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Pesticide Drift Series: Understanding and Controlling Pesticide Drift

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Understanding Pesticide Drift

Many numbered Virginia Cooperative Extension (VCE) publications warn about the dangers of pesticide drift and recommend that you avoid it, but they do not clearly define it. **Pesticide drift** is the uncontrolled movement of pesticides through the air away from your intended application site (target site). Drift is largely a problem with liquid pesticides, but it can also occur with dry formulations. Any amount of pesticide that moves through the air away from your target site is considered drift, and all efforts should be made to eliminate or reduce this movement.

Pesticide drift is different from runoff and leaching. **Runoff** occurs when a pesticide moves across the ground away from the target site due to dilution with water. Pesticide **leaching** is similar to runoff, except that the movement is downward toward the water table.

- With the urbanization of many agricultural areas, people increasingly find themselves living in or near areas that are sensitive to pesticide drift. No amount of drift is acceptable. Any violation of the pesticide label directions due to offsite movement of pesticides presents a liability for the applicator. You can control pesticide drift with knowledge and responsible application practices. For information about sensitive areas and pesticide drift, please see Pesticide Drift Series: Protecting Sensitive Areas from Pesticide Drift (Virginia Cooperative Extension [VCE] publication ENTO-453NP).

Types of Pesticide Drift

Two types of drift can occur:

Particle Drift – Movement of fine particles through the air away from the target site. This only occurs during pesticide application.

Vapor Drift – Movement of pesticide as a gas or vapor away from the target site. This can occur during or after an application. Some formulations and active ingredients are more prone to vapor drift than others.

What Causes Drift?

Drift can occur anywhere. When it becomes a problem, it is usually associated with areas near people, nontarget animals, or valuable plants. Drift can also be a problem when it comes in contact with sensitive surfaces — such as the shiny new paint of an expensive automobile. Several factors can affect whether your pesticide application will drift from your target site. These include droplet size, chemical formulation, weather, and your actions.

Droplet Size Affects Drift

With liquid pesticide formulations, drift potential is most closely linked to droplet size. **Droplets (or drops)** are small particles of liquid spray containing pesticide that come out of a sprayer nozzle. **Control your droplet size, and you can control where your drops will land**.

Large drops are more likely to settle on your target area. Smaller drops tend to move off site. **Small** droplets are considered to be those less than 150 microns in size (about the diameter of a human hair). **Fine spray** droplets can move up to three miles in a 3-mph wind when their droplet size is less than 20 microns. Fine spray droplets can take over an hour to fall just 10 feet (Table 1).

Table 1. Movement of spray droplets.

Droplet Diameter (microns)	Droplet Size	Time Required to Fall 10 Feet	Lateral Movement in a 3-mph Wind
5	Fog (VF)	66 min.	3 miles
20	Very Fine (VF)	4.2 min.	1,100 feet
100	Very Fine (VF)	10 sec.	44 feet
240	Medium (M)	6 sec.	28 feet
400	Coarse (C)	2 sec.	8.5 feet
1000	Extremely Coarse (XC)	1 sec.	4.7 feet

Adapted from Bode, L.E., Wolf, R.E. Techniques for Applying Postemergence Herbicides. Univ. Illinois, Urbana, IL. 5 pp. Undated.

To avoid drift, keep your droplets in the medium (240 microns) to coarse (400 or greater microns). Adjust your nozzle opening size (orifice) to control droplet size. Droplets should be large enough to avoid drift, yet small enough to allow adequate penetration of foliage for effective pest control. You may have to increase spray volume with larger droplets to achieve your desired level of coverage. There are two excellent VCE publications available that go into greater detail about droplet size: **Droplet Chart/Selection Guide** (VCE publication 422-031) and **Nozzles: Selection and Sizing** (VCE publication 442-032).

Chemical and Formulation Type Can Affect Drift

Chemical Type

A pesticide is any substance used to control a pest or to reduce the unwanted or harmful effects of a pest. Choose pesticides with minimal toxicity to nontarget species. Avoid volatile pesticides because they can move offsite in the form of vapor drift hours after application. This is especially important if there are sensitive plants like grapes, tomatoes, tobacco, soybeans, cotton, or other fruit and vegetable crops planted nearby.

Pesticide Formulations

Pesticides are sold in a variety of forms such as liquids, powders, and granules. Some formulations are more prone to drift than others. Choose pesticides that can be applied in large drops or substitute formulations that are less likely to drift (i.e., granules, pellets, or baits) whenever possible. Avoid ultra-low volume (ULV) formulations if you seek to keep droplets large enough to avoid drift. Regardless of the formulation, always choose pesticides with minimal toxicity to nontarget species when possible.

Weather Conditions Can Affect Drift

Wind, low humidity, and high temperatures all contribute to pesticide drift. Highly unstable weather conditions can lead to atmospheric **thermals**, which can draw a pesticide application up into the air column and carry it away from the target site. By contrast, when the weather is highly stable, you may encounter a **temperature inversion**, which can trap a layer of cool air beneath warmer air. When an inversion occurs, the air near the surface is cooler than the air above. The result is a very stable layer of air that prevents vertical air movement and can cause small droplets to stay suspended for hours. These droplets may then travel far from your intended target.

Avoid application during a dead calm or in light winds (less than 2 mph) because fine particles can move unpredictably. A steady crosswind blowing at 3 to 9 mph is ideal. Do not spray if the wind is blowing above 10 mph, or if it is blowing at any speed toward a sensitive area. High temperatures (greater than 82ºF) and low humidity (less than 50%) encourage droplets to evaporate, become smaller, and drift. **Continually monitor weather conditions at your application site**.

Decisions You Make Can Minimize Drift

Application Decisions and Methods

Applicators should practice integrated pest management (IPM) to control their target pest. Integrating a variety of control measures saves money and reduces the number of necessary pesticide applications. Contact your local Extension agent for information on IPM and sustainable agricultural practices.

Keep Applications On Target

Proper equipment operation, maintenance, and

careful pesticide application under favorable weather conditions, help achieve effective and efficient pest management. Minimize ground rig boom (release) height by converting to 110º nozzles or angling nozzle bodies. Keep speed and nozzle pressures to a minimum.

Choose Application Equipment with Drift Guards

Drift reduction devices include air assist and boom skirts (fig. 1). Shields, skirts, and other devices can be retrofitted on older sprayers to reduce drift. Backpack spray wands can also be fitted with shields to reduce drift. In some states, there are tax breaks for retrofitting spray equipment to reduce environmental pollution.

Figure 1. A skirt over a spray boom can virtually eliminate pesticide drift.

Use Spray Adjuvants to Reduce Drift

An **adjuvant** is any substance added to a pesticide spray tank that will improve the performance of a pesticide. There are drift-reducing adjuvants (DRA) specifically designed to reduce the distance a pesticide can move from a target site. While adjuvants are commercially tested to demonstrate that they reduce drift, it is always best to test an adjuvant with your own equipment and pesticide formulation to ensure it will meet your needs.

Use Buffers to Reduce Drift

Buffers are areas designed to intercept drift. For a detailed explanation of the value and proper use of buffers, please see **Pesticide Drift Series: Using Buffers to Reduce the Impact of Spray Drift** (VCE publication ENTO-454NP).

References

Blevins Wycoff, S., and M. Weaver. 2021. "Pesticide Drift Series: Using Buffers to Reduce the Impact of Spray Drift." *Virginia Cooperative Extension* ENTO-454NP.

Grisso, R. 2019. "Droplet Chart/Selection Guide." *Virginia Cooperative Extension* 442-031.

Grisso, R., S. D. Askew, and D. McCall. 2019. "Nozzles: Selection and Sizing." *Virginia Cooperative Extension* 442-032.

Parson, R. 2021. "Pesticide Drift Series: Protecting Sensitive Areas From Spray Drift." *Virginia Cooperative Extension* ENTO-453NP.

Additional Resources

For further information, please visit:

- Virginia Tech Pesticide Programs: vtpp.org
- Virginia Department of Agriculture and Consumer Services, Office of Pesticide Services: vdacs.virginia.gov/pesticides.shtml
- National Pesticide Information Center (NPIC): npic.orst.edu

This publication was adapted by Tim McCoy, Extension Associate, Virginia Tech Pesticide Programs, from "Control Your Drops: Control Your Drift" by M. J. Weaver (Virginia Tech Pesticide Programs) and W. W. Surles (Virginia Department of Agriculture and Consumer Services, Office of Pesticide Services), October 2005. This factsheet is not a substitute for pesticide label directions. Always consult your local Extension agent when developing a plan for drift management.

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