# *The Pesticide Applicator Report*

*Published by*
*The Vermont Agency of Agriculture, Food & Markets*
*For Vermont's Pesticide Applicators*
**Fall 2013** *(I know, it's not Fall 2013 anymore!)*
*Volume 15 – Issue II*

In This Issue:



## *News from the Agency*

### Concern over Possible Increase in Use of Synthetic Auxin Herbicides and Drift

2,4-D and dicamba are synthetic auxin herbicides used to kill broadleaf plants. They are the active ingredients in many herbicide products used to control weeds in cereal crops like corn and wheat. Because they are designed to eliminate broadleaf weeds, they can cause damage to broadleaf crops. Some crops that are susceptible include soybeans, tomatoes, grapes, green beans, peas, cucumbers, squash, melons, pumpkins, hops, and other fruits and vegetables.

A new class of genetically modified 2,4-D and dicamba tolerant crops are awaiting regulatory approval. Approval of these herbicide tolerant crops may lead to an increase in use of 2,4-D and/or dicamba in agriculture. With the potential for increased use has come the increase in concerns over movement of these compounds either through drift of spray droplets or volatilization of the active ingredient onto nearby (or in some cases not-so-nearby) crops, causing damage that leads to reduced yields or even complete crop loss.

If these GMO crops do come to market, we encourage the use of the lower volatility formulations such as 2,4-D choline instead of traditional 2,4-D formulations, and the use of adjuvants that reduce drift to help protect sensitive crops from damage.

*Information taken from:*

- *The Save Our Crops Coalition website, http://saveourcrops.org*
- *The Enlist Weed Control Fact Sheet, Dow Agrosciences, LLC*

Questions or comments regarding this newsletter?
Please contact **Matthew Wood** at the Vermont Agency of Agriculture at 802-828-3482 or email matthew.wood@state.vt.us

# *Pesticides and Water*

*Taken from Chapter 11 of the Pesticide Safety Education Core Manual, 3rd Edition, November 2012, Cornell University – Used with permission.*

**Sources of Water Contamination** - Surface water or groundwater contamination results from either point-source or non-point-source pollution. ***Point-source pollution*** comes from a specific, identifiable place or location, such as:

- A pesticide spill entering a storm sewer or an unprotected well;
- Pesticide spills at mixing and loading, equipment cleanup, and storage sites;
- Back-siphoning (discussed later) during pesticide mixing; and
- Improper disposal of containers, rinsate from containers, and excess pesticides.

***Non-point-source pollution*** comes from a widespread area. The movement of pesticides into streams or groundwater following a broadcast application to an agricultural field, large turf area, or right-of-way is an example of non-point-source pollution. Indirect or non-point-source contamination of groundwater can occur when contaminated surface streams interact with shallow groundwater through subsurface flow. Surface water can become contaminated when water runs off treated sites or when pesticide drift occurs.

## Pesticide Contamination of Surface Water -

Surface water is often a source of drinking water. Therefore, pesticide contamination of surface water (ditches, streams, rivers, ponds, and lakes) is a health concern.

Anything that increases the likelihood and amount of runoff from a site treated with pesticides will increase the risk of surface water contamination. Factors that affect runoff include:

- **Slope.** Steeper slopes present a greater risk of runoff.
- **Vegetative cover.** Vegetation helps trap or slow down moving water, so runoff will be greater as vegetative cover decreases.
- **Soil characteristics.** Water soaks into finer-textured (e.g., clayey) soils more slowly than into coarser (e.g., sandy) soils. This means that with finer soils (e.g., clay), more water remains on the surface to contribute to runoff.
- **Temperature.** Sometimes, pesticides are applied in the colder months, such as for brush control along a right-of-way. If the ground is frozen, water cannot infiltrate and runoff will be more likely.
- **Rainfall and irrigation.** Obviously, heavy rain or excessive irrigation after an application will contribute greatly to runoff because water will not be able to soak into the soil fast enough.

Runoff may be a concern for most outdoor application sites; it is critical that runoff does not carry the pesticide into water sources or other vulnerable areas.

## Pesticide Contamination of Ground Water -

***Ground water*** is water that is underground in cracks in the bedrock and in the spaces between sand grains, gravel, and rocks. It is the source of water for wells and springs and provides 70 percent of the water used for public and private water supplies, irrigation, and industry.

The layer of soil, sand, gravel, or fractured bedrock in which all available spaces are filled with water is the saturated zone. Above that is the unsaturated zone, in which some pores between soil particles contain air and others contain water. The boundary between the saturated zone and the overlying unsaturated rock and soil is known as the ***water table.*** The overall geologic formation from which groundwater can be drawn is called an ***aquifer.***

Groundwater is recharged by water that filters down through the unsaturated zone to the water table. This is why we have to be careful how we handle pesticides on the surface; the water that moves downward can carry pesticides with it in a process called leaching. Once groundwater has been contaminated, correcting the problem is difficult or even impossible.

**Pesticide Characteristics -** A pesticide's chemical and physical characteristics influence its ability to leach into groundwater. In general, the following pesticide characteristics make leaching more likely:

- **High solubility.** Pesticides leach by moving in soil water, so leaching is more likely if a pesticide easily dissolves in the soil water.
- **Persistence.** It takes time for a pesticide to reach groundwater. Pesticides that are more persistent are more likely to reach groundwater before they degrade into non-toxic compounds.
- **Low adsorption.** A pesticide that adsorbs or binds itself strongly to soil particles will not be free to move in soil water; however, pesticides with low adsorption will be able to leach through the soil water.

Pesticides that exhibit all 3 of these characteristics—high solubility, persistence, and low adsorption—typically have a label statement informing the applicator of leaching concerns.

**Site Characteristics -** Soil properties and environmental conditions also influence a pesticide's potential for leaching. These include soil texture and structure, organic matter, depth to groundwater, and geology.

**Soil Texture and Structure -** Soil texture is the relative proportion of sand, silt, and clay-sized particles. Sandy soils are more prone to leaching because water moves faster through them and they also adsorb less pesticide. However, leaching may also occur in clay or silt soils.
Soil structure is the shape or arrangement of soil particles. It plays a big role in determining the size and shape of the pores through which water moves. Small amounts of pesticides may also move through soil cracks, worm holes, and root channels.

**Organic matter -** Organic matter consists of decaying plant material. The higher the soil organic matter content, the greater the soil's ability to both hold water and adsorb pesticides. Pesticides held in the root zone are less likely to leach into groundwater and may be taken up by plants.

**Depth to Groundwater -** Areas with a shallow water table have a greater chance for groundwater contamination because less soil is available to act as a filter, resulting in fewer opportunities for the pesticide to degrade or be adsorbed. When you must use pesticides in areas where the groundwater is close to the surface, select a pesticide having a low leaching potential and take extra precautions during mixing, application, and cleanup.

**Geology -** The permeability of the geologic layers lying between the surface of the soil and the groundwater is also an important factor. Highly permeable materials such as gravel deposits allow water and dissolved pesticides to move downward to groundwater freely. Layers of clay, which are much less permeable, can inhibit and slow the downward movement of water.

## Preventing Surface Water and Groundwater Contamination

You can greatly reduce the risk of water contamination by handling pesticides properly.

**Read the Pesticide Label -** Following the use directions on a pesticide label will reduce the risk of water contamination. Labels will also provide specific warnings in the "Precautionary Statements" section. Any pesticide product with directions for outdoor uses must include the following environmental hazard statements on the label: "Do not apply directly to water, or to areas where surface water is present, or to intertidal areas below the mean high water mark. Do not contaminate water supplies when cleaning equipment or disposing of equipment washwaters." The label may also prohibit you from mixing and/or applying the pesticide within a certain distance (e.g., 50 feet) from a well or surface water. Pesticides which have the potential to be found in groundwater must bear groundwater warning statements on their labels; this helps applicators choose appropriate pesticides where extra precautions are needed to reduce contamination risk.

**Best Management Practices -** You can greatly reduce the risk and adverse effects of point- or non-point-source contamination by following best management practices (BMPs). BMPs are effective, commonsense practices that emphasize proper mixing, loading, application, and disposal of pesticides.

**Use IPM -** Following IPM principles, use nonchemical control methods whenever possible. If pesticides are needed:

- Select a product that will provide adequate control while being less likely to leach or run off;
- Calibrate pesticide application equipment regularly; and
- If possible, reduce the amount applied by using spot treatments, band applications, and/or the lowest effective application rates.

**Identify Vulnerable Areas -** The presence of sandy soil, sinkholes, wells, streams, ponds, and shallow groundwater increases the chance of surface or groundwater contamination. Avoid pesticide application in these locations, if at all possible. Never dispose of empty pesticide containers in sinkholes or dump or rinse sprayers into or near sinkholes. Also exercise care to avoid contamination of streets, storm sewers, drainage ditches, and other potential sources of runoff to streams and waterways. Do not under any circumstances clean tanks or intentionally discharge water from a tank of any vehicle into a street, along a road, or into a storm drain.

**Keep Pesticides Away From Wells -** Do not store pesticides around wells. Poorly constructed or improperly capped or abandoned wells can allow runoff or leaching water containing pesticides and other contaminants direct entry into groundwater. These wells are sometimes located in or near treated fields and other application sites.

**Select Appropriate Mix and Load Sites -** Consider using a sealed permanent or portable mixing and loading pad to prevent seepage into soil.
Do not mix pesticides near wells or surface water or where a spill or overflow could get into them (directly or via storm drains or ditches). If a well, storm drain, drainage ditch, or surface water is nearby, the site should be graded to slope away from them. Ideally, mix and load as far as possible (at least 50 feet) from such sites. Sometimes, a pesticide label or your state laws and regulations will tell you how far you must be from water or wells in order to mix and load pesticides.
Groundwater has been contaminated because of pesticides being spilled during filling and mixing. Even small spills can lead to problems if you always mix and load at the same site. Vary the location by mixing and loading at the site of application, but not always at the same spot if you make repeated applications to a site. If a spill does occur, respond immediately.

**Containment Pads for Mixing and Loading -** If you often use the same location to mix and load pesticides or clean equipment, a pesticide containment pad may be necessary. These pads are designed to contain spills, leaks, overflows, and waste water for reuse by the applicator or for disposal by a commercial waste management contractor. If the spray tank contains pesticides, keep it on the pad. The pads make spills easier to clean up and also help prevent environmental contamination.
The containment pad must be made of an impermeable material such as sealed concrete, glazed ceramic tile, welded steel, synthetic liners, or no-wax sheeting. Construct a concave pad or one having curbs, berms, or walls high enough to hold the largest amount of spill, leak, or equipment wash water likely to occur at the site. It also must be equipped with a system for removing and recovering spilled, leaked, or released material by either an automatic sump system or a manually operated pump. Smaller, portable pads and lightweight trays made of heavy duty plastic may be used when mixing and loading at the application site.

**Avoid Back-Siphoning -** Back-siphoning is the reverse flow of liquids into a fill hose. Suction occurs at the end of a fill hose or pipe when you turn off the water or if there is a drop in water pressure. If the end of the hose or pipe is in the spray tank and below the level of the spray mix, the suction could cause the pesticide mixture to back-siphon into your water source; if you are drawing water from a well, public water supply, or surface water, back-siphoning would contaminate those water sources.
There are three ways you can prevent back-siphoning from contaminating groundwater or surface water:

- **Use a water tank.** A water tank is used only for carrying water that you originally drew from a well, public water supply, or surface water. By drawing water from a water tank during mixing and loading, you will not contaminate the original water source if back-siphoning occurs.
- **Maintain an air gap.** When filling your spray tank, keep the end of the hose or pipe well above the level of the mixture; a distance of at least twice the diameter of the hose or pipe is recommended. The resulting air gap prevents contamination of the hose or pipe and keeps pesticide from back-siphoning into the water source. Secure the hose or pipe over the spray tank to avoid letting it fall into the tank.
- **Install backflow prevention between the hose or pipe end and the water source.** An ***antisiphoning device*** has a mechanism that automatically closes if a drop or loss of water pressure occurs. This prevents anything from back-siphoning into the water source. Check valves prevent back-siphoning in chemigation systems that inject pesticides into irrigation water.

***Note: Vermont requires that you use at least one of the above to preventing back-siphoning.***

**Avoid Overflow -** If a tank is filled beyond capacity, the overflow will result in a spill that could eventually leach into groundwater or run off into surface water. To avoid overflow, never leave a spray tank unattended while it is being filled.

**Improve Land Use and Application Methods -** In agriculture, terraces and conservation tillage practices can reduce runoff and soil erosion. Ideally, leave as much plant residue as possible on the soil surface to lessen erosion. Where conservation tillage is not possible, reduce runoff potential by incorporating pesticides into the soil. In ornamental

plantings, use mulches to reduce runoff and soil erosion.
Grass buffer strips are very effective in reducing runoff from a treated site because they trap sediment containing pesticides and slow runoff water, allowing more of it to infiltrate the soil. Leave untreated grass strips next to streams, ponds, and other sensitive areas.

**Watch Weather Conditions -** Pesticides are most susceptible to runoff from heavy rains or irrigation during the first several hours after application. Time applications appropriately to avoid runoff; often, the pesticide label will tell you not to apply the product within so many hours of expected rainfall.
To avoid allowing pesticide to drift onto surface water, check the pesticide label for application precautions and for restrictions during windy conditions. Wind speed, temperature, and humidity all affect the off-target movement of pesticides.

**Select Products Wisely -** Check site conditions to determine if contamination of surface water or groundwater poses the bigger risk. Then, whenever possible, use pesticides that are less likely to leach and/or runoff, depending on the site's particular risk. Read labels for leaching warnings.

**Handle Pesticides Safely -** Follow these guidelines to prevent surface or groundwater contamination:

- Immediately contain and control pesticide spills.
- Check application equipment regularly for leaks or damage.
- Mix and load pesticides away from water sources.
- After the pesticide application is complete, follow label directions for proper equipment cleanup and container disposal.
- After applying granular pesticides, sweep or blow any granules from sidewalks, driveways, or patios onto the treatment area.
- Clean sprayers at the application site, whenever possible, and at a safe distance from wells, ponds, streams, and storm drains. Spray the rinsate on the treated area or on another site listed on the pesticide label, or use in the next tank mix of the pesticide. Be sure not to exceed label rates.

*See the quiz on page 9 for a credit…*

# *News from UVM Extension*

## *Pesticide Formulations*

*Ann Hazelrigg, UVM Pesticide Safety and Education Program*

Pesticide active ingredients in their raw or unformulated state are not typically suitable for pest control. Most pesticides are a mixture of chemicals made up of active ingredients and other ingredients (sometimes termed inerts) called formulations.

Pesticide active ingredients (a.i.) by themselves may not mix well with water, may be chemically unstable, may be difficult to handle or store, and may be difficult to apply for good pest control. As a result, to make an active ingredient useful, manufacturers add other ingredients to "formulate" the pesticide into the final product offered for sale.

The other ingredients making up the formulation can include chemicals that serve as surfactants (make the pesticide stick or spread out over the surface of a leaf), dispersants, wetting agents, solvents (liquids that dissolve the active ingredient), emulsifiers, carriers (liquids or solid chemicals that are added to a pesticide product to aid in the delivery of the active ingredient), defoamers, stabilizers, anti-freeze agents, pigments and buffers.

Manufacturers consider many factors when developing a pesticide formulation; type and habits of the pest, crop, site or surface, runoff, drift and the type of equipment used for application and safety. A single active ingredient may be sold in several formulations. The applicator should choose the formulation that will best meet the requirements for a particular job.

Abbreviations are often used to describe the formulation. These abbreviations are on the pesticide label and are used in recommendations. See some of the common pesticide formulations on the following page.

| Pesticide Formulations: | |
|---|---|
| A | Aerosol |
| B | Bait |
| D | Dust |
| DF | Dry flowable |
| E, EC | Emulsifiable concentrate |
| FL | Flowable |
| G | Granule |
| M | Microencapsulated |
| P | Pellet |
| RTU | Ready-to-use |
| SP | Soluble powder |
| ULV | Ultra-low-volume concentrate |
| WP | Wettable Powder |
| WDG | Water Dispersable Granule |

The amount of active ingredient and the kind of formulation are listed on the pesticide label.
For example, an 80 WP contains 80 percent by weight of active ingredient. If it is packaged in a 10-pound bag, it contains 8 pounds of a.i. and 2 pounds of inert ingredient. Liquid formulations indicate the amount of a.i. in pounds per gallon. For example, 4F means 4 pounds of the a.i. per gallon in a flowable formulation.

**Ready-To-Use (RTU)**
These formulations are typically solutions in highly refined oils that contain low concentrations of the pesticide. They are easy to use since mixing is not necessary. These low concentrate formulations can be expensive for the amount of actual pesticide and the uses for most RTUs are limited. These are often used by general consumers.

**Wettable or Soluble Powders (WP or SP)**
These are dry formulations containing relatively high concentrations of active ingredients but can vary from 15%-95%. WPs are mixed with water to form suspensions and SPs dissolve in water to form solutions. These formulations are relatively inexpensive and easy to store and handle. There is risk when mixing these pesticides since the dry powder can be inhaled. The WPs require good agitation in the tank and will settle quickly if the pump is off. WP formulations can also cause some pumps to wear out quickly.

**Fumigants**
Fumigants are pesticides in the form of poisonous gases that kill when absorbed or inhaled. They are good at penetrating cracks, crevices, burrows and soil. The area to be fumigated must almost always be enclosed and these pesticides are highly toxic and require extensive personal protective equipment to use.

**Aerosols (A)**
Aerosols are usually in pressurized cans and contain a small amount of pesticide that is driven through a fine nozzle under pressure. They are ready to use, easily stored and do not lose their strength while in the can during their normal period of use. They are practical only for small areas and are an expensive way to deliver pesticides since there is not much active ingredient. These sometimes are perceived as an attractive toy for young children. They can also be dangerous if punctured or heated.

**Dusts (D)**
Dusts are finely ground dry mixtures containing a low concentration of pesticide with an inert carrier such as clay. These are ready to use and can be applied with simple lightweight equipment. These are prone to drift and can pose an inhalation threat.

**Granules (G)**
These are similar to dusts, but granular particles are larger and heavier. The active ingredient is either coated on the particle or absorbed within. Granules are typically used for soil treatments and are often combined with fertilizers. They will not stick on plant leaves due to their large size.

**Baits**
Baits are pesticides mixed with a food or other substance that will be consumed by the pest. These are useful for large areas and can be carefully placed so they don't contaminate feed or food and can be removed after use. Baits minimize potential pollution but can be attractive to non-target organisms, including children and pets.

**Flowables (F)/Liquids (L)**
These are made from very finely ground solid materials and suspended in a liquid. They are typically mixed with water and don't usually clog nozzles and require less agitation than WPs. They can be spilled or splashed when mixing and may require moderate agitation.

**Emulsifiable Concentrates (EC)**
These pesticides usually contain a high concentration of the active ingredient and can have a strong odor. ECs are easy to transport, store and handle. Most are designed to be mixed with oil or water and contain wetting agents, stickers and other additives. They are not corrosive and are appropriate for low pressure - low volume applications. The price per pound of active ingredient is low but it can be easy to over or under dose. These pesticides can be easily absorbed

through the skin and can cause some pitting of metals.

*Adapted from;*
*Pesticide Safety Education Core Manual, Cornell.*
*Pesticide Safety Manual, Minnesota. Chapter 4, Formulations.*
*http://www.extension.umn.edu/agriculture/pesticide-safety/ppat_manual/Chapter%204.pdf*
*Pesticide Formulations Topic Fact Sheet. National Pesticide Information Center (NPIC)*
*http://npic.orst.edu/factsheets/formulations.pdf*

*See the quiz on page 11 for a credit…*

# *Protection of our Pollinators*

Many types of plants, including fruit and vegetable crops, depend on animals for pollination. In fact, three quarters of the world's plants and at least ninety food crops we eat in North America depend on these priceless pollinators. A world without pollinators would be a world without apples, blueberries, strawberries, chocolate, almonds, melons, peaches and pumpkins in addition to many other important food, fiber, and medicinal plants. The honey bee contributes to the production of many billions of dollars worth of crops in America every year.
Declining pollinator health and the advent of colony collapse disorder in 2006, has spurred research and EPA pesticide label changes focused on protecting our bees. There have been many theories about the cause of CCD, but researchers are now focused on multiple factors (and the complex interactions among these factors) that play a role in bee colony decline:

- pests (varroa mite), pathogens (American foulbrood) and viruses.
- poor nutrition due to loss of foraging habitat
- pesticide exposure
- bee management practices (e.g., long migratory routes to support pollination services)
- lack of genetic diversity

The Environmental Protection Agency (EPA) is concerned about declines in pollinator health, and is working to protect bees and other pollinators (wild bees, ants, beetles, wasps, lizards, birds and bats) from pesticide risks through regulatory actions, voluntary changes to pesticide use by registrants and research programs aimed at increasing the understanding of factors associated with declining pollinator health. The EPA is taking action to protect bees from pesticide exposure and has developed label changes to further these efforts. The new labels will have a bee advisory box and icon with information on routes of exposure and spray drift precautions (see following page). These label changes will affect products containing the neonicotinoids imidicloprid, dinotefuran, clothianidin and thiamethoxam. The EPA will work with pesticide manufacturers to change labels so that they will meet the Federal Insecticide, Fungicide, and Rodenticide Act (FIFRA) safety standard.

*Adapted from:*
*Resources on Pollinators, National Academy of Sciences*
*http://nas-sites.org/pollinators/about-pollinators/*

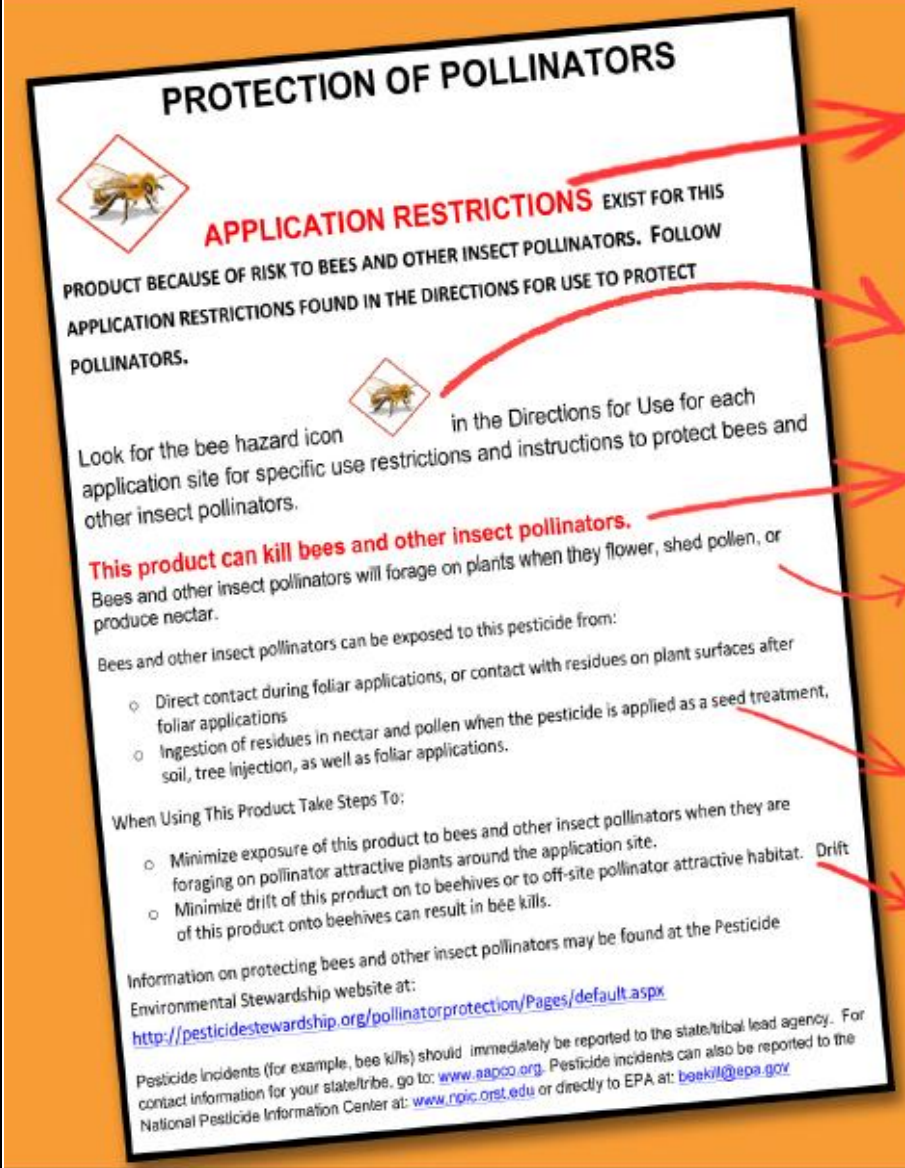
*Pesticides: Environmental Effects. Pollinator Protection*
*http://www.epa.gov/opp00001/ecosystem/pollinator/*

*Pesticide issues in the works: Honeybee colony collapse disorder*
*http://www.epa.gov/opp00001/about/intheworks/honeybee.htm*

*Please see the following page for more information from the US EPA on the Bee Advisory Box.*

# THE NEW EPA BEE ADVISORY BOX

*On EPA's new and strengthened pesticide label to protect pollinators*



PROTECTION OF POLLINATORS

**APPLICATION RESTRICTIONS** EXIST FOR THIS PRODUCT BECAUSE OF RISK TO BEES AND OTHER INSECT POLLINATORS. FOLLOW APPLICATION RESTRICTIONS FOUND IN THE DIRECTIONS FOR USE TO PROTECT POLLINATORS.

Look for the bee hazard icon in the Directions for Use for each application site for specific use restrictions and instructions to protect bees and other insect pollinators.

**This product can kill bees and other insect pollinators.**

Bees and other insect pollinators will forage on plants when they flower, shed pollen, or produce nectar.

Bees and other insect pollinators can be exposed to this pesticide from:

- Direct contact during foliar applications, or contact with residues on plant surfaces after foliar applications
- Ingestion of residues in nectar and pollen when the pesticide is applied as a seed treatment, soil, tree injection, as well as foliar applications.

When Using This Product Take Steps To:

- Minimize exposure of this product to bees and other insect pollinators when they are foraging on pollinator attractive plants around the application site.
- Minimize drift of this product on to beehives or to off-site pollinator attractive habitat. Drift of this product onto beehives can result in bee kills.

Information on protecting bees and other insect pollinators may be found at the Pesticide Environmental Stewardship website at:
http://pesticidestewardship.org/pollinatorprotection/Pages/default.aspx

Pesticide incidents (for example, bee kills) should immediately be reported to the state/tribal lead agency. For contact information for your state/tribe, go to: www.aapco.org. Pesticide incidents can also be reported to the National Pesticide Information Center at: www.npic.orst.edu or directly to EPA at: beekill@epa.gov

**Alerts users to separate restrictions on the label. These prohibit certain pesticide use when bees are present.**

**The new bee icon helps signal the pesticide's potential hazard to bees.**

**Makes clear that pesticide products can kill bees and pollinators.**

**Bees are often present and foraging when plants and trees flower. EPA's new label makes it clear that pesticides cannot be applied until all petals have fallen.**

**Warns users that direct contact and ingestion could harm pollinators. EPA is working with beekeepers, growers, pesticide companies, and others to advance pesticide management practices.**

**Highlights the importance of avoiding drift. Sometimes, wind can cause pesticides to drift to new areas and can cause bee kills.**

**The science says that there are many causes for a decline in pollinator health, including pesticide exposure. EPA's new label will help protect pollinators.**

EPA

**Read EPA's new and strengthened label requirements: http://go.usa.gov/jHH4**

# *Home Study Quiz 1- Pesticide and Water*

The following questions refer to the article on pages 2-5. Fill out the information on the back of this completed quiz and mail it to the Vermont Agency of Agriculture to receive **(1) one pesticide recertification credit. Circle the single, best answer:**

1. Which of the following would be considered a source of point-source pollution?
   A. a broadcast application to an agricultural field
   B. a pesticide spill at a storage location
   C. an application of fungicide to a golf course

2. What provides 70% of the water used for public and private water supplies, irrigation and industry?
   A. surface water
   B. public water supplies
   C. ground water

3. Which of the following is a characteristic of a pesticide that may make it more likely to leach to ground water?
   A. low solubility
   B. persistence
   C. high adsorbtion to soil particles

4. What type of soil is more prone to leaching because water moves quickly through it?
   A. sand
   B. silt
   C. clay

5. When using pesticides in an area where the ground water is close to the surface, select a pesticide having _____ in order to protect the ground water.
   A. high solubility
   B. high persistence
   C. low leaching potential

6. During mixing and loading, even small spills can lead to problems if you always mix and load _____.
   A. on a containment pad.
   B. at the same location every time.
   C. at different locations every time.

7. Which of the following is an acceptable way to avoid back siphoning when filling a spray tank?
   A. Keep the filler hose at the bottom of the spray tank to agitate the mixture.
   B. Keep the filler hose above the spray mixture and spray tank opening.
   C. Only fill the spray tank from surface water sources and not wells.

8. Pesticides are most susceptible to run off from heavy rains or irrigation_____.
   A. more than a week after application.
   B. before the application takes place.
   C. during the first several hours after application.

9. Which of the following is a way to prevent surface or ground water contamination with pesticides?
   A. clean your application equipment in a pond
   B. immediately contain and control pesticide spills
   C. leave granular pesticides on hard surfaces such as driveways and sidewalks

The following information is required. Mail the completed quiz to the Vermont Agency of Agriculture to receive one (1) pesticide recertification credit.

| | | |
|---|---|---|
| Name: | | |
| Certificate #: | | Please check: ☐Commercial ☐ Non-Commercial ☐Government ☐Private |
| Street Address: | | |
| City/State/Zip | | |
| Company/Farm: | | |
| Signature: | Date: | |
| Email address to add to your account (optional): | | |

**Please mail the quizzes in an envelope to:** Vermont Agency of Agriculture, Food & Markets
**Attn: Matthew Wood**
116 State Street
Montpelier, VT 05620-2901

# *Home Study Quiz 2 – Pesticide Formulations*

The following questions refer to the article on pages 5-7. Fill out the information on the back of this completed quiz and mail it to the Vermont Agency of Agriculture to receive **(1) one pesticide recertification credit.**

1. What is the difference between an active ingredient and a formulation?

2. What are some of the benefits of making a formulation?

3. When would you choose to use a granular formulation? When would a granular formulation not be appropriate?

4. What are the disadvantages of using a dust formulation?

5. Which formulations pose high risk for splashing in eyes?

6. What is the disadvantage to using ready to use (RTU) formulations?

7. Why is it important to recognize the abbreviations for the different formulations?

8. What is meant by inert? Give examples of some inert ingredients.

9. What is meant by 60 WP? How much active ingredient is in the product?

10. What is meant by 8F? How much active ingredient is in the product?

11. What formulation would you choose if you wanted it to penetrate cracks, crevices, soil or burrows?

# Pesticide Applicator Report
## Fall 2013

**Vermont Agency of Agriculture, Food & Markets**
**Agriculture Resource Management Division**
**116 State Street**
**Montpelier, VT 05620-2901**

The following information is required. Mail the completed quiz to the Vermont Agency of Agriculture to receive one (1) pesticide recertification credit.

| | | |
|---|---|---|
| Name: | | |
| Certificate #: | | Please check: ☐Commercial ☐ Non-Commercial ☐Government ☐Private |
| Street Address: | | |
| City/State/Zip | | |
| Company/Farm: | | |
| Signature: | Date: | |
| Email address to add to your account (optional): | | |