# Managing Orchard Sprayer Drift to Protect Water Quality



**Tips & Techniques** 

# Managing Orchard Spray Drift To Protect Surface Water

Applying crop protection products (pesticides) carries important responsibilities not only for doing the best job possible to control insects and diseases but for limiting the potential for off target impact of an application. If there is an off-site impact to waterways, it can trigger actions mandated by the Regional Water Board through the Irrigated Lands Regulatory Program.

To prevent problems, equipment operators must take extra care when spraying near field edges, especially when near sensitive sites such as streams, roads, houses, schools, livestock, and pets. Doing the best job takes a thorough understanding of the principles of pesticide application stewardship outlined in this publication. To ensure the spray is delivered at labeled rate, and covers the target foliage, set up your spray equipment with: nozzles that minimize drift potential, a fully functioning control system, and regularly check the calibration of your equipment.

Make sure you have a clear understanding of the field being sprayed, the expected weather conditions and the environment surrounding the field. That includes sensitive sites and crops, anything that can be harmed by spray drift.

Understand that what you are doing can have wide-reaching implications if mistakes are made. Ultimately, it's the applicators responsibility to safely apply pesticides.





#### **Spraying Stewardship Practices**

This information is intended as guidance on orchard spraying good stewardship practices, especially near sensitive sites such as waterways, schools or houses.

- Applicator must be aware of and comply with county permit conditions and restrictions.
- Maintain an adequate buffer zone (untreated area between sprayed crop and sensitive area) to protect waterways and other sensitive sites. Check the product label or with the county agricultural commissioner for specific state and county requirements.
- Avoid spraying when wind is blowing toward nearby waterways or sensitive sites.
- Applications should only be made when the wind is blowing at least 3 mph away from nearby waterways or other sensitive sites.
- Start spraying only when nozzles are adjacent to the first row of trees.
- Stop spraying when making turns at the end of a row.
- Shut off outward facing nozzles when spraying the outside row, directing spray inward only.
- Always check weather forecasts prior to spraying. Avoid applications just prior to a rainfall event or irrigation (if the field has drainage) to minimize potential for pesticide runoff.

 Make sure applicator has a copy of any required county permit(s) on hand during applications.

#### **Before You Start Spraying**

Any orchard being sprayed with pesticides should be evaluated prior to - and monitored during and after - an application. This requires the person onsite to have a thorough understanding of the field being sprayed, the expected weather conditions, and the location of sensitive sites and waterways in the vicinity of the treated orchard. The individual responsible for the application must be aware of:

• Wind conditions (speed and direction – current and forecast) and whether rainfall is forecast for the next 48 hours.



- Air temperature and humidity (current and forecast).
- Presence/absence of temperature inversion layer.
- Presence/absence of waterways and sensitive areas in the vicinity, especially downwind of the application site and/or connected to the site by drainage ditches, sloughs or canals.

### Site Evaluation Check List

- Evaluate each orchard to pinpoint areas where spray drift could pose a potential risk.
- Develop a field layout map and note the location of wells, sink holes, drainage ditches, streams or sloughs.
- Provide the field layout map to all sprayer operators, commercial applicators, Pest Control Advisors or anyone involved in pest management decisions.
- Review the field layout map and flag or stake any no-treatment buffer zones.

#### **Fields Bordering Waterways**

- When sensitive aquatic sites are downwind from orchards, spray the first two rows nearest the aquatic site only when the wind is blowing away from the sensitive site.
- The first two rows at the edge of the field next to sensitive aquatic sites should be sprayed with the outside nozzles turned off.
- Ideal wind speed is 3-10 mph into the field at the application site as measured by an anemometer outside of the orchard on the side nearest and upwind from a sensitive site.

# **Orchard Sprayer Set Up**

- Tree canopy is the best barrier to off-site spray drift: aim for it.
- Know the droplet spectrum of each nozzle (available for some nozzles; check with distributor.)
- Use nozzles with the volume medium diameter (VMD) appropriate to the product being applied (available for some nozzles; check with distributor.)

- Consider spray flow controllers (Raven, etc.) that adjust nozzle output based on ground speed to ensure accurate gallons per acre delivery. Be sure to understand the limitations of the controller and select the proper nozzle for use with the operating speed range.
- Adjust (or open/close) spray nozzles based on the structure of the tree canopy.
- Set nozzle location and size to match tree height and shape.
- Reduce the size of lower nozzles when lower canopy is thin or non-existent.
- For smaller trees, shut off upward facing nozzles where canopy is not present to conserve spray and reduce overspray between tree tops.
- Periodically check a sprayer's coverage by placing water sensitive paper in a few areas of the tree canopy. Compare patterns on cards within the tree to check spray uniformity.
- Spraying some trees with white chalk/clay materials used for sunburn protection can show how uniformly the tree canopy is covered by the nozzle configuration.

# **Testing Alternative Techniques**

Technology used in orchard air blast sprayer designs has changed little since the first sprayers were commercialized in the 1960s. The goal then as now is to cover an entire tree canopy with the sprayed liquid containing pesticides or nutrients. Also ensuring that only the targeted crop was covered, with no spray landing on unintended targets such as neighboring crops or sensitive sites.

Finding equipment or spray techniques that minimize impacts to unintended targets requires detailed and rigorous field studies that include the variables posed by the different crops (canopy size), equipment technology and weather situations likely to be encountered in today's commercial production systems. In the end, field studies can verify if an approach has the potential to minimize or eliminate off-site movement of spray drift.



### **Drift From Outer Edge of Orchard**

Spray drift was measured from the edge of the orchard following each treatment.

Results show that the most spray drift occurs with the grower standard and double spray techniques, while the least spray drift is using the interference perimeter spray technique.

A significant difference in spray drift mitigation can be seen up to 100 feet from the tree row.

#### New Drift Management Technique: Interference Perimeter Spraying

Interference perimeter spraying is a new approach for managing spray drift being examined by CURES and University of California researchers.

The technique is simple; two orchard sprayers move through the orchard parallel to each other; one sprayer on the outside row and another between row 1 and 2. The rig between row one and two is spraying normally while the rig on the outside row is running with the fan on and nozzles shut off. The inward air flow pushes any spray material back into the tree.

After the two sprayers complete a pass, a single sprayer runs down the orchard perimeter with the outside nozzle bank shut off and the nozzles facing the tree turned on, allowing for normal spray coverage of the outer side of the row.

Recent field trials in mature almond and walnut orchards showed significant reduction of spray drift up to 100 feet by using interference perimeter spraying compared to the standard practice. However, the practice still needs further evaluation to ensure that control of the targeted pests is maintained and the technique is effective with differing tree structures.



In the field trial with this practice, researchers noted that it's important for the sprayers to move exactly perpendicular to each other. Also that both sprayers must have identical or near identical fan speed and air volume displacement.

Interference perimeter spraying still needs further study but the concept shows promise as another practice for protecting surface water and other sensitive areas from off site movement of spray drift. A recent modification to the approach is attaching a plastic shroud to the outward-facing half of the fan housing.

This plastic shroud serves two purposes:

- block air blowing from the outer facing half of the fan housing since spray material can be carried with the air, even if the nozzles are shut off;
- direct more air toward the canopy, blocking spray material being applied by the equipment operating between row 1 and 2.

One sprayer manufacturer, Air-O-Fan, builds all its sprayers with adjustable air vanes. When the vanes are closed on the outward facing side of the fan housing, it accomplishes the same goal as attaching a shroud to the fan housing.

#### Spraying Inward Only on the Outer Rows Near Sensitive Sites

Most off-site drift from orchard sprayers comes from applications to the outside rows, which are those rows closest to sensitive sites.

Follow these steps to minimize off site movement:

- On rows #1 and #2, only spray inward (shut off outward facing nozzles).
- Reduce ground speed by one-half on outer two rows to partially compensate for spraying on one side of the tree only. This will require recalibrating sprayer or flipping nozzles to deliver the same pesticide rate as the rest of the orchard.

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# Maintenance Checklist

Before filling the tank, adding pesticides and beginning the application, perform a thorough inspection of the equipment.

Be aware that according to California state law, even if you are hired to just check equipment used to apply pesticides, you are considered a pesticide "handler" and must be trained accordingly. Training includes knowing the location of the application schedule and labels for the product last used in the equipment.

The label will indicate which personal protection equipment (PPE) needs to be worn when checking application equipment.

Check and make sure:

- Hose connections are sealed and tightened.
- Regulator connections are sealed and tightened.
- Sight gauges are clear and working.
- Clean filters and screen on a daily basis.
- Fix leaking gaskets immediately.
- Pressure gauges are sealed and working.
- All nozzles and metering devices are correct size, not leaking and unplugged.
- All sprayer shields are in place (where appropriate).
- Tank drain plug is in place.
- There is no damage to hoses or piping.



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