

PESTICIDE STEWARDSHIP: your responsibility to the environment

This is a CEU article.

By Tim Gaver

Pesticides are an integral part of conventional production agriculture, and the use of these potentially hazardous materials in a responsible manner should not be taken for granted. Pesticide stewardship can be defined as the responsibility for environmental quality shared by all those whose pesticide application actions could possibly affect the environment. Words or descriptive terms such as IPM, resistance management, damage threshold, drift management, beneficial organisms, critical habitats and potential for leaching should be well understood and be considered when developing or implementing a pest management program.

All pesticides sold and used in the United States must undergo an intensive registration process before the manufacturer is issued a product use label. This process involves the submission of toxicology, efficacy and other relevant data, and an investment of many millions of dollars by the manufacturer to develop this data. The U.S. Environmental Protection Agency (EPA) is ultimately responsible for deciding which pesticides are registered for use and what crops or sites they may be used on. Pesticide labels approved by the EPA contain information needed for safe and effective use of the pesticide product and indicate that the product has been determined to pose no unreasonable risks to humans or the environment if used according to the label.

The EPA categorizes every labeled pesticide as either “unclassified” or “restricted use.” Restricted-use pesticides may only be purchased or applied under the supervision of Certified Pesticide Applicators who have demonstrated that they have the knowledge to use these pesticides safely and effectively. This certification of competency requires training and/or testing to initially obtain the certification and a requirement for continuing education to retain the certification. Restricted-use pesticides may be classified as such because of toxicity, potential for groundwater contamination, cancer concerns or the possibility of effects on endangered species or other organisms.

Among other issues, the EPA is especially concerned about the protection of groundwater and the protection of endangered species. Water that is located beneath the earth’s surface is defined as groundwater. Groundwater is a major source of drinking, washing and irrigation water. The recharge of this underground water source is mostly by rain, but can also be supplemented by water from ponds, lakes, canals and streams. The rate of movement of water from the earth’s surface down to groundwater is determined by a number of factors. These include soil type and the presence of an organic layer or “hardpan” or other geological layers such as limestone or gravel.

The potential for pesticides to be moved downward into groundwater is also dependent on several factors. These include:

1. The type of soil where the pesticide is released,
2. the practices followed by pesticide users,
3. chemical characteristics of the pesticides,
4. the presence or absence of water at the surface of the site where pesticides are released, and,
5. the distance from the surface to the groundwater and the type of geological formations above it.

A major factor in the potential for movement of pesticides

is the soil type. Soil texture, permeability and organic matter content vary by soil type. The relative proportions of sand, silt and clay in the soil define soil texture. Soil permeability is a general term that measures how fast water moves downward in a particular soil type. Organic matter in the soil has the ability to hold both water and pesticides. The deep, sandy soils found under the Florida “ridge” contain little clay and organic matter and have a high rate of permeability, which would generally allow water and, potentially, pesticides to be moved down into the groundwater. The naturally poorly drained, or “flatwoods,” soils generally have a relatively shallow layer of sand on the soil surface over a thin, accumulated layer of organic material called a spodic horizon or “hardpan.” This hardpan layer is relatively impermeable and results in water moving either laterally or downward very slowly. Deeper horizons under the hardpan that contain clay and marl also allow only limited water movement downward.

Potential contamination of groundwater can best be avoided by following label directions and using accepted Good Agricultural Practices (GAPs). Using a higher rate of pesticide than is specified on the label is illegal, expensive and may result in contamination. Mix/load sites should be located at least 100 feet from surface water sources if possible. Sites near water sources can utilize dikes, containment pads or sump pits to keep pesticides from reaching the water. Well-designed and constructed pesticide storage facilities may help to avoid contamination from damage resulting from severe storm events or other disasters. Triple rinsing pesticide containers and disposing of them properly and promptly helps to ensure they do not wind up in surface water bodies. Pesticide application equipment cleaning sites should be designed to capture the wash water so that it can be applied to a labeled site.

Pesticide formulations have different potentials for groundwater contamination. Soluble formulations such as the true solubles (S) and emulsifiable concentrates (EC) dissolve easily in water and are therefore more likely to move into water systems. Pesticides vary widely in their persistence, or ability to remain in the environment. Some compounds are quickly broken down by environmental factors such as moisture, exposure to sunlight and high temperatures, while others may resist degradation for longer periods. An example of a persistent pesticide might be a herbicide used as a pre-emergence application to control weed seedlings for several months. Adsorption, or the process in which pesticides may become attached to soil particles or organic matter, also affects the potential for leaching. These factors are all related in that a soluble pesticide that is not persistent may not be as likely to move to groundwater. Another example would be a persistent herbicide that is tightly adsorbed to soil particles or organic matter, and therefore resists leaching.

If the soil is already saturated with water when a pesticide is applied, then additional water in the form of rainfall or irrigation will make it more likely that leaching of pesticides will occur. Pesticide applicators should be aware of forecasts of heavy rain and delay pesticide applications if these events are likely. Pesticide labels often contain information about how soon and the amount of irrigation that may be applied after a pesticide application. Some soil-applied herbicides may require rain or irrigation to move them into the rooting zone of emerging weed seedlings.

The depth to groundwater in Florida varies considerably,

with some poorly drained areas having groundwater only a few feet down. Areas with deeper, well-drained sands tend to have much deeper groundwater levels. Sinkholes, which are occurring more frequently in Florida due to increased withdrawals from shallow aquifers, are unfortunately a convenient avenue for contaminated water to reach groundwater supplies.

While the EPA focuses considerable attention on groundwater contamination, the fact is that much of Florida agriculture is conducted in close or immediate proximity to canals, ditches, swamps, ponds or lakes which contain vulnerable surface waters and valuable aquatic wildlife. This wildlife includes fish, aquatic birds, mammals and reptiles and tiny invertebrates that form the base of the aquatic food chain. Many pesticide labels contain warnings or restrictions about applications near these surface bodies of water. Aquatic organisms are very sensitive to even minute amounts of pesticides, and applicators should use considerable care when applying pesticides near surface water.

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. These are plants or animals that are in danger of becoming extinct, and include the classifications "endangered species" and "threatened species." Pesticide labels may identify areas of land as "critical habitat" if these areas of land, water and air space are needed for survival of an endangered species.

Most pesticide applicators in Florida are aware that alligators, Florida panthers, sandhill cranes and the Everglades kite are endangered or threatened species. However, the Florida Fish and Wildlife Conservation Commission currently lists seven invertebrates and 59 animals in Florida on the Federal Endangered or Threatened lists. With the exception of three insect species, the other invertebrates are aquatic organisms that are especially vulnerable to pesticide

exposure. There are an additional 65 plants and animals on the "State Threatened" or "Species of Special Concern" lists. These include insects, mollusks, crustaceans, fish, amphibians, reptiles, birds and mammals.

While many of the species on the endangered or threatened lists are seemingly insignificant, the bigger picture is that the future of mankind depends on biological diversity. Our new knowledge of genetic technology is advancing at a blinding pace. Who knows what obscure plant or animal may provide the genetic material to help feed the world, create a miracle cure for cancer or provide a link to an undiscovered bioenergy source? Although scientists are scouring the ocean floors and humid rainforests for undiscovered species, a scarce and diminutive species living right in our own back yard may someday provide the key to a valuable scientific breakthrough.

Nature's creatures interact with each other in very complex ways. The disappearance of a single species from an area could possibly result in the subsequent extinction of several other plants, insects or animals. Pesticides can kill endangered or threatened species in a direct manner, resulting in reduced populations. Pesticides improperly applied to sensitive habitats have the potential to modify the food sources or protective shelter necessary for the survival of a species. Modern man is a relative newcomer to this interaction, but we have the means to quickly alter this delicate balance of nature with our powerful technology. Pesticides are valuable tools, and whether we use these chemistries in a positive or negative way is up to us as responsible stewards of the environment. *Reference source: Applying Pesticides Correctly, Fred Fishel, University of Florida, Gainesville.*

Tim Gaver is a citrus Extension agent based at the St. Lucie County Extension Service, Fort Pierce.

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“Pesticide stewardship: your responsibility to the environment” test

To receive one Core continuing education unit (CEU), read “*Pesticide stewardship: your responsibility to the environment*” on page 26. Answer the 20 questions on the magazine’s Web site (www.citrusindustry.net) or mail the answers and application information to the address at the bottom of this form. The article and test set will be valid for up to one year from the publication date. After one year, this test will no longer provide a CEU.

1. Pesticide labels are only required for pesticides that are used on very large numbers of acres in the United States.
 - a. True _____
 - b. False _____
2. A pesticide is only labeled as “Restricted Use” if the active ingredient is extremely toxic.
 - a. True _____
 - b. False _____
3. Certified Pesticide Applicators are licensed to:
 - a. Purchase restricted-use pesticides
 - b. Supervise the application of restricted-use pesticides
 - c. Use pesticides on whatever crop they choose
 - d. Answers A & B
4. Groundwater is safe from pesticide contamination because it is always located hundreds of feet under the soil surface.
 - a. True _____
 - b. False _____
5. The potential for pesticides to be moved downward into groundwater is dependent on:
 - a. Soil type
 - b. Pesticide chemical characteristics
 - c. Distance to groundwater from the soil surface
 - d. All of the above
6. Pesticide movement in soils may depend on:
 - a. Soil temperature
 - b. Amount of vegetation present
 - c. Soil type
 - d. Time of year
7. Pesticides are all persistent in the environment so that they will kill pests over a long period of time.
 - a. True _____
 - b. False _____
8. Pesticides have limited downward movement in poorly drained, or “flatwoods” soils because:
 - a. These soils are highly permeable
 - b. Water dilutes the pesticide
 - c. The hardpan layer is relatively impermeable
 - d. The very high organic matter content of these soils neutralizes the pesticide
9. Which pesticide formulation dissolves easily in water and is more likely to move downward in soils?
 - a. Wettable powder (WP)
 - b. Granular (G)
 - c. Emulsifiable concentrate (EC)
 - d. None of the above
10. Florida only has a few animals on the endangered or threatened species lists.
 - a. True _____
 - b. False _____
11. Aquatic organisms can generally tolerate pesticide contamination because water quickly breaks down pesticides.
 - a. True _____
 - b. False _____
12. The process by which pesticides can become attached to soil or organic particles is called:
 - a. Adhesion
 - b. Adsorption
 - c. Bipolar cohesion
 - d. None of the above
13. Pesticides are only labeled by the EPA when they are shown to be harmless to the environment, no matter how they are used.
 - a. True _____
 - b. False _____
14. Groundwater supplies in the United States are only regarded as a minor source of water used for drinking, washing and irrigation.
 - a. True _____
 - b. False _____
15. Accepted Good Agricultural Practices (GAPs) to prevent pesticide contamination might include:
 - a. Triple rinsing empty pesticide containers
 - b. Using the correct rates of pesticides
 - c. Locating mix/load sites 100 feet away from water bodies
 - d. All of the above
16. Sinkholes are an unlikely avenue for groundwater contamination because they are so rare in Florida.
 - a. True _____
 - b. False _____
17. Which of the following terms are related to responsible pest management?
 - a. Excessive applications
 - b. Critical habitats
 - c. Damage threshold
 - d. B & C
18. The wash water from pesticide application equipment cleaning sites can legally be applied to:
 - a. Any bare ground
 - b. Canals or ditches that do not connect with lakes
 - c. Crops that are listed on the pesticide label
 - d. None of the above
19. An environmental factor that might accelerate the degradation of a pesticide would be:
 - a. High winds
 - b. Cold temperatures
 - c. Rainfall
 - d. Application to a tolerant insect
20. Pesticide contamination of surface waters in Florida is not a potential problem because the EPA is only interested in groundwater contamination.
 - a. True _____
 - b. False _____

Pesticide Applicator CEU Form

First Name: _____

Last Name: _____

Email: _____

Pesticide License Number _____

Address _____

City _____ State _____

Zip: _____

Phone Number: _____

*Please mail the answer sheet or a copy of the form to:
Tim Gaver, IFAS/St. Lucie Extension, 8400 Picos Road, Suite 101,
Fort Pierce, FL 34945*

If you have questions regarding this form, test or CEUs, email Tim Gaver at tgaver.49@ufl.edu or call (772) 462-1660. 🍊