Spray Drift Management

LSU AgCenter
Cooperative Extension Service
W. A. Callegari Environmental Center

Office of Pesticide Safety Education
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What is Pesticide Drift?

The unintentional airborne movement of pesticides outside of the intended target area.

Why is Drift a Problem?

- Spotty pest control
- Wasted chemicals
- Result-higher costs- $$$
- Off-target damage
- More high value specialty crops
- Urban sprawl and.....
- Less tolerant neighbors
- Litigious Society
- Environmental impact
  - Water and Air Quality
- Public more aware of pesticide concerns! (Negative) (Perceptions)
Types of Drift

**Vapor Drift:** associated with volatilization (gas, fumes)

**Particle Drift:** occurs during application
Avoiding Vapor Drift

- Follow label directions!
- Several active ingredients such as those in 2,4-D, Banvel, and Command are quite volatile and pose harm when the vapor moves off target
  - Labels may state cut-off temperatures for application
  - Labels may require pesticide to be incorporated into the soil

Temperature $\uparrow$ Humidity $\downarrow$ = Higher Volatility
Evaluate the Site

- Inspect and document potential problems
- Identify sensitive areas
  - Susceptible crops
  - Bodies of water
  - Wetlands
- Topography of area can create microclimates where temperature, wind, air flow, and humidity can be different from adjacent areas
- Analyze site and consider weather conditions before making applications
- Leave untreated buffer zones between treated areas and sensitive areas
Evaluate the Weather

- Wind
- Temperature
- Humidity
- Temperature Inversions
Evaluate the Weather: Wind

- Most common contributor to pesticide particle drift
- Be attentive to wind speed and wind direction
- Wind speeds above 8 mph significantly increase the risk of particle drift to downwind areas
- Wind speeds below 3 mph are often variable and may change direction rapidly
- No wind may be indicative of a temperature inversion
Difficult to “guess” wind speed

A wind meter is a sound investment for good recordkeeping

Use a wind meter for most accurate results

Local weather station (or radio station) is a guide, but conditions can vary in a short distance
Temperature and Humidity: Evaporation of Droplets

High Relative Humidity
Low Temperature

Low Relative Humidity
High Temperature

Fall Distance

Wind
Normal Conditions vs Temperature Inversions
### Normal Conditions

- Warmest air is near the earth’s surface
- Temperature decreases with altitude
- Sun warms the ground and crop canopy, which in turn warms the air above it
- Warm air rises and is replaced with cooler air causing a mixing action of the atmosphere
- Winds generated blow from consistent direction

**Diagram:**

- **Normal Temperature Profile**
  - Cooler
  - Warmer
  - Temperature decreases with height
  - Increasing Temperature
  - Altitude
Situation is reversed from normal conditions.

From dusk to early morning, earth’s surface can lose heat causing surface air to be cooler than air above it.

Because the cool air sinks, the result is a stagnant layer of air that does not mix with air above it.
Recognizing Temperature Inversions

- Can occur at any height: low or high
- Can occur at any time
Temperature Inversions

- The major problem with inversions is that applicators perceive little wind or air movement and assume this is a good time to spray.
- **In actuality, it’s the worst time.**
- Favorable to long distance pesticide drift
- Low wind conditions during inversion conditions may cause small spray drops to remain suspended in the air.
- The droplets will eventually move out of the treatment area as a concentrated cloud
Temperature Inversions

Temperature inversions must be identified before ALL pesticide applications: **GROUND AND AERIAL**

One documented case of drift from an inversion shows damage occurring over a 15 mile area from a late afternoon application in calm wind.
Arkansas has set specific rules regarding temperature inversions to help minimize the risk of drift for both aerial and ground applications.

Applicators must record ambient temperature in field they will be making application to.
To make application:

Temperature must increase 3°F from the morning low at the time of application for applications made before noon.

Temperature must not decrease more than 3°F from the afternoon high for applications made after noon.

The applicator should also use other legal means available to him/her to verify that an inversion does not exist.
# Factors Affecting Particle Drift

**Equipment and Application**
- Equipment Speed
- Boom Height
- Nozzle Type
- Nozzle Size
- Nozzle Pressure
Managing Spray Drift: Equipment/Operating Speed

- Increased operating speeds can cause the spray to be diverted
  - Upward into wind currents
  - Into vortexes behind the sprayer
- These currents trap small droplets and contribute to drift
- As wind velocities increase, reduce operating speed.
Boom Height

- Lower the boom
- The greater the distance between the nozzle and the target area, the greater the impact wind velocity has on drift.
- Shorter the distance a droplet has to travel, the less chance for drift.
- Be careful to stay within manufacturer’s guidelines.
Nozzle Selection

- Designed to reduce drift and improve droplet size

Nozzles
- Control the amount of product being applied (GPA)
- Determine the uniformity of the application
- Affect coverage
- Influence drift potential
# Color Codes For Droplet Size

<table>
<thead>
<tr>
<th>Droplet Size Category</th>
<th>Symbol</th>
<th>Color Code</th>
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<tbody>
<tr>
<td>Very Fine</td>
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<tr>
<td>Extremely Coarse</td>
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# Choosing Nozzles by Droplet Size

## Turbo TeeJet® (TT) and Turbo TeeJet® Duo (QJ90-2XTT)

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## AI TeeJet® (AI) and AIC TeeJet® (AIC)

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## Turbo TeeJet® Induction (TTI)

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## Nozzle Types

- **C**: Coarse
- **M**: Medium
- **VC**: Very Coarse
- **VF**: Very Fine
- **F**: Fine
- **XC**: Extremely Coarse
The bigger they are the faster they fall...

<table>
<thead>
<tr>
<th>Droplet</th>
<th>Width (in μm)</th>
<th>Time to fall 10 feet</th>
<th>Travel distance in 3 mph wind</th>
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<tr>
<td>Fog</td>
<td>5</td>
<td>66 min</td>
<td>3 miles</td>
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<tr>
<td>Very fine</td>
<td>20</td>
<td>4 min</td>
<td>1100 ft</td>
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<tr>
<td>Fine</td>
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<td>Medium</td>
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<td>Coarse</td>
<td>400</td>
<td>2 sec</td>
<td>8.5 ft</td>
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<tr>
<td>Xtra Coarse</td>
<td>1,000</td>
<td>1 sec</td>
<td>4.7 ft</td>
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Source: Akesson and Yates, 1964, Annual Rev. Ent.
Know Your Nozzles

- Match nozzle type to the application at hand
- Type of pesticide (herbicide, insecticide, fungicide...) and whether its action is contact or systemic (coverage)
- Time of application: PRE or POST emergence
- Operating Pressure
- Susceptibility to drift
Drift Reducing Nozzle Tips

- Low pressure (extended range)
- Pre-orifice
- Pre-orifice and turbulence chamber
- Air-induction
Low Pressure and Pre-Orifice Nozzles

- Extended Range
- Pre- orifice with Drift Guard
Air Induction Nozzles

Air Induction nozzles produce air-induced, larger droplets that “splatter” on contact.
More Keys to Drift Management:

- Drift control agents
- Costlier Options:
  - Boom Shields
  - Electrostatic Sprayers
  - Air-assisted Sprayers
**Strategies to Reduce Drift**

- Avoid adverse weather conditions
  - High winds, light & variable winds, calm air, temperature inversions
- Consider using buffer zones
- Select nozzle to increase drop size
- Use lower pressures
- Use lower spray (boom) heights
- Avoid high application speeds/rapid speed changes
- Consider using new technologies:
  - drift reduction nozzles
  - drift reduction additives
  - shields, electrostatics, or air-assisted sprayers
Drift can be successfully managed with the right knowledge of the equipment and factors that influence it

Every application must be balanced between managing drift and maintaining effective crop protection
Minimizing spray drift is in the best interests of everyone. Do your part to keep applications on target.
Information in this presentation was provided by

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- Joanna E. Radford, Ag Extension Agent, NC State University Cooperative Extension Service
- Dr. Wayne Buhler, Extension Specialist, NC State University
- Audio by Bryan Gueltig (LSU Ag Center, Office of Pesticide Safety Education)
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- Daniel Thomas
- Dwight Landreneau
- Paul Coreil
- JK Bordelon
- David Fields
- Bobby Simoneaux
- Billy Pretch
- Bradley Reed
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