Concerns about wildlife and the environment are becoming more important in decisions about which pesticides will be registered and what they may be used for. Two environmental concerns are receiving particular attention:

- protection of ground water, and
- protection of endangered species.

Federal and State efforts to protect ground water and endangered species are resulting in new instructions and limitations for pesticide handlers. Whether you apply pesticides indoors or outdoors, in an urban area or in a rural area, you must become aware of the importance of protecting these two vital national resources. Pesticides that are incorrectly or accidentally released into the environment — either during application or during other handling activities, such as mixing, loading, equipment cleaning, storage, transportation, or disposal — pose a threat to ground water and endangered species.

Whether you must take special action to protect ground water and endangered species depends mainly on the location of your use site. Ground water contamination is of greatest concern in release sites where ground water is close to the surface or where the soil type or the geology allows contaminants to reach ground water easily. Protection of endangered species usually is required only in locations where they currently live or are being reintroduced. Read the pesticide labeling carefully to determine whether your pesticide use is subject to any special ground water or endangered species limitations.

The U.S. Environmental Protection Agency may establish specific limitations or instructions for pesticide users in locations where ground water or endangered species are most at risk. These limitations and instructions are often too long to be included in pesticide labeling. The labeling may tell you that you must consult another source for the details about the instructions and limitations that apply in your situation. Your legal responsibility for following instructions that are distributed separately is the same as it is for instructions that appear in full on the pesticide labeling.

Protecting Ground Water

Ground water is water located beneath the earth's surface. Many people think that ground water occurs in vast underground lakes, rivers, or streams. Usually, however, it is located in rock and soil. It moves very slowly through irregular spaces within otherwise solid rock or seeps between particles of sand, clay, and gravel. An exception is in limestone areas, where ground water may flow through large underground channels or caverns. Surface water may move several feet in a second or a minute. Ground water may move only a few feet in a month or a year. If the ground water is capable of providing significant quantities of water to a well or spring, it is called an **aquifer.** Pesticide contamination of aquifers is very troubling, because these are sources of drinking, washing, and irrigation water.

Sources of Ground Water

Ground water is recharged (replaced) mostly from rain or snow that enters the soil. However, some water from lakes and streams and from irrigation also becomes ground water. Water that is above the ground can move in three ways — it can evaporate into the air; it can move across the surface, as in a stream or river; or

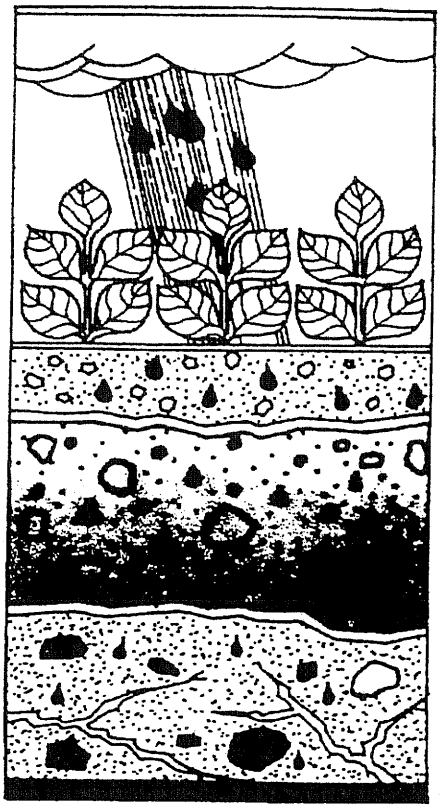
it can move downward from the surface. Some of the water that moves downward is absorbed by plants and other organisms. Another portion of the downward-moving water is held in the upper layers of the soil. The rest moves down through the root zone and the relatively dry soil zone until it reaches a zone saturated with water. This saturated zone is the uppermost layer of ground water and is called the water table. The water table is the "dividing line" between the ground water and the unsaturated rock or soil above it.

Pesticide Contamination of Ground Water

When water that is moving downward from the surface contains pesticides — or comes into contact with them as it moves — the pesticides may be carried along with the water until they eventually reach the ground water. Five major factors determine whether a pesticide will reach ground water:

- the practices followed by pesticide users,
- the presence or absence of water on the surface of the site where the pesticides are released,
- the chemical characteristics of the pesticides,
- the type of soil in the site where the pesticides are released,
- the location of the ground water — its distance from the surface and the type of geological formations above it.

By being aware of these considerations, you can handle pesticides in ways that will make



the potential for ground water contamination less likely.

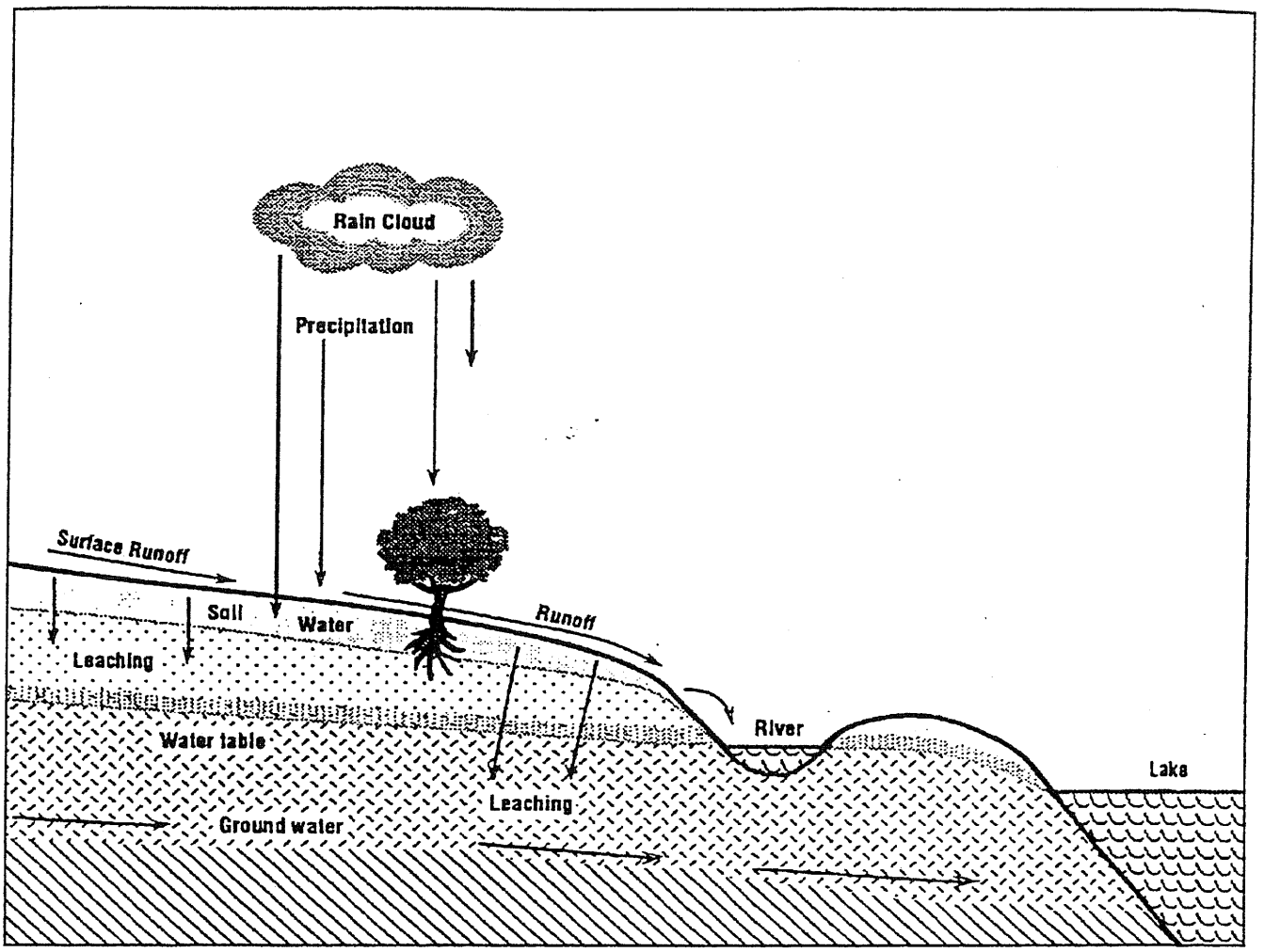
Practices for Pesticide Users

The best way to keep from contaminating ground water is to follow labeling directions exactly. Be sure to note whether the labeling requires you to take any special steps to protect ground water. In addition, remember the following:

- Avoid the temptation to use more pesticide than the labeling directs. Overdosing will increase both the cost of pest control and the odds that the pesticide will reach ground water. Overdosing is also illegal. Keeping the use of pesticides to a minimum greatly reduces the risk of ground water contamination.
- Consider whether your application method presents any special risks. For example, soil injection of some pesticides may not be wise when ground water is close to the surface.
- Take precautions to keep pesticides from back-siphoning into your water source.
- Locate pesticide storage facilities at least 100 feet from wells, springs, sinkholes, and other sites that directly link to ground water to prevent their contamination from runoff or firefighting water.
- Whenever possible, locate mix-load sites and equipment-cleaning sites at least 100 feet from surface water or from direct links to ground water. This will help prevent back-siphoning, runoff, and spills from contaminating the water sources. If you must locate one of these work sites near a water source, use methods such as dikes, sump pits, and containment pads to keep pesticides from reaching the water.
- Do not contaminate ground water through improper disposal of unused pesticides, pesticide containers, or equipment and container rinse water. Dispose of all pesticide wastes in accordance with local, State, tribal, and Federal laws.

Water on the Treated Surface

If there is more water on the soil than the soil can hold, the water (along with any pesticides it contains) is likely to move downward to the ground water. Prolonged heavy rain or excessive irrigation will produce excess water on the soil surface.



Rain

If weather forecasts or your own knowledge of local weather signs cause you to expect heavy rain, delay outdoor handling operations — including mixing and loading, application, and disposal — to prevent wash-off, surface runoff, or leaching.

Irrigation

Pesticide movement into ground water is affected by both the amount of water used in irrigation and how soon before or after a pesticide application the irrigation is done. If irrigation water contains pesticides, be careful to prevent it from flowing into water sources.

Pesticide Factors

Some pesticide chemicals are more likely than others to move to ground water. Such movement depends mainly on:

- **solubility** — Some pesticides dissolve easily in water and are more likely to move into water systems.
- **adsorption** — Some pesticides become tightly attached (strongly adsorbed) to soil particles and are not likely to move out of the soil and into water systems.
- **persistence** — Some pesticides break down slowly and remain in the environment for a long time.

These factors are all related to one another. Pesticides that are most likely to move into ground water are highly soluble, moderately to highly persistent, and are not strongly adsorbed to soil. A nonpersistent pesticide would be less likely to move to ground water, even if it is highly soluble or not strongly adsorbed to soil. A pesticide that is strongly adsorbed to soil would be less likely to move to ground water even if it is persistent.

Pesticide labeling usually does not tell you about these properties of the pesticide product. The Soil Conservation Service, Cooperative Extension Service, your trade association, or your pesticide dealer may have specific information about the characteristics of the pesticides you are using.

Soil Factors

Soil is also an important factor in the breakdown and movement of pesticides. Your local Soil Conservation Service can help you determine the types of soil in your area and how they affect breakdown and movement. The three major soil characteristics that affect pesticides are texture, permeability, and organic matter.

Soil texture is an indication of the relative proportions of sand, silt, and clay in the soil. Coarse, sandy soils generally allow water to carry the pesticides rapidly downward. Finer textured soils generally allow water to move at much slower rates. They contain more clay, and sometimes organic matter, to which pesticides may cling.

Soil permeability is a general measure of how fast water can move downward in a particular soil. The more permeable soils must be managed carefully to keep pesticides from reaching ground water.

Soil organic matter influences how much water the soil can hold before it begins to move downward. Soil containing organic matter has greater ability to stop the movement of pesticides. Soils in which plants are growing are more likely to prevent pesticide movement than bare soils.

Geology

The **distance from the soil surface to the water table** is the measure of how deep the ground water is in a given location. If the ground water is within a few feet of the soil surface, pesticides are more likely to reach it than if it is farther down. In humid areas, the water table may be only a few feet below the surface of the soil. In arid areas, the water table may lie several hundred feet below the soil surface. The depth to the water table does not stay the same over the course of the year. It varies according to:

- the amount of rain, snow, and irrigation water being added to the soil surface,
- the amount of evaporation and plant uptake,
- whether the ground is frozen, and
- how much ground water is being withdrawn by pumping.

The Soil Conservation Service can provide you with valuable information on the geology of an area and on the potential for ground water contamination on your property.

Spring and fall generally are the times when the water table is closest to the soil surface. The water table often moves downward during the summer when evaporation and plant uptake are high and when larger than normal amounts of ground water are being used for irrigation and other hot weather needs. The water table also moves downward in winter if surface water cannot move down through the frozen soil to recharge the ground water.

The **permeability of geological layers** between the soil and ground water is also important. If surface water can move down quickly, pesticides are more likely to reach ground water. Gravel deposits are highly permeable. They allow water and any pesticides in it to move rapidly downward to ground water. Regions with limestone deposits are particularly susceptible to ground water contamination, because water may move rapidly to the ground water through caverns or "rivers" with little filtration or chemical breakdown. On the other hand, layers of clay may be totally impermeable and may prevent most water and any pesticides in it from reaching the ground water.

Sinkholes are especially troublesome. Surface water often flows into sinkholes and disappears quickly into the ground water. If a pesticide is released into an area that drains to a sinkhole, even a moderate rain or irrigation may carry some of the pesticide directly to the ground water.

The Certified Applicator's Role

Some pesticides or certain uses of some pesticides may be classified as restricted use because of ground water concerns. As a certified applicator, you have a special responsibility to handle all pesticides safely in and near use sites where ground water contamination is particularly likely. Take extra precautions when using techniques that are known to be likely to cause contamination of ground water, such as chemigation and soil injection.

When a pesticide product has been found in ground water or has characteristics that may pose a

threat of contamination of ground water, the pesticide product labeling may contain statements to alert you to the concern. Typical pesticide labeling statements include:

This chemical has been identified in limited ground water sampling and there is the possibility that it can leach through the soil to ground water, especially where soils are coarse and ground water is near the surface.

This product is readily decomposed into harmless residues under most use conditions. However, a combination of permeable and acidic soil conditions, moderate to heavy irrigation and/or rainfall, use of 20 or more pounds per acre, and soil temperature below 50°F (10°C) at application time tend to reduce degradation and promote movement of residues to ground water. If the above describes your local use conditions and ground water in your area is used for drinking, do not use this product without first contacting (registrant's name and telephone number).

Protection of Endangered Species

An endangered species is a plant or animal that is in danger of becoming extinct. There are two classifications of these plants and animals in danger — "endangered species" and "threatened species." The term "endangered species" is used here to refer to the two classifications collectively. Scientists believe that some pesticides may threaten the survival of some of America's endangered species if they are used in the places where these plants and animals still exist.

A Federal law, the Endangered Species Act, requires the U.S. Environmental Protection Agency (EPA) to ensure that endangered species are protected from pesticides. EPA's goal is to remove or reduce the threat that pesticide use poses to endangered species. Reaching this goal will require some limitations on pesticide use. These limitations usually will apply only in the currently occupied habitat or range of each endangered species at risk. Occasionally the limitations will apply where endangered species are being reintroduced into a habitat they previously occupied.

Habitats, sometimes called "critical habitats," are the areas of land, water, and air space that an endangered species needs for survival. Such areas include breeding sites; sources of food, cover, and shelter; and surrounding territory that gives room for normal population growth and behavior.

United States
Environmental Protection
Agency

EPA

Protecting Endangered Species

The information in this pamphlet is similar to what the U.S. Environmental Protection Agency (EPA) expects to distribute once our Endangered Species Protection Program is in effect. The limitations on pesticide use are not law at this time, but are being provided now for your use in voluntarily protecting endangered and threatened species from harm due to pesticide use. We encourage you to use this information. We also welcome your comments.

The Endangered Species Act is intended to protect and promote recovery of animals and plants that are in danger of becoming extinct due to the activities of people. Under the Act, EPA must ensure that use of pesticides it registers will not result in harm to the species listed as endangered or threatened by the U.S. Fish and Wildlife Service, or to habitat critical to those species' survival. To accomplish this, the EPA expects to implement program requirements beginning in 1991. This program will protect endangered and threatened species from harm due to pesticide use.

EPA requests your comments regarding the information presented in this publication. Please drop us a line to let us know whether the information is clear and correct. Also tell us to what extent following the recommended measures would affect your typical pesticide use or productivity. This information will be considered by EPA during the final stages of program development.

Please submit comments to:
Interim Endangered Species
Protection Program (H7506C)
Public Docket and Information Section
U.S. EPA
401 M Street, SW
Washington, DC 20460

About This Publication

This publication contains a County Map showing the area within the county where pesticide use should be limited to protect listed species. These areas are identified on the map by a shaded pattern. Each shaded pattern corresponds to a species in need of protection.

The Shading Key shows the name of the species that each shaded pattern represents and describes the shaded area. The area may be described in terms of Township, Range, and Section or by giving details about the habitat of the species.

The first column of the "Table of Pesticide Active Ingredients" lists the active ingredients for which there should be limitations on use to protect certain species. The next columns are headed by the shading pattern of the species with Codes listed underneath them.

The Code indicates the specific limitation that is necessary to protect the species. The section titled Limitations on Pesticide Use explains the code.

Does This Information Apply To You?

To determine whether this information applies to your use of a pesticide, review the questions below. The information applies only if you answer "yes" to both questions:

- Do you intend to use pesticides within the shaded area on the county map?
- Are any of the ingredients listed on the front panel of your pesticide product label named in the "Table of Pesticide Active Ingredients"?

If you answer "yes" to both questions, you should follow the instructions on "How to Use This Information" to determine if you should limit use of the pesticide to help protect listed species.

If you answer "no" to either question, you should follow the usage directions on the pesticide product label.

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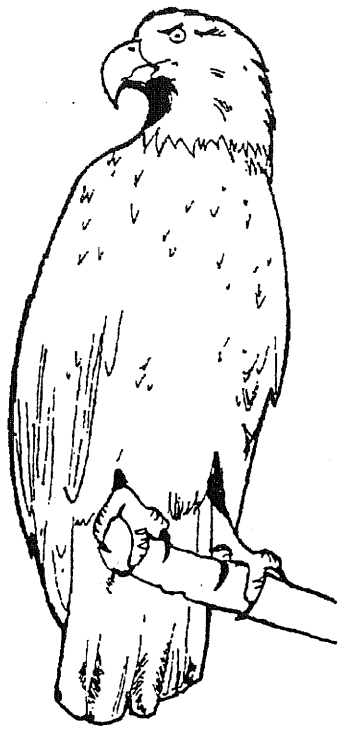


Limitations on Pesticide Use

Read all pesticide labeling carefully to find out whether the use of that product requires you to take any special steps to protect endangered species. The label may direct you to another source for the details about what you must do. When limitations do apply, they usually will be in effect only in some specific geographic locations. Use of a particular pesticide is usually limited in a particular location when:

- the site is designated as the current habitat of an endangered species, **and**
- the endangered species that uses the site might be harmed by the use of the pesticide within (or close to) its habitat.

Habitats of Endangered Species

The U.S. Fish and Wildlife Service is responsible for identifying the current habitat or range of each endangered species. For aquatic species, the restricted habitat often will include an additional zone around the body of water to keep any drift, runoff, or leachate in the watershed from reaching the water.

The U.S. Fish and Wildlife Service is attempting to identify the habitats as accurately as possible so that pesticide use will need to be limited only in locations where it is absolutely necessary. For this reason, limitations on pesticide use may apply on one property, while a similar adjoining property may not have these limitations.

Importance of Protecting Endangered Species

Hundreds of animals (including fish, birds, mammals, reptiles, amphibians, insects, and aquatic invertebrates) and thousands of plants have been named as endangered or threatened species under the provisions of the Endangered Species Act. Some of these animals and plants are ones that everyone knows about, such as the bald eagle. Others are tiny, little-known creatures that may rarely be seen by anyone except trained naturalists.

Regardless of the size or apparent significance of these endangered species, it is important that each is allowed to survive — mankind's well-being depends on maintaining **biological diversity**.

Endangered Species Restriction

Under the Endangered Species Act, it is a Federal offense to use any pesticide in a manner that results in the death of a member of an endangered species. Prior to making applications, the user must determine that endangered species are not located immediately adjacent to the site to be treated. If the users are in doubt whether or not endangered species may be affected, they should contact the regional U.S. Fish and Wildlife Service Office (Endangered Specialist) or personnel of the State Fish and Game Office.

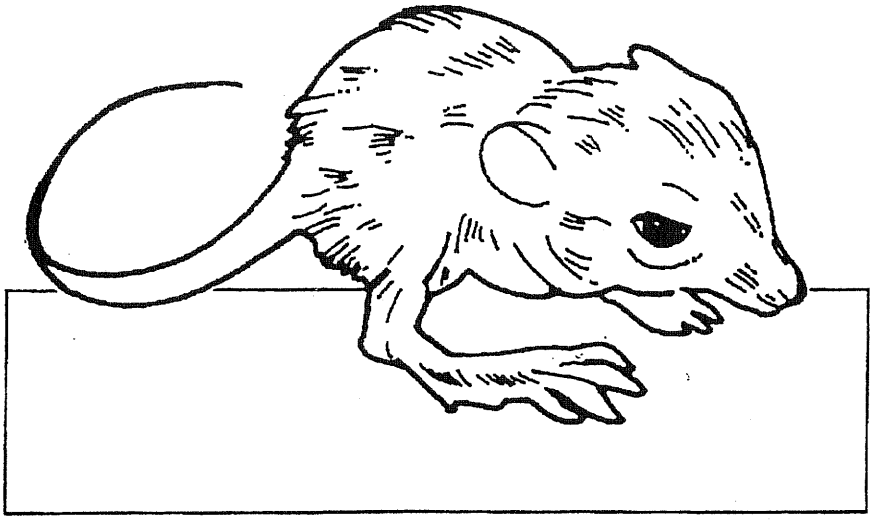
Biological diversity is the variety and differences among living things, and the complex ways they interact. Diversity is necessary for several reasons:

Agriculture

Nearly all of today's crops started as wild species. Genes from wild species often are used to create new hybrids that have resistance to plant diseases and insects, better climatic tolerance, and higher yields. Having different varieties available is necessary insurance against devastating crop failures caused by climate extremes or major pest outbreaks.

Medicine

Many of today's most important medicines come from obscure plant and animal species. A mold is the source of penicillin, the miracle drug; an herb is the source of quinine, a cure for malaria. Scientists are testing countless plant and animal species around the world for sources of cures for major diseases.

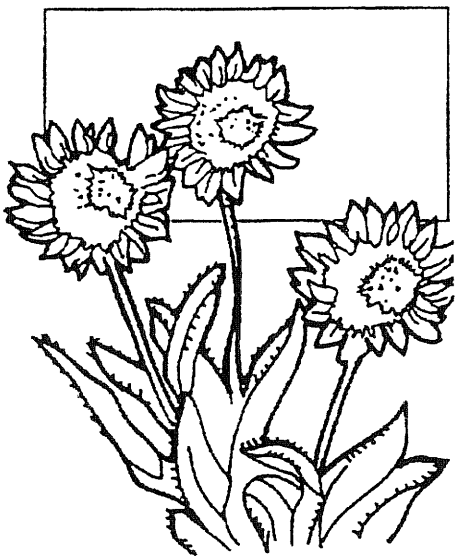


Preserving choices

No one can predict which species may be essential to the future of mankind. A species that is allowed to become extinct might have been the key to stopping a global epidemic or to surviving a major climate change.

Interdependence

The extinction of a single species can set off a chain reaction of harm to other species. The disappearance of a single kind of plant from an area, for example, may lead to the disappearance of certain insects, higher animals, and other plants.



Natural balance

Extinction has always been a natural part of an ever-changing process. During most of history, species have formed at a rate greater than the rate of extinctions. Now, however, it appears that human activity is greatly speeding up the rate of extinctions. People, plants, and animals live together in a delicate balance; the disappearance of species could easily upset that balance.

Stability

The more diversity that exists in an ecosystem, the more stable it is likely to be. There is less likelihood of huge swings in populations of particular organisms. There is also less likelihood of devastation from the introduction of a new species from outside the system.

The Certified Applicator's Role

Pesticides have the potential to harm living organisms, including endangered species:

- Pesticides can kill endangered plants and animals directly.
- Pesticides in the habitat of the endangered organisms can disrupt or destroy their sources of food and shelter.
- Pesticide application, drift, runoff, and leachate can contaminate water ingested by or inhabited by endangered organisms.
- Some pesticides can build up to dangerous levels in endangered predators that feed on plants or animals exposed to pesticides.

As a certified applicator, you have a clearly defined legal responsibility to protect endangered species against the hazards posed by pesticides. Careful use of pesticides in and around the key habitat areas will help these fragile plants and animals to survive, and it also may prevent some important pesticides from being removed from the market.

Typical pesticide labeling statements that alert you to concerns about endangered species include:

Under the Endangered Species Act, it is a Federal offense to use any pesticide in a manner that results in the death of a member of an endangered species. Prior to making applications, the user must determine that endangered species are not located in or immediately adjacent to the site to be treated. If the users are in doubt whether or not endangered species may be affected, they should contact the regional U.S. Fish and Wildlife Service office (Endangered Species specialist) or personnel of the State Fish and Game office.

Endangered Species Restrictions: For Aerial Application — Do not use within 100 yards of aquatic habitats. For Ground Application — Do not use within 20 yards of aquatic habitats.

Know the Law

The Endangered Species Act (ESA) is a Federal law administered by the Fish and Wildlife Service (FWS) of the Department of the Interior. The ESA makes it illegal to kill, harm, or collect endangered or threatened wildlife or fish or to remove endangered or threatened plants from areas under Federal jurisdiction. It also requires other Federal agencies to ensure that any action they carry out or authorize is not likely to jeopardize the continued existence of any endangered or threatened species, or to destroy or adversely modify its critical habitat. As a result, EPA must ensure that no registered pesticide use is likely to jeopardize the survival of any endangered or threatened species.

The FWS has the authority to designate land and freshwater species as endangered or threatened and to identify their current habitat or range. The National Marine Fisheries Service has the same authority for marine species.

The FWS has the authority to prosecute persons, including pesticide users, who harm endangered or threatened species. In addition, EPA enforcement personnel have the authority to ensure that pesticide users observe labeling restrictions.

Test Your Knowledge

Q. Which pesticide handling activities pose a threat to ground water or endangered species?

A. All handling activities may pose a threat, including mixing, loading, applying, equipment cleaning, storage, transportation, disposal, and spill cleanup.

Q. Why is the location of your pesticide use site the main factor that determines whether you must take special action to protect endangered species or ground water?

A. These special limitations on pesticide use are usually in effect only in locations where endangered species live or are being introduced and in areas where ground water is especially likely to be contaminated. Unless your pesticide use site is in one of these places, the special restrictions do not apply to you.

Q. How will you know if you must take special action to protect emdangered species or ground water?

A. The pesticide labeling will tell you if special measures are necessary, but it may not contain the detailed instructions that you must follow. The labeling may instruct you to get these from another source.

Q. What are some factors that determine whether pesticides will reach ground water?

A. The factors include: practices followed by pesticide users; presence or absence of water on the surface of the site where the pesticides are released; chemical characteristics of the pesticides; type of soil in the site where the pesticides are released; location of the ground water — its distance from the surface and the type of geological formations above it.

Q. How can you help to prevent pesticides from reaching ground water?

A. Avoid using more pesticide than the labeling directs; avoid application methods that present special risks; keep pesticides from back-siphoning into your water source; locate pesticide storage facilities at least 100 feet from wells, springs, sinkholes, and other sites that directly link to ground water; locate mix-load sites and equipment-cleaning sites at least 100 feet from surface water or from direct links to ground water or take precautions to protect those sites; dispose of unused pesticides, pesticide containers, and equipment and container rinse water correctly.

Q. Explain why the amount of water on the surface of the soil at the pesticide use site is an important factor in ground water contamination.

A. If there is more water on the soil than the soil can hold, the water (along with any pesticides it contains) is likely to move downward to the ground water.

Q. Explain how the solubility, adsorption, and persistence of a pesticide affect its ability to move into ground water.

A. *Solubility* — Some pesticides dissolve easily in water and are more likely to move into water systems.
Adsorption — Some pesticides become tightly attached (strongly adsorbed) to soil particles and are not likely to move out of the soil and into water systems.
Persistence — Some pesticides do not break down quickly and remain in the environment for a long time, so are more likely to move into ground water.

Q. What types of soil slow the movement of pesticides into ground water? What types permit rapid movement?

A. Soils that are fine-textured and contain organic matter slow the downward movement of water containing pesticides. Coarse, sandy soils generally allow water to carry pesticides rapidly downward.

Q. What geologic factors affect the movement of pesticides into ground water?

A. Distance to ground water, permeability of geologic layers, and the presence or absence of sinkholes.

Q. What is an endangered species?

A. An endangered species is a plant or animal that is in danger of becoming extinct.

Q. What is a habitat?

A. A habitat is the area of land, water, and air space that an endangered species needs for survival. Such areas include breeding sites; sources of food, cover, and shelter; and enough surrounding territory to give room for normal population growth and behavior.

Q. What is biological diversity?

A. Biological diversity is the variety and differences among living things, and the complex ways they interact.

Q. How can pesticides harm endangered species?

A. Pesticides may harm endangered species by direct contact; by disrupting or destroying sources of food and shelter; by contaminating water ingested by or inhabited by endangered organisms; by building up to dangerous levels in endangered predators that feed on plants or animals exposed to pesticides.