

Preventing pesticide contamination of water sources

By Parker Platts and Stephen H. Futch

Water is a vital and precious resource to our environment. Protecting Florida's water sources should be a high priority when dealing with pesticides. The restoration of pesticide-contaminated water is complex and expensive, and in many cases, not feasible. The pesticide user must be diligent in employing good management practices that prevent pesticides from polluting our waters.

Surface water is the water on top of the earth's surface such as lakes, rivers, canals and irrigation ditches. More than a third of the state's fresh water withdrawals comes from surface water. Pesticides can move downslope in runoff water or with eroded sediment to contaminate surface water.

Runoff is the water that flows downslope over the land during heavy or continual rainfall. This runoff water can carry pesticides with it to unintended surface-water bodies. Factors affecting runoff are rainfall amounts and intensities, slope, vegetative cover, temperature and soil type.

Groundwater is the water beneath the earth's surface, found in the spaces

between soil particles, gravel and rock. Groundwater, the source of water for wells and springs, is where approximately 90 percent of Florida's drinking water comes from. Groundwater must be protected from pesticide contamination, as the restoration of underground water pollution is very difficult if not impossible.

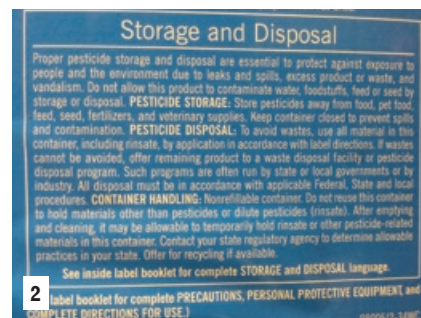
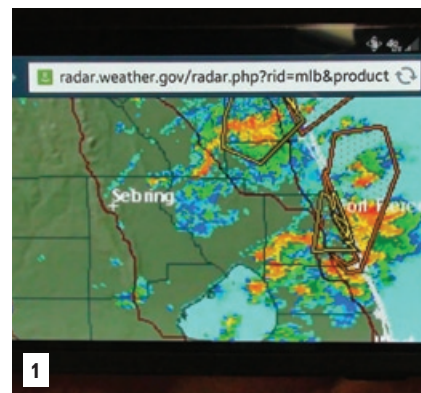
Leaching is the downward movement of pesticides or other compounds in water through the soil profile, which can cause pollution of the groundwater. The physical and chemical characteristics of a pesticide, as well as the properties of the soil, influence the ability for leaching.

Characteristics of a pesticide that affect its ability to leach are adsorption, solubility and persistence.

Adsorption is the ability of a pesticide to bind with soil particles. If a pesticide is held strongly on the surface of soil particles, it is less likely to leach.

Solubility is a measure of the ability of a pesticide to be dissolved in a solvent or water. A more soluble substance will move more easily in water through the soil.

Persistence is the ability of a pesticide to remain present and active



1: To help determine when to apply pesticides, applicators should check the weather forecast periodically during the day.

2: Follow the instructions on the pesticide label for proper storage and disposal.

3: Keep pesticides in a locked storage facility.

in its original form for an extended period before breaking down. A pesticide that is quickly broken down is less prone to pollute the groundwater. When leaching is a concern, look for label information or call the pesticide manufacturer and ask about these pesticide characteristics.

Soil properties are also an important factor in the movement and breakdown of pesticides. These factors include permeability, organic matter and depth of groundwater.

Soil **permeability** refers to how easily or quickly a liquid will flow through the soil. Basically, the larger

the particles that make up the soil, the more permeable it is. A coarse sand is more permeable and porous than fine sand or clay, and therefore more prone to leaching.

Organic matter content has a large impact on the water-holding capacity and pesticide adsorption of the soil. Organic matter consists of decomposed plant and animal material in the soil. Soils that are high in organic matter hold more water in the rooting zone, which results in a lower leaching potential.

The **depth of the groundwater** has an effect on leaching as well. An area with a shallow water table and no shallow restrictive hardpan has a higher chance of pesticides reaching the groundwater than an area with a deep water table. Such a table has more vertical soil area, which is more favorable to pesticide adsorption and degradation as it moves through the soil.

The following management practices should be incorporated into every pesticide program to help prevent ground and surface-water contamination.

EVALUATE THE SITE

Now that you know how pesticides can move into water sources, you can evaluate the site as to its vulnerability to pesticide contamination. The slope of the field in relation to lakes, ponds, streams, canals and wetlands should be assessed. If you find water bodies that are vulnerable, berms or banks between the surface-water bodies and the application sites will reduce the chance of pollution from runoff. Also, buffer zones such as grass borders can help in filtering between the application site and water bodies.

The soil properties should also be evaluated for leaching potential, considering the texture, structure and organic matter content. Some pesticides may have restrictions on where they can be applied according to the soil properties. Always read the label carefully and follow label directions. A good resource to determine the soil characteristics is the Natural Resources Conservation Service Web Soil Survey website



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(<http://websoilsurvey.sc.egov.usda.gov/App/HomePage.htm>). If you have a highly leachable soil, take extra precautions in preventing pesticide soil exposure and, when possible, choose pesticides that are less likely to leach.

MONITOR THE WEATHER AND IRRIGATION

Intense downpours or prolonged periods of rain affect runoff and erosion rates to a large degree. Florida receives more than half of its annual rainfall from June through September, so extra care should be taken when applying pesticides during these wet months. To help determine when to make pesticide applications, applicators should check the weather forecast periodically during the day. If heavy downpours are predicted, pesticide applications should be delayed until favorable weather returns. Irrigation scheduling should be carefully managed, taking into consideration when pesticide applications are made to minimize runoff and leaching.

USE INTEGRATED PEST MANAGEMENT

Integrated pest management (IPM) is a comprehensive strategy of pest control. The major objective is to achieve desired levels of pest control in an environmentally responsible manner, combining physical, chemical, cultural and biological control methods. IPM combines understanding the causes of pest outbreaks, manipulating the crop ecosystem for pest control and monitoring pest populations and their life cycles to determine if and when the use of pesticides is necessary.

When pest monitoring shows pest levels have reached the threshold where pesticide application is necessary, choose pesticides with the least possible hazard to people and the environment, and apply the lowest rate required for adequate control. Reducing the amount of pesticides applied lowers the risk of water pollution and the grower's costs.

PROPERLY CALCULATE, CALIBRATE AND APPLY

The key to an effective pest control program is to efficiently keep the pesticide on the target site in the proper amount. Labeled rates should never be exceeded. To help eliminate having to dispose of leftover spray mix, carefully calculate the amount of pesticide needed to treat the site. Pesticide application equipment should be calibrated frequently to assure the pesticide rates are being applied within the desired application levels. Sprayer equipment should be checked often for leaks and malfunctions. Accurate calibration and properly working equipment will help prevent pesticide contamination of surface water and groundwater.

USE EXTRA CARE WHILE MIXING AND LOADING

Mixing and loading require extra care. The people who perform these tasks need to be attentive, responsible and properly trained. When mixing and loading, the pesticide is in a concentrated form and is more toxic than when it is diluted in the application tank. Precautions should be taken to prevent spills and overfilling that could cause water contamination.

In many instances, mixing and loading is performed at the same locations on the farm, due to the location of water required for mixing. Repeated spills over months or years at the same location may exceed the soil's capabilities to degrade or adsorb the pesticide, increasing the chances it will leach into the groundwater. Permanent or portable containment pads can be used to avoid point-source pollution of groundwater such as that caused by pesticide soil saturation.

If containment pads are not used, mixing and loading should be rotated between many locations to reduce the chances of pesticide buildup in the soil. When choosing mix-and-load sites, check the soil for characteristics that are not conducive to leaching and runoff, and avoid mixing and loading within 300 feet of a well.

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PROPERLY STORE, TRANSPORT AND DISPOSE OF PESTICIDES

Pesticides should be stored in a locked storage facility, with impervious flooring that is designed to contain spills. Containers should be inspected regularly for leaks, and spills should be cleaned up immediately. When transporting pesticides, do not allow workers to ride in the same compartment as the pesticides, make sure the pesticides are properly secured and drive responsibly.

When disposing of pesticides, follow the instructions found on the label. If there is excess spray mix, it can be applied to the crops or sites that are listed on the label. Never drain excess material onto the ground. To dispose of empty pesticide containers, first triple rinse them and pour the rinse water back into the tank. Dispose of containers in accordance with federal, state, tribal and local regulations.

More and more pesticide labels list environmental effects as reasons for being classified as restricted use. All pesticide users should consider the ways that pesticides can infiltrate our ground and surface water, and implement good management practices to reduce the chance of pollution. Prevention is the best way to keep pesticides out of our valuable water resources. 🍌

Source of information: “Applying Pesticides Correctly” by Fred Fishel, SM 1 UF/IFAS

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Mail the answer sheet or copy of the form to: Parker Platts, Saint Lucie County Extension Office, 8400 Picos Rd., Ste. 101, Fort Pierce, FL 34945-3045. If you have questions regarding this form, test or CEUs, e-mail Parker Platts at pplatts@ufl.edu or call 772-462-1628. Please allow two weeks to process your CEU request.

‘Preventing pesticide contamination of water sources’ test

To receive one core continuing education unit (CEU), read “Preventing pesticide contamination of water sources” in this issue of *Citrus Industry* magazine. Answer the 20 questions on the magazine’s website (www.citrusindustry.net) or mail the answers and application form to the address at the bottom of the 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 grant a CEU. Please allow at least 10 business days after submission to receive your CEU approval form by mail or e-mail.

1. When pest monitoring shows pest levels have reached the threshold where pesticide application is necessary, the grower should apply the highest labeled rate of pesticide. T F
2. If there is excess spray mix, it can be applied to the crops or sites that are listed on the label. T F
3. Florida receives more than half of its annual rainfall from September through December. T F
4. Some pesticides may have restrictions on where they can be applied according to the soil properties. T F
5. The depth of the groundwater has no effect on leaching. T F
6. Buffer zones, such as grass borders, can help in filtering pesticides between the application site and surface-water bodies. T F
7. Monitoring pest populations and their life cycles is an important aspect of a successful integrated pest management program. T F
8. Restoration of underground water pollution is most often a simple process. T F
9. Permeability is a measure of the ability of a pesticide to be dissolved in a solvent or water. T F
10. Runoff is the water that flows downslope over the land during heavy or continual rainfall. T F
11. Soils that are high in organic matter hold more water in the rooting zone, which results in a higher leaching potential. T F
12. Surface water is where approximately 90 percent of Florida’s drinking water comes from. T F
13. Persistence is the ability of a pesticide to remain present and active in its original form for an extended period before breaking down. T F
14. Groundwater is the water on top of the ground such as lakes, rivers, canals and irrigation ditches. T F
15. Mix-and-load containment pads and the rotation of mix-and-load sites help prevent soil contamination. T F
16. Berms or banks between the surface-water bodies and the application sites will reduce the chance of pollution from runoff. T F
17. The smaller the particles that make up the soil, the more permeable it is. T F
18. Leaching is the horizontal movement of pesticides in water across the soil surface. T F
19. Solubility refers to how easily or quickly a liquid will flow through the soil. T F
20. Adsorption refers to a pesticide’s ability to bind to soil particles. T F

Please mark the boxes below to rate your knowledge gained from this exercise:

Your knowledge of preventing pesticide contamination of water sources **before** completing this exercise:

Very Low Low Moderate High Very High

Your knowledge of preventing pesticide contamination of water sources **after** completing this exercise:

Very Low Low Moderate High Very High

Pesticide Applicator CEU Form

First Name: _____ **Last Name:** _____

E-mail: _____

Pesticide License Number: _____

Address: _____

City: _____ **State:** _____ **Zip:** _____

Phone Number: _____