are killed. However, the pest population doesn't remain small for long. Other organisms which compete with or eat the pest may be killed too. Then the number of pests increases very quickly. Soon the problems with the pest can be as bad or worse than they were before the pesticide was used.

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 fire ants, but many other ants were killed. Some of the other ants were competitors with fire ants. Later, fire ants from outside the area moved back in. They built new nests much faster than other species of ants. Soon there were many more fire ant nests per acre instead of just a few.



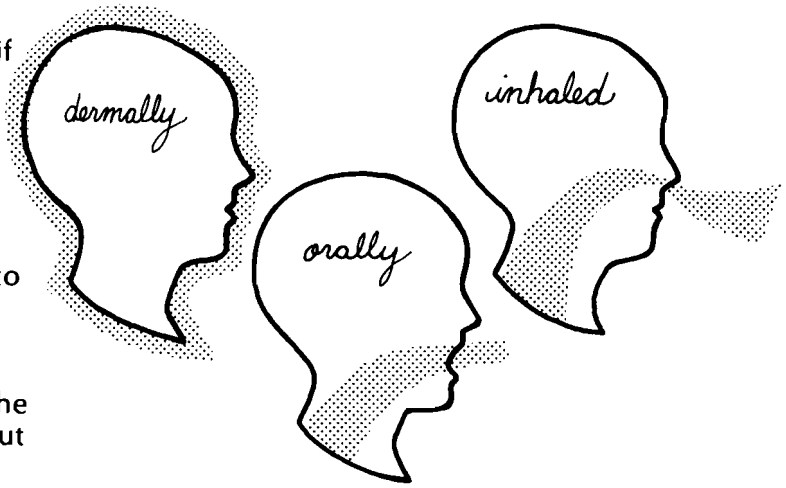
Energy. Energy is used in making and applying pesticides. Most of this energy comes from petroleum products. Petroleum energy is becoming more expensive. Pesticide users are looking for less expensive ways to manage pests.



Pesticide Poisoning

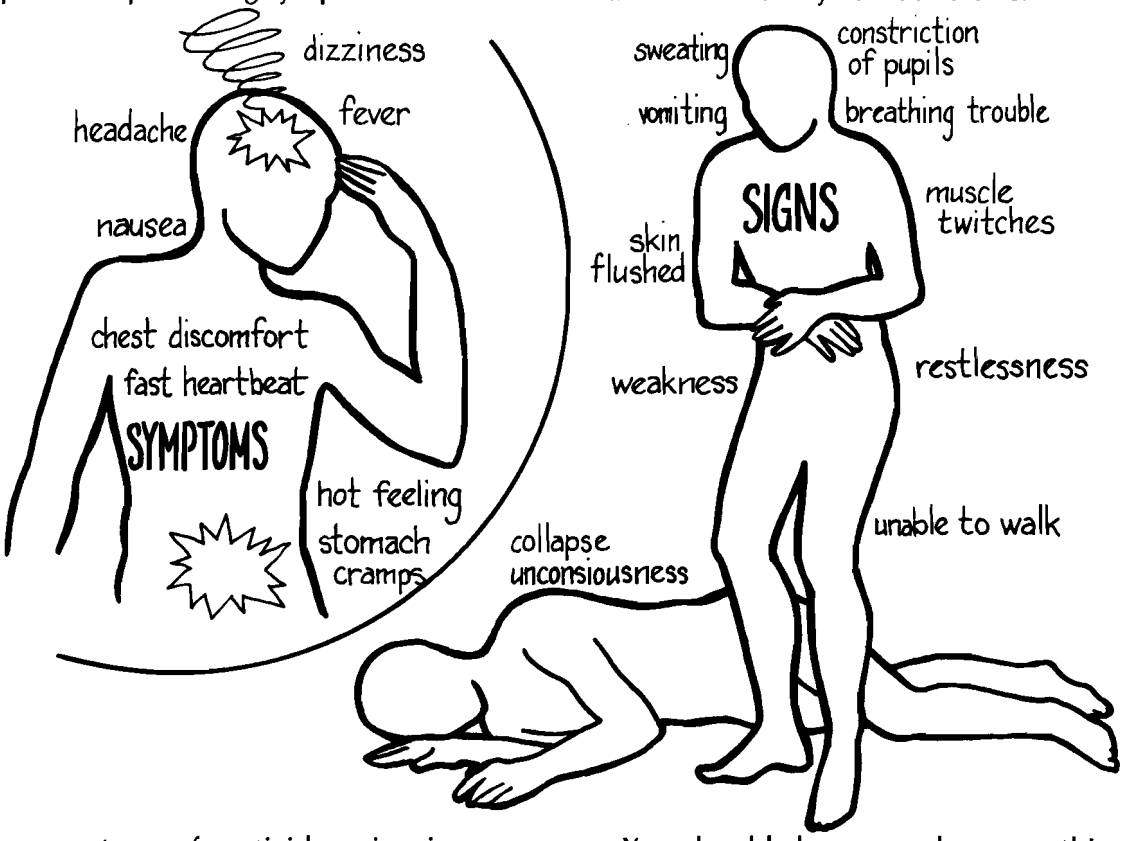
Pesticides can cause severe injury or death if misused. They are poisons and must be used carefully. They can enter the body in three ways.

1. Dermally — Pesticides can be absorbed right through the skin.
2. Orally — Pesticides can be swallowed.
3. Inhaled — Pesticides can be breathed into the lungs.



Routes of Entry. The most common entry is through the skin. However, most accidental pesticide deaths are from eating or drinking the poison. In some cases, the poison had been put into a different container without a label.

Everyone who uses pesticides should know what kinds of sickness may be caused by pesticide poisoning. There are two kinds of clues to pesticide poisoning symptoms and signs. **SYMPTOMS** are feelings that only the person who has been poisoned can notice like headache and nausea. **SIGNS**, like vomiting, can be noticed by someone else.



Signs or symptoms of pesticide poisoning may be mild or severe. It depends on the pesticide and the amount absorbed. Many pesticides injure the nervous system. Typical signs and symptoms are nausea, headache, vomiting, and muscle twitching. These are only a few of the possible signs and symptoms. Your county extension agent or other authority on pesticides can provide you with a more complete list.

You should also remember something else. Other kinds of sickness may have similar signs and symptoms. Having some of the signs and symptoms does not always mean that you have been poisoned. But, get medical advice quickly if you suspect a pesticide poisoning. Take the label and/or pesticide container to the physician.

How Pesticides Are Used In IPM

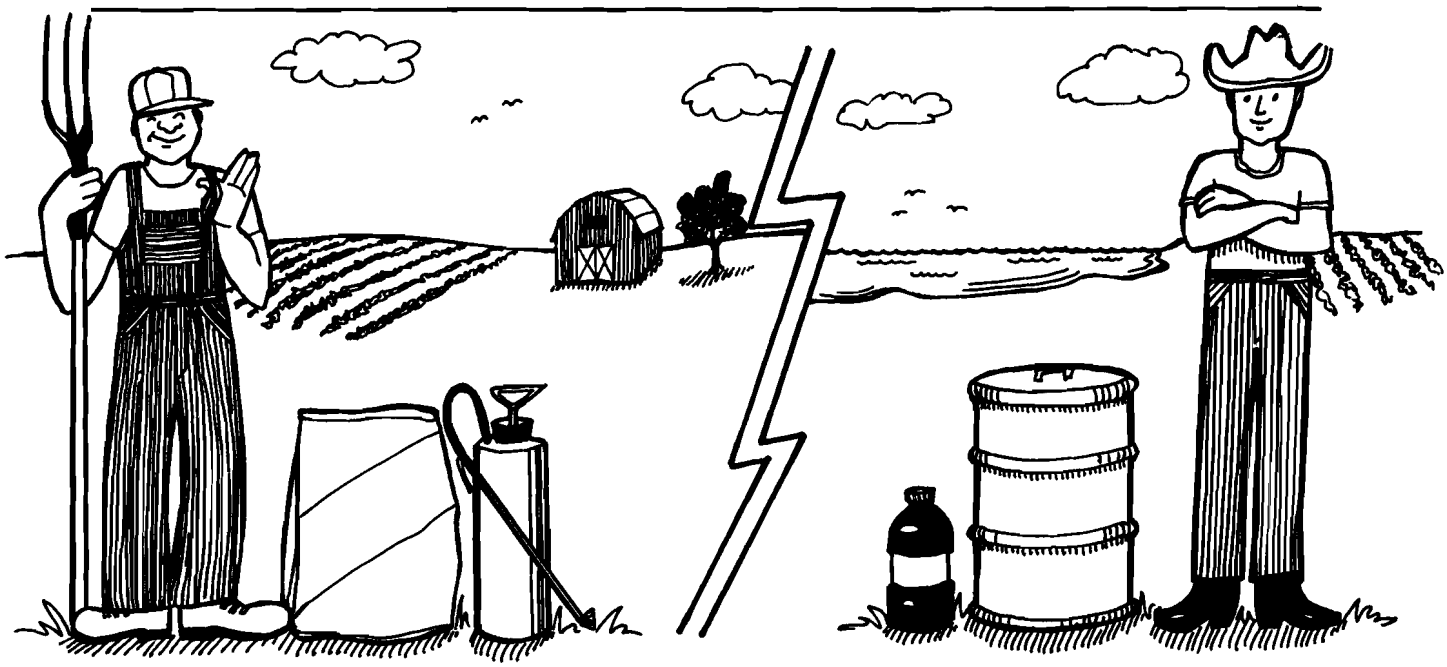
Pesticides are an important tool in an Integrated Pest Management program. They are used with the other tools:

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

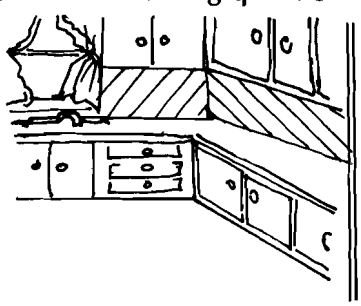
In **Circular 548, Pest Management — Where to Start** the six-step IPM process was explained. The six steps are:

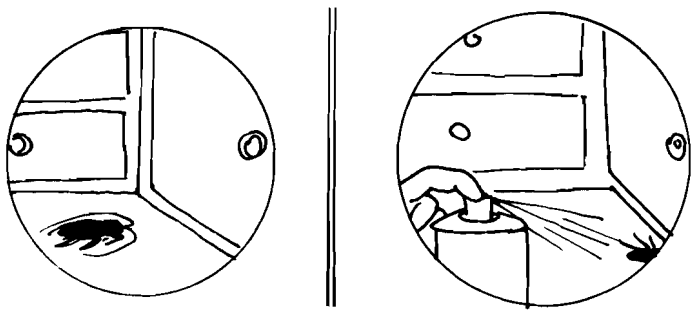
Step 1. Identification
Step 2. Prevention
Step 3. Monitoring
Step 4. Prediction
Step 5. Decision
Step 6. Evaluation

At Step 5, you, as a homeowner or agricultural producer must decide what pest management method to use. You must consider all of the tools of IPM. You must then choose the one that will work best in your situation.

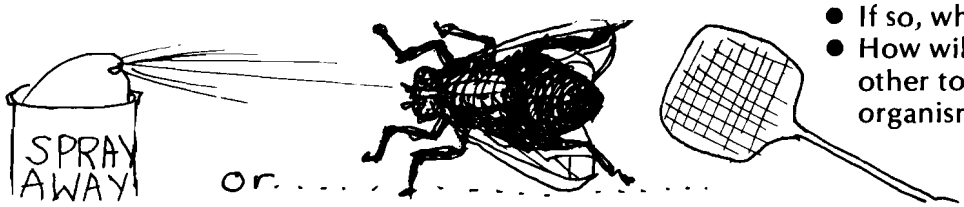


Pesticides should only be used as they are needed. When you consider using a pesticide you need to ask the following questions:





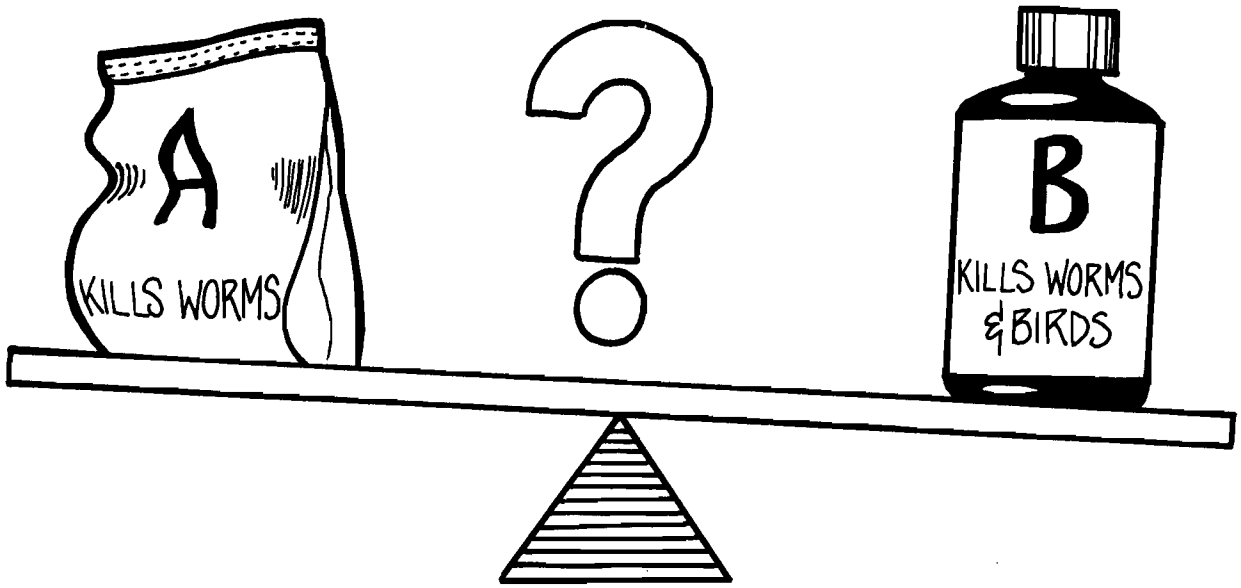
- Will another tool solve the problem?
- If so, when do I need to use it?
- How will using a pesticide affect the other tools, especially beneficial organisms?



If you decide to use a pesticide, then you must also decide which one to apply. You may ask:

- Which pest am I trying to kill?
- Which pesticide will kill that pest?
- Which pesticide will have the fewest side effects?

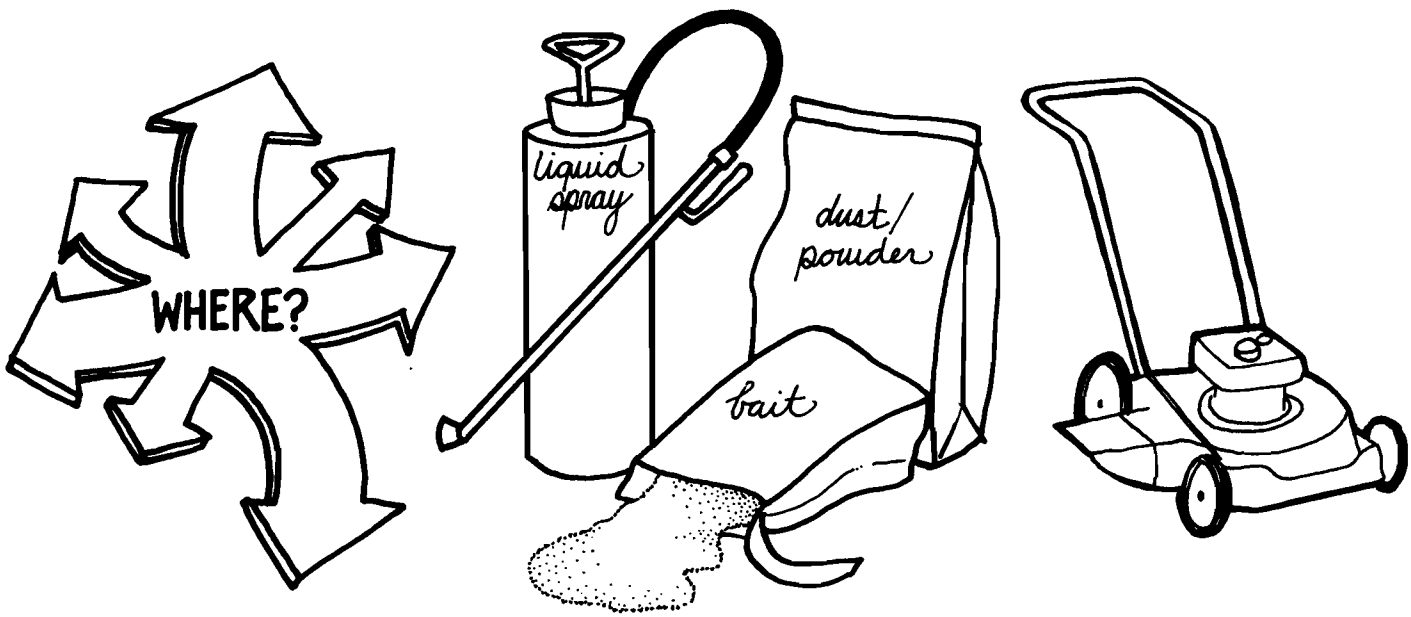
The pesticide that kills the pest with the fewest side effects is the best choice.



Where to apply the pesticide. For example, you may wish to control flies in manure in a barn. If you spray the pile directly, you will kill many beneficial organisms as well as the flies. However, if you spray the ceiling, the flies will walk in the poison and die. Nothing else will be killed.

What form of the pesticide to use. Pesticides can be put out in a wet or dry form. For example, you can put poison bait out for some pests to eat. This will kill the pest without having to spray at all.

Other methods of making the pesticide more effective. You may reduce the amount of pesticide needed. For example, mowing the lawn before applying a pesticide will make application more effective.



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.

Glossary

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. Aquatic — Refers to water or to a plant or animal that lives in water.
5. Beneficial Organism — A plant or animal that helps control a pest species, or helps plants or animals in some way.
6. Botanical Pesticide — A pesticide made from plants. They are also called plant-derived pesticides.
7. Carbon — An element found in all organic substances. In chemistry, it is represented by the symbol C.
8. Compete, Competitors — Two or more plants or animals trying to use the same resource. Each one reduces the amount of the resource that the other one can use.
9. 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.
10. Dilution — To make weaker or less strong by adding a liquid such as water.
11. Effective, effectiveness, effectively — Producing the results wanted, working properly.
12. Emulsion — A mixture in which one liquid dispersed as tiny drops, floats in another liquid. An example is oil in water.
13. Environment — Surroundings, including anything that affects man, other animals or plants.
14. 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.
15. Host — Any plant or animal that shelters or gives a home to a parasite or other natural enemy.

16. 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.
17. Inorganic — Not organic; not being animal or plant.
18. 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.
19. Nontarget — An organism a pesticide kills that is not supposed to be killed.
20. Organic — Having to do with plants or animals, containing carbon.
21. 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.
22. Pesticides — Poisons that are used to kill organisms that man regards as pests. Insecticides kill insects. Herbicides kill plants. Fungicides kill fungi.
23. Pollute, Pollution — Similar to contamination, but the term pollution refers mainly to the environment.
24. Propellant — The liquid in pressurized pesticide products that forces the active ingredient from the container.
25. Resistant, Resistance — Withstanding attack, offering opposition to pests. Able to withstand infection or contamination. The ability of a pest population to stay alive after it has been treated with a pesticide.
26. Resurgence — The ability of a pest population to recover and increase in number after it has been treated with a pesticide.
27. Solution — Mixture of one or more substances in another in which all ingredients are completely dissolved.
28. Sterilized — Made free from infecting agents or organisms. To make barren or without pests, as to sterilize soil.
29. Suspension — Finely divided solid particles mixed in a liquid.
30. Synthetic — Artifically produced by man, man-made. Example: alcohol for gasohol is produced from corn. Nitrogen fertilizer can be man-made from chemicals.
31. Ventilation — Circulating and adding fresh air.
32. Wildlife — Wild animals, including animals like birds and squirrels you might see in your own backyard.

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