Minimizing Spray Drift and Spray Drift Damage
Outline

• Drift Concerns
• Misapplication Causes
• Drift Factors
• Importance of Droplet Size
• Nozzle Selection
• Strategies for Drift Reduction
• Current Issues and Drift Control
What is Drift?

– Movement of spray particles and vapors off-target causing less effective control and possible injury to susceptible vegetation and wildlife.

Adapted from National Coalition on Drift Minimization 1997 as adopted from the AAPCO Pesticide Drift Enforcement Policy - March 1991
Types of Spray Drift

• Vapor - associated with volatilization, gases, fumes.
• Particle - off-target movement of spray droplets.
Drift Concerns

• Spotty pest control.
• Wasted chemicals.
• Off-target damage.

Result - Higher Costs.
Drift Concerns

• Environmental impact.
• Residential encroachment of farmland.
• Public more aware of pesticide concerns! (Negative!!!)
MISAPPLICATION – WHAT’S THE CAUSE?
Misapplication Facts

- Equipment: 33%
- Drift: 33%
- Tank Mix: 24%
- Wrong Field: 8%
- Off Label: 2%

Source: Farmland Insurance
Contributions to Drift

- Nozzle: 26%
- Applicator: 38%
- Physical: 13%
- Other: 23%
DRIFT FACTORS

Spray Characteristics, Equipment/Application Factors, Weather Factors
Spray Characteristics Affecting Drift

- Droplet size
- Evaporation
- Chemical
- Formulation
- Additives
Equipment & Application Factors Affecting Drift

- Nozzle pressure
- Nozzle type
- Nozzle size
- Nozzle orientation
- Height of release
- Technology
Weather and Other Factors Affecting Drift

- Temperature & humidity
- Air movement (direction and velocity)
- Air stability/inversions
- Topography
IMPORTANCE OF DROPLET SIZE
Droplet Size

- Particle drift potential is greater with smaller droplets.
- Spray droplets are measured in microns and expressed as Volume Median Diameter (VMD).

One micron (µm) = 1/25,000 inch
Comparison of Micron Sizes

- 2000\(\mu\)m  #2 Pencil lead
- 850\(\mu\)m  paper clip
- 420\(\mu\)m  staple
- 300\(\mu\)m  toothbrush bristle
- 150\(\mu\)m  sewing thread
- 100\(\mu\)m  human hair
Drift Potential Influenced by:

- **Volume Median Diameter (VMD)**
  - How large is the average droplet size.
- **Droplet Spectrum (Range - big to small)**

% Volume in droplets less than 200 microns in size
½ of spray volume = smaller droplets

½ of spray volume = larger droplets
Why is this a problem?

- Need consistent size of droplets above the 150-200 micron diameter.
- VMD only represents an average of the total spectrum of droplets.
# Evaporation and Deceleration of Various Size Droplets*

<table>
<thead>
<tr>
<th>Droplet Diameter (microns)</th>
<th>Terminal Velocity (ft/sec)</th>
<th>Final Drop diameter (microns)</th>
<th>Time to evaporate (sec)</th>
<th>Deceleration distance (in)</th>
</tr>
</thead>
<tbody>
<tr>
<td>20</td>
<td>.04</td>
<td>7</td>
<td>0.3</td>
<td>&lt;1</td>
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<tr>
<td>50</td>
<td>.25</td>
<td>17</td>
<td>1.8</td>
<td>3</td>
</tr>
<tr>
<td>100</td>
<td>.91</td>
<td>33</td>
<td>7</td>
<td>9</td>
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<tr>
<td>150</td>
<td>1.7</td>
<td>50</td>
<td>16</td>
<td>16</td>
</tr>
<tr>
<td>200</td>
<td>2.4</td>
<td>67</td>
<td>29</td>
<td>25</td>
</tr>
</tbody>
</table>

*Conditions assumed: 90 F, 36% R.H., 25 psi., 3.75% pesticide solution
Evaporation of Droplets

<table>
<thead>
<tr>
<th>High Relative Humidity</th>
<th>Low Relative Humidity</th>
</tr>
</thead>
<tbody>
<tr>
<td>Low Temperature</td>
<td>High Temperature</td>
</tr>
</tbody>
</table>

Wind

Fall Distance
Droplet Size Classification

- Smaller than 150 Microns
- 150 Microns to 250 Microns
- 250 to 350 Microns
- 350 to 450 Microns
- 450 to 750 Microns
- Larger than 750 Microns

- Insecticides and Fungicides
- Herbicides, Pre-emergent and Foliar Sprays
- Soil Applied Herbicides
NOZZLE SELECTION
Nozzles

- Control the amount (GPA).
- Determine the uniformity of the application.
- Affects the coverage.
- Influences drift potential.
Considerations

- Getting adequate coverage while reducing the fine droplets.
- Different types of nozzles available.
- Label mandated types of nozzles for specific applications.
STRATEGIES FOR DRIFT REDUCTION
Reducing Drift

- Select nozzle for lower amounts of fine droplets.
- Increase flow rates - higher application volumes.
- Use recommended pressures.
Reducing Drift

- Use lower spray (boom) heights.
- Avoid adverse weather conditions.
- Consider using buffer zones.

Shielded (Hooded) sprayer: Willmar Fabrications, LLC
Reducing Drift

• Consider using new technologies:
  – drift reduction nozzles.
  – drift reduction additives.
  – shields, electrostatics, air-assist.

Shielded (Hooded) sprayer: Willmar Fabrications, LLC
CURRENT ISSUES AND DRIFT CONTROL
Perception of Harm

- Exaggerated potential for harm to humans or environment is becoming normal.
- Hype and sensationalism replacing science.
- Issue with any type of pesticide drift.
Pollinator Protection

- Pollinator protection is a priority for EPA.
- Insecticides are being scrutinized.
- Herbicides and fungicides are being evaluated.
- All drift to areas with pollinators potentially hazardous.
Organic Operations

- Organic operations near conventional farms pose challenges.
- Farms can lose organic certification if drift occurs.
- Potential for significant damages.
Urban Encroachment

- Residential properties on traditional agricultural areas.
- Greater potential for exposure.
- More potential for perceived damages.
Endangered Species

- May be a significant issue for some species and locations.
- Current rules include required buffers zones for specific pesticides to protect salmon.
- Possibility to extend to other species.
Drift Reduction Technology

- EPA program to encourage the manufacturing and use of DRT products.
  - Nozzles
  - Spray shields
  - DR Adjuvants
- Rated system.
- May lower restrictions on use.
SUMMARY
Summary

• Drift is a significant concern to applicator and public.

• Consider all factors before application.
  – Environmental
  – Equipment
  – Chemical
  – Formulation
Summary

• Newer technologies, adjuvants, and application techniques can significantly reduce drift.
• Environmental impact receiving much attention.
Summary

• Reducing Drift:
  – Better Control.
  – Lower Off-Target Damage.
  – Lower Negative Environmental Impact.
  – Lower Costs.
Questions?
Thank You!