Pesticide Drift Management
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Spray Smart
EREC
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Outline

• Background
• Definition
• Types of drift
• Factors affecting drift
• Drift management
Pest control

• Pest control is an important factor in crop production
• There is a demand from applicators for increased efficiency of pesticide application
• Attention to detail is necessary to
  – Improve efficiency of deposition
  – Reduce drift
  – Increase sprayer output
Pesticide drift

• Pesticide drift is an unavoidable part of pesticide application

• Pesticide drift management should be kept in mind when applying pesticides
  – It requires the applicator to think about reducing drift before the law apply controls
  – All movement to off-label crops is illegal

• Managing spray drift is the responsibility of the applicator
Pesticide drift is undesirable!

• Inefficient use of equipment and time
• Lower than intended rate to the target pest
  – Reduction of pesticide efficacy
    • Under-application = Ineffective control
• Damage to susceptible off target crops
• Litigation concerns
• Environmental contamination
• Air/water pollution
• Human health/safety
• Livestock and wildlife concerns
What is pesticide drift?

• Drift- movement of spray particles or droplets away from the spray site before they reach the target or ground surface

• Types
  – Physical drift
  – Vapor drift
Physical drift

Physical drift problems

- Equipment and its operation are responsible for 68 – 90%
- Weather accounts for 10 – 32%

D. B. Smith et al. 1982
Physical drift: droplet size

- Measured in microns
  - Range
    - 20 – 370 microns
  - Average
    - 200 microns
  - Smaller drops increase drift potential
    - <100 microns
## Fall rate of various size droplets

<table>
<thead>
<tr>
<th>Droplet diameter (microns)</th>
<th>Time to fall 10 ft</th>
</tr>
</thead>
<tbody>
<tr>
<td>20</td>
<td>4 minutes</td>
</tr>
<tr>
<td>100</td>
<td>11 seconds</td>
</tr>
<tr>
<td>240</td>
<td>5 seconds</td>
</tr>
<tr>
<td>400</td>
<td>2 seconds</td>
</tr>
</tbody>
</table>
Relationship of particle size to drift

<table>
<thead>
<tr>
<th>Droplet diameter (microns)</th>
<th>Particle type</th>
<th>Drift distance (feet)</th>
</tr>
</thead>
<tbody>
<tr>
<td>400</td>
<td>Course</td>
<td>8.5</td>
</tr>
<tr>
<td>150</td>
<td>Medium</td>
<td>22.0</td>
</tr>
<tr>
<td>100</td>
<td>Fine</td>
<td>48.0</td>
</tr>
</tbody>
</table>

Based upon 10 feet fall in 3 MPH winds
Physical drift: ideal spray boom height

- Easy and inexpensive
- Wide-angle nozzles can be
  - Placed lower to the target
  - But also produce smaller droplets

<table>
<thead>
<tr>
<th>Spray angle</th>
<th>Spacing</th>
</tr>
</thead>
<tbody>
<tr>
<td>65</td>
<td>20”</td>
</tr>
<tr>
<td></td>
<td>22-24</td>
</tr>
<tr>
<td></td>
<td>30”</td>
</tr>
<tr>
<td></td>
<td>33-35</td>
</tr>
<tr>
<td>80</td>
<td>17-19</td>
</tr>
<tr>
<td>110</td>
<td>15-18</td>
</tr>
<tr>
<td></td>
<td>20-22</td>
</tr>
<tr>
<td></td>
<td>24-26</td>
</tr>
</tbody>
</table>
Physical drift: weather

- Wind speed/direction  
  - Most important  
- Soil moisture  
- Temperature  
- Humidity  
- Inversions
Inversions

• Restrict vertical air mixing, which causes small, suspended droplets to remain in a concentrated cloud
• This cloud could move in unpredictable directions due to light variable winds
• Characterized by
  – Increasing temperatures
  – Common on nights with limited cloud cover and light to no wind
  – Begin to form as sun sets and often continue into the morning
• Presence indicated by
  – Ground fog
  – Movement of smoke from ground source or aircraft smoke generator
• Smoke that layers and moves laterally in a concentrated cloud (under low wind conditions) indicates an inversion
• Smoke that moves upward and rapidly dissipates indicates good vertical air mixing
Physical drift: weather

- Drift potential maybe high at low wind speeds
  - Light winds (0 – 3 mph) tend to be unpredictable and variable in direction
  - Calm and low wind conditions may indicate presence of a temperature inversion
- Drift potential is lowest at wind speeds between 3 and 10 mph (gentle but steady breeze) blowing in a safe direction
Physical drift: other factors to consider

• Nozzle selection
Turbulence-chamber and air-assist nozzles

- Allows air into a mixing chamber creating a vacuum that mixes the air and spray solution
- Forms large bubbles that do not drift as far

Greenleaf, TurboDrop

Turbo TeeJet
Physical drift: other factors to consider

- Nozzle selection
- Spray pressure
  - Higher pressure = smaller droplets, conversely, low pressure = large droplets that may bounce off the target
  - Certain spray surfactants can change the droplet spectrum, reducing the number of driftable droplets
Influence of spray pressure on droplet size

Flat fan nozzle - 0.6 GPM

<table>
<thead>
<tr>
<th>Pressure</th>
<th>% Droplets of 100-micron size or less</th>
</tr>
</thead>
<tbody>
<tr>
<td>20 psi</td>
<td>6</td>
</tr>
<tr>
<td>40 psi</td>
<td>12</td>
</tr>
</tbody>
</table>
Physical drift: other factors to consider

• Nozzle selection
• Spray pressure
  – Higher pressure = smaller droplets = better coverage at the expense of drift control
  – Low pressure = large droplets, but reduced coverage
  – Evaluations have demonstrated that constant pressure settings produce best results
• Spray volume
  – Most effective means to increase spray volume is to increase nozzle orifice size
    • 8002 vs. 8003 vs. 8004
Vapor drift

- Volatilization or evaporation of a pesticide from the soil or crop surface that occurs after application
  - Movement of chemical vapor out of the target area
- Vapor drift is influenced by
  - Vapor pressure/volatility
  - Temperature
  - Wind speed
Vapor drift can occur even days after the application
Ways to reduce drift

• Before spraying
  – Train the operator to use the sprayer correctly under your conditions
  – Plan the spraying operation
    • Consider the use field cards
  – Read and follow the pesticide label
  – Select the correct nozzle for the target
    • Use nozzles that produce large droplets
      – Increase nozzle size
  – Consider spray additives to reduce drift
Ways to reduce drift

• Before spraying
  – Improve spraying logistics to ensure adequate time to spray within ‘ideal’ conditions
  – Only spray when weather conditions are ideal
    • Avoid spraying on days when conditions are favorable for inversion or wind drift
    • Check wind speed and direction
    • Avoid spraying when winds exceed 10 MPH
  – Calibrate the sprayer
Ways to reduce drift

• During spraying
  – Stay alert
  • Ensure the spray is not allowed to drift on to non-target areas
  • Watch for changes in wind speed and direction
  • Look for inversions
  – Incase of drift potential
  • Lower application pressure
  • Lower boom height
  – Avoid spraying near sensitive crops or water courses
  – Use common sense
References used in making this presentation

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Thank you