THE DECISION: To Spray

Even under good spraying conditions, drift cannot be totally eliminated with current technology. So, if you decide to spray, take every reasonable precaution to minimize drift.

- Use the lowest nozzle height that provides uniform coverage, and
- Apply the coarsest droplet size spectrum that provides sufficient coverage and pest control.

Apply the Coarsest Spray

You cannot eliminate small droplets, but you can use several techniques to reduce the proportion of small droplets in the spray.

Spray Pressure

Increased spray pressure increases the number of small droplets produced, so keep pressure as low as possible within the range for the nozzle and product you are using.

Nozzle Selection

Nozzles with larger openings or narrower spray angles will produce fewer fine droplets. However, wider spray angles may allow you to bring the nozzles closer to the target surface; doing so more than compensates for the finer spray. Some nozzles (e.g., turbo flat-fan, air-induction nozzle) are specifically designed to produce fewer fine droplets.

Rather than list a specific nozzle size or spray pressure, future pesticide labels may require you to apply a spray of a defined droplet size spectrum, ranging from "very fine" to "very coarse." Some spray nozzle catalogs already contain tables showing the spectrum produced for different nozzle-pressure combinations. Note that a single nozzle may produce a different range of droplet sizes at different pressures. By focusing on the droplet spectrum, you can ensure that you will produce the coarsest spray possible that will still provide adequate coverage and efficacy.

STOP spraying if conditions become unfavorable. Remember, pesticide drift management begins with YOU!

Spray Rate

Higher spray rates (GPA) let you use nozzles with larger openings. Thus, if you need to increase the spray rate, use larger nozzles rather than increasing spray pressure.

Drift-Reduction Agents

These adjuvants may reduce the number of small spray droplets. They will also, however, reduce coverage of the plant surface, so be sure to use adjuvants according to directions on the pesticide label.

A pesticide label may require the use of drift-reduction agents under certain conditions (e.g., low spray rate).

Keep in mind that no single management practice will adequately reduce drift; you need to use a combination of strategies mentioned here.

This bulletin was funded by a grant from the United States Department of Agriculture Cooperative State Research, Education, and Extension Service

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X1000 Managing Pesticide Drift in Wisconsin: Field Sprayers

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PAT Pesticide Applicator Training University of Wisconsin Extension

March 1999

Managing Pesticide Drift in Wisconsin:

FIELD SPRAYERS

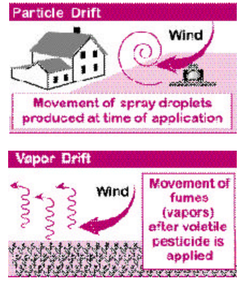
BY DAN WIXTED AND CHRIS BOERBOOM

Any pesticide that is carried out of the target application site by wind or any air current may damage nontarget plants, contaminate surface waters, or harm wild and domesticated animals or even people. As a pesticide applicator, it is your responsibility to apply a pesticide so that it remains within the target area.

In recent years, documented cases of pesticide drift have increased in Wisconsin. This bulletin is designed to help field sprayer operators reverse that trend.

What Is Pesticide Drift?

Pesticide drift occurs when air currents cause pesticide to be deposited outside a target application site. This definition excludes *overspray*, which occurs when pesticide is directly applied outside of the target area.



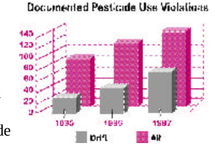
What Are the Consequences of Pesticide Drift to the Applicator?

Because pesticide drift can cause harm, you may be subject to civil, criminal, or administrative penalties (e.g., fines) if you use or direct the use of a pesticide in a manner that results in significant pesticide drift, which is drift in amounts that:

- Cause actual harm to persons, property, or the environment;
- Could potentially cause such harm under any reasonably foreseeable circumstances; or
- Are readily visible.

All complaints of drift made to the Wisconsin Department of Agriculture, Trade and Consumer Protection will be investigated. In Wisconsin, drift accounted for 50% of all pesticide use violations from 1995 through 1997.

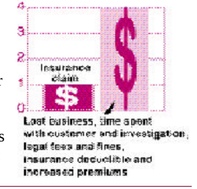
Please refer to Wis. Adm. Code, Chapter ATCP 29 (Pesticide Use and Control), for actual wording of rules concerning pesticide drift.



Costs Associated with Drift

There are also costs associated with drift complaints.

Though the applicator may be insured, the average loss to an application business is 4 times more than the insurance claim.



What Causes Particle Drift?

Drift increases as...	Because...
Spray droplet size decreases	Smaller droplets fall more slowly and are more easily moved by wind
Wind speed increases	Droplets are carried farther before they can be deposited
Nozzle height from target surface increases	Droplets take longer to reach the target surface
Temperature rises and relative humidity falls	Water in spray droplets evaporates, making droplets smaller

Spray droplet size is the most important factor affecting the potential for particle drift. Wind speed is also very important; however, increasing droplet size can greatly reduce the wind's effect.

The active ingredient is not a significant factor in particle drift (though it is for vapor drift, discussed later). The effects of formulation and physical properties of the spray mix are also much smaller than those of droplet size, wind, and nozzle height.

Particle drift is more likely if you spray during a temperature inversion, which occurs when a layer of warm air is sandwiched between layers of cold air, or when there is nearly no wind. Small droplets remain suspended in the air (especially during an inversion, which restricts vertical mixing of air) and can be carried off later by the slightest winds. Inversions are common on clear, calm nights and often last into the morning.

THE CHOICE: To Spray OR Not To Spray?

The first rule of drift management is: Know when NOT to spray. Under some conditions (e.g., excessive wind), there is nothing you can do to prevent drift except to refrain from spraying.

To decide whether to spray, you need to be aware of site conditions and assess the risks before you prepare the pesticide mix. It will be harder to refrain from spraying once you are at a site with a fully loaded sprayer. However, you should do so (even if you have already started spraying) if site conditions become unsuitable.

If you are a commercial applicator, you also need a supervisor who will support your decision (though it is up to you to begin the process).

Know Conditions at Site

Weather

Know the weather forecast before you prepare the spray mix and go to the site. However, because weather reports from a remote or distant weather station may not reflect actual site conditions and won't help defend you against complaints, double check the conditions when you get to the site. Record wind speed and direction and check for an inversion.

Sensitive Areas

Drift only occurs downwind and it decreases as distance downwind increases. Thus, know the distance between the site and downwind sensitive areas.

During a temperature inversion or when wind speed is near zero, you cannot predict the direction of winds that may eventually carry suspended spray particles out of the target area. In such a case, you need to consider sensitive areas in all directions from the field.

A description of the site is also important; soybeans in the next field, for example, would be more of a concern than corn if you will be spraying a corn herbicide.

Sprayer Setup

Consider how fine or coarse a spray you will be using as well as the nozzle height from the target surface.

Assess the Risks

Likelihood of Drift

Given the site conditions, how likely is it that pesticide will drift onto sensitive sites? What is the likelihood that drift will cause adverse effects in these sites? You may not be able to accurately assess this risk during an inversion or when wind speed is near zero because you cannot predict the speed or direction of winds that could cause suspended particles to drift later on.

Pesticide Factors

The pesticide you use will be a factor in assessing the relative sensitivity of downwind sites. For example, most plant damage from pesticide drift involves herbicides.

Consequences of Drift

It is hard for you to assess the consequences to, or predict the reaction of, a neighbor when drift occurs; assume there will be little or no tolerance for drift. You can better assess the consequences to yourself: we discussed these earlier.

"Do not spray near sensitive plants if wind is gusty or in excess of 10 mph and moving in the direction of adjacent sensitive crops.

"Do not apply during temperature inversion conditions."

Label statements may prohibit application under certain conditions (e.g., high wind). Applying the pesticide under such conditions would violate state and federal pesticide laws.

Vapor Drift: Additional Considerations

If the pesticide contains a volatile active ingredient (e.g., dicamba [Banvel®], 2,4-D esters, clomazone [Command®]), you must also consider factors that influence vapor drift in addition to checking site conditions and assessing the risk of particle drift as we just described.

Temperature. Volatility increases with temperature; some labels tell you not to spray above a given temperature.

Soil Conditions. Wet soil increases the rate of volatilization and decreases the effectiveness of incorporation; both effects increase the risk of vapor drift and are addressed on the labels of soil-applied volatile herbicides. For example, Command 4EC® must be soil incorporated immediately or, if the soil is dry, within 8 hours after being applied.

Sensitive Sites. Vapor drift can occur from the moment of application until up to several days later. Wind direction will change over that time, so check for sensitive sites in all directions. Vapors can be carried farther than droplets, and labels of volatile herbicides may prohibit you from treating a site that is within specified distances of listed sensitive areas (e.g., within 1,000 feet of an orchard) regardless of weather conditions.

THE DECISION: Not To Spray

If you conclude that drift is likely and serious consequences unavoidable, or if you cannot adequately assess this risk (e.g., because of temperature inversion or no wind), DO NOT MAKE THE APPLICATION. Although this sounds simple, the reality is that imminent pest damage, impatient customers, and schedule-wielding supervisors can put enormous pressure on you to spray anyway.

The importance of this cannot be overemphasized. Undue pressure on an applicator to proceed with an application under unsuitable conditions is perhaps the biggest obstacle to preventing pesticide drift.

How can this pressure be relieved?

Dealing with Pests

The pressure to spray is greatest when there is a small window of opportunity for making the application, as when a crop is nearing the maximum growth stage allowed for a postemergence herbicide application. Better crop management practices (e.g., earlier pest detection, flexible pest management plan) will greatly ease this concern. For example, if your first choice of pesticide is too volatile to apply given the conditions, have a backup product that fits into your plan.

Establishing buffer zones (unsprayed areas) around a site will also widen the window of opportunity. A buffer zone effectively increases the distance between the target area and a sensitive site so that you can spray within a wider range of wind speeds.

Dealing with a Supervisor

If you are a custom applicator, you will need to convince your supervisor that not spraying is the right thing to do. Ideally, the decision-making process and support of your decision should be part of company policy; after all, you are the one who is at the site and who has the primary responsibility to prevent drift. Supervisors need to remember, though, that Wisconsin law also holds the person who directs the use of a pesticide responsible for preventing drift.

Dealing with Customers

If you are a custom applicator, let your customers know in advance what criteria you use in deciding whether to spray. Remind them that you are responsible for any adverse effects that arise from an application you make. And that as a professional, you will not apply pesticides under unsuitable conditions. Let them know you will make rescheduling a priority if you decide not to spray.

If your supervisor or customer knows that spraying under current conditions will cause a violation, it is illegal for him/her to coerce or compel you to spray.