

Minimizing Spray Drift and Spray Drift Damage





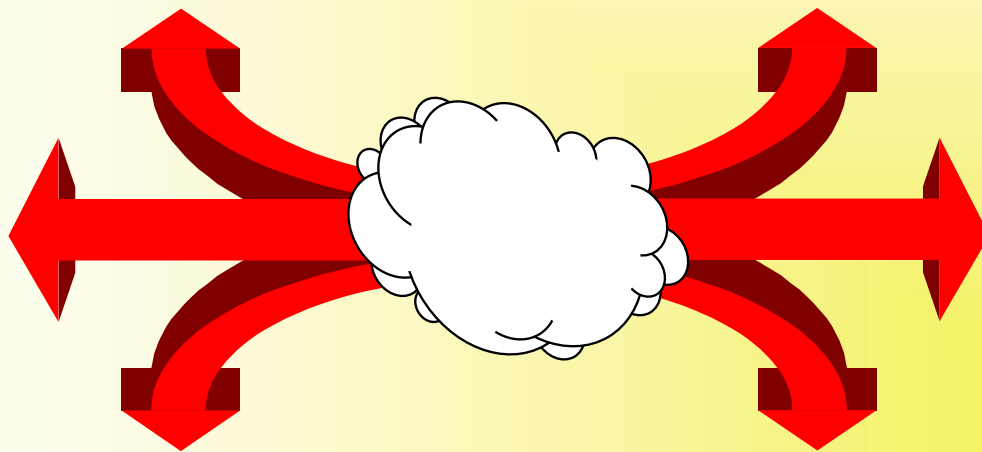
Outline

- 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!!!)





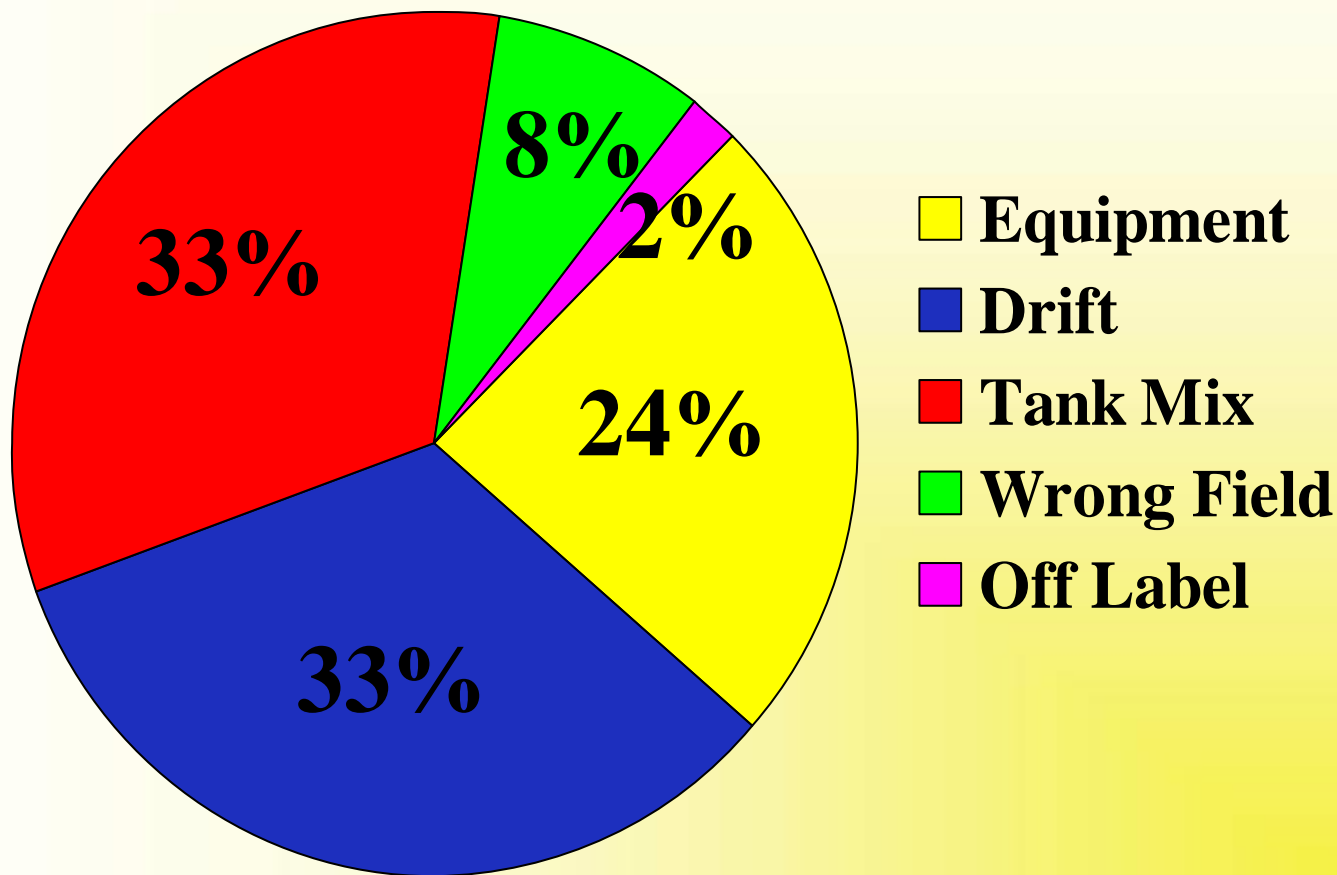
MISAPPLICATION – WHAT'S THE CAUSE?





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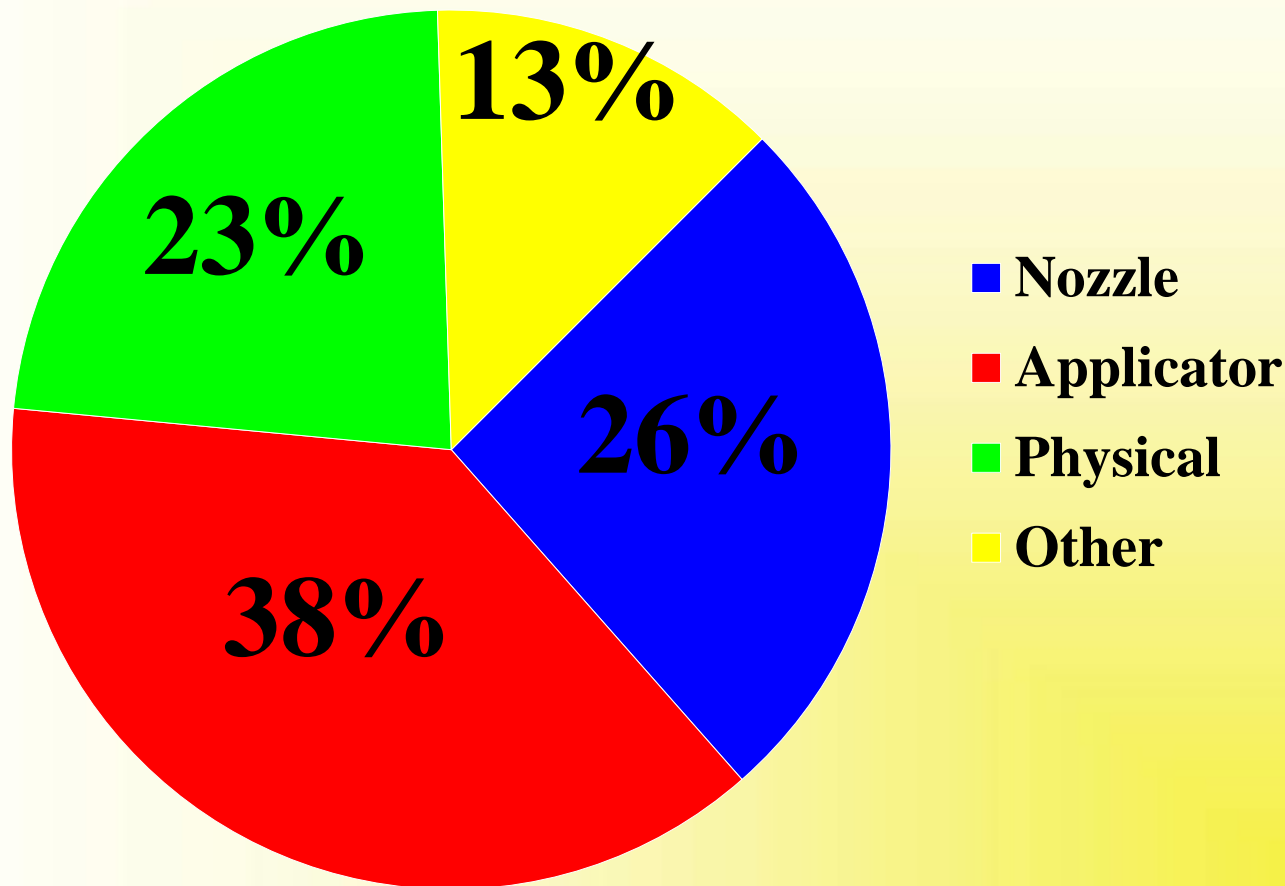
Misapplication Facts



Source: Farmland Insurance



Contributions to Drift





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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



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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 μm #2 Pencil lead
- 850 μm paper clip
- 420 μm staple
- 300 μm toothbrush bristle
- 150 μm sewing thread
- 100 μm human hair





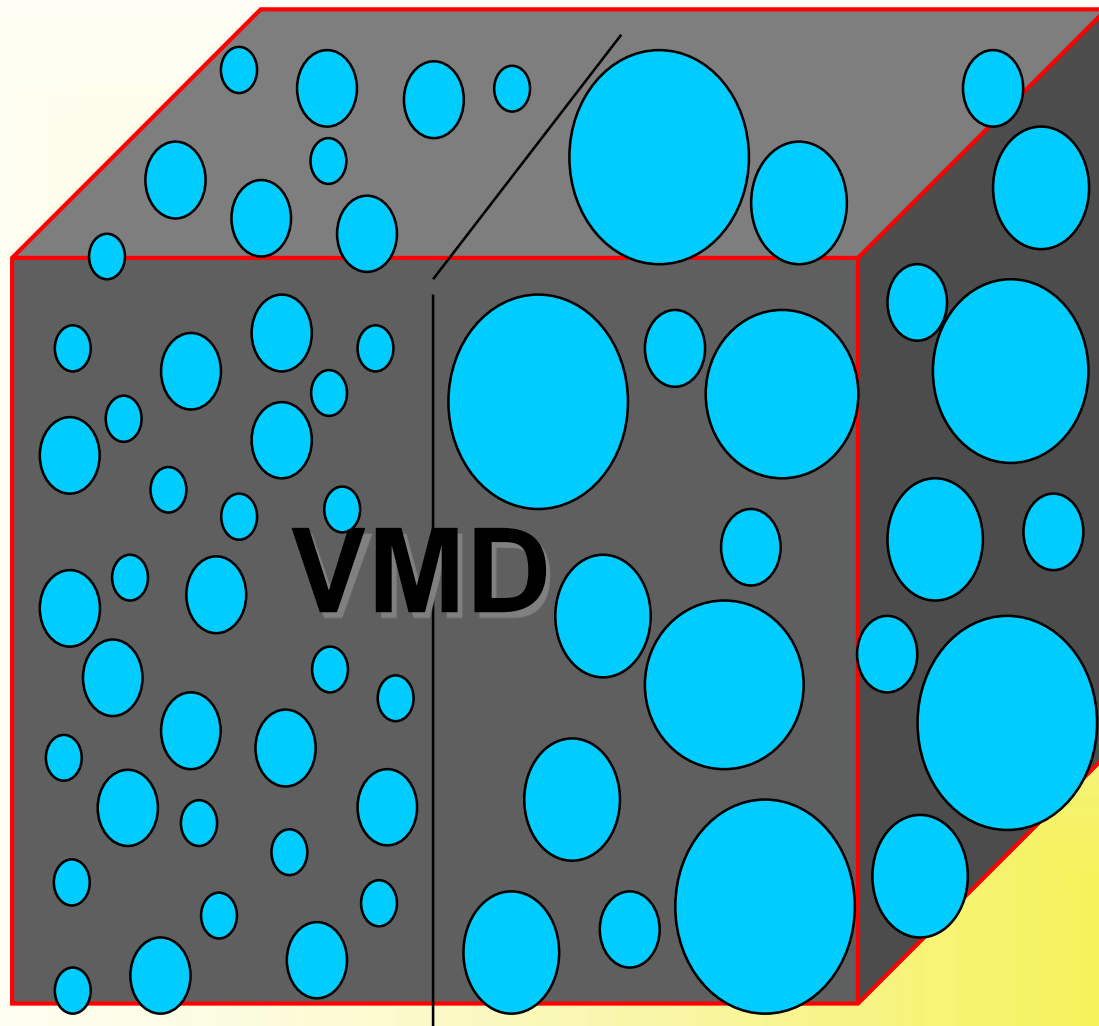
Drift Potential Influenced by:

- 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**



$\frac{1}{2}$ of spray volume = smaller droplets



$\frac{1}{2}$ of spray volume = larger droplets

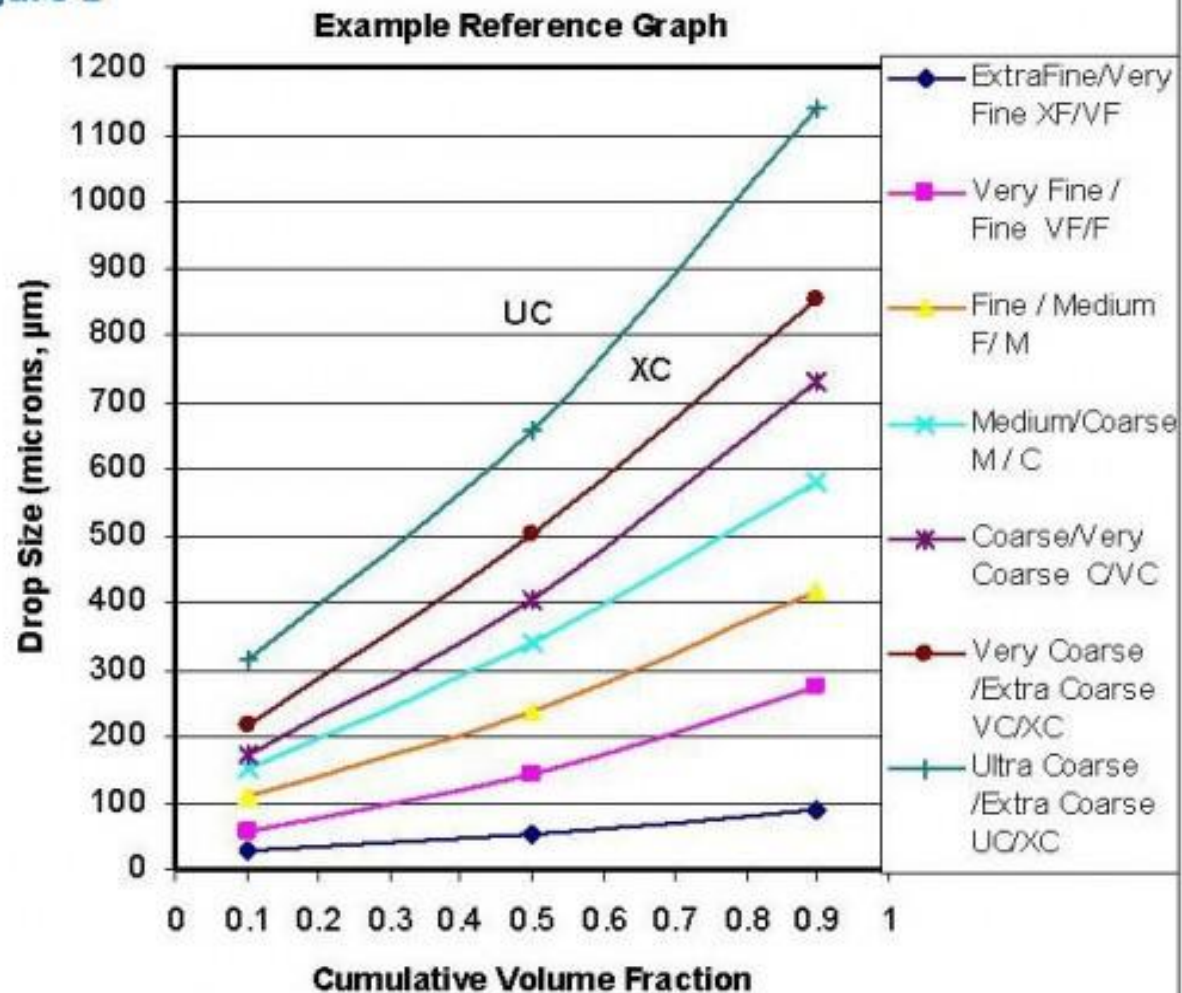


Why is this a problem?

- Need consistent size of droplets above the 150-200 micron diameter.
- VMD only represents an average of the total spectrum of droplets.



S572 Spray Nozzle Classification by Droplet Spectra Figure 1



Sample reference graph developed from measurements averaged from three types of laser instruments



Evaporation and Deceleration of Various Size Droplets*

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

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

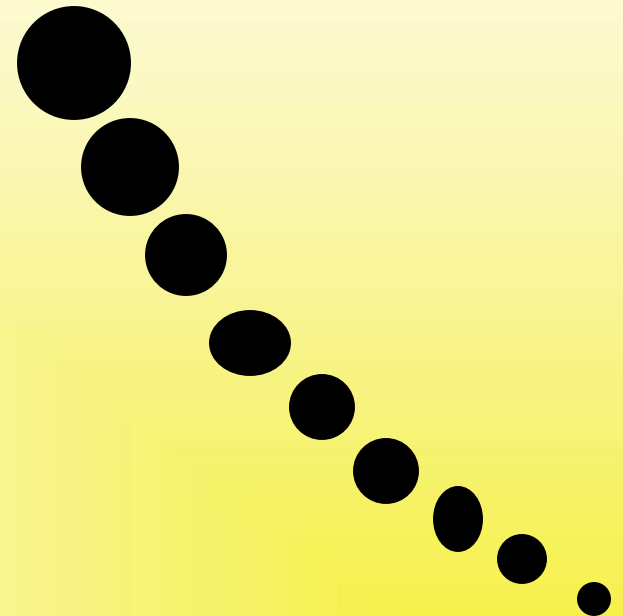
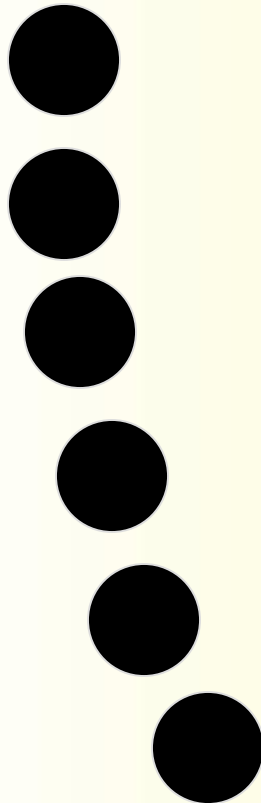


Evaporation of Droplets

High Relative Humidity
Low Temperature

Low Relative Humidity
High Temperature

Fall Distance



Wind





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Droplet Size Classification

VF

Very Fine

F

Fine

M

Medium

C

Coarse

VC

Very Coarse

EC

Extremely Coarse

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



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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)
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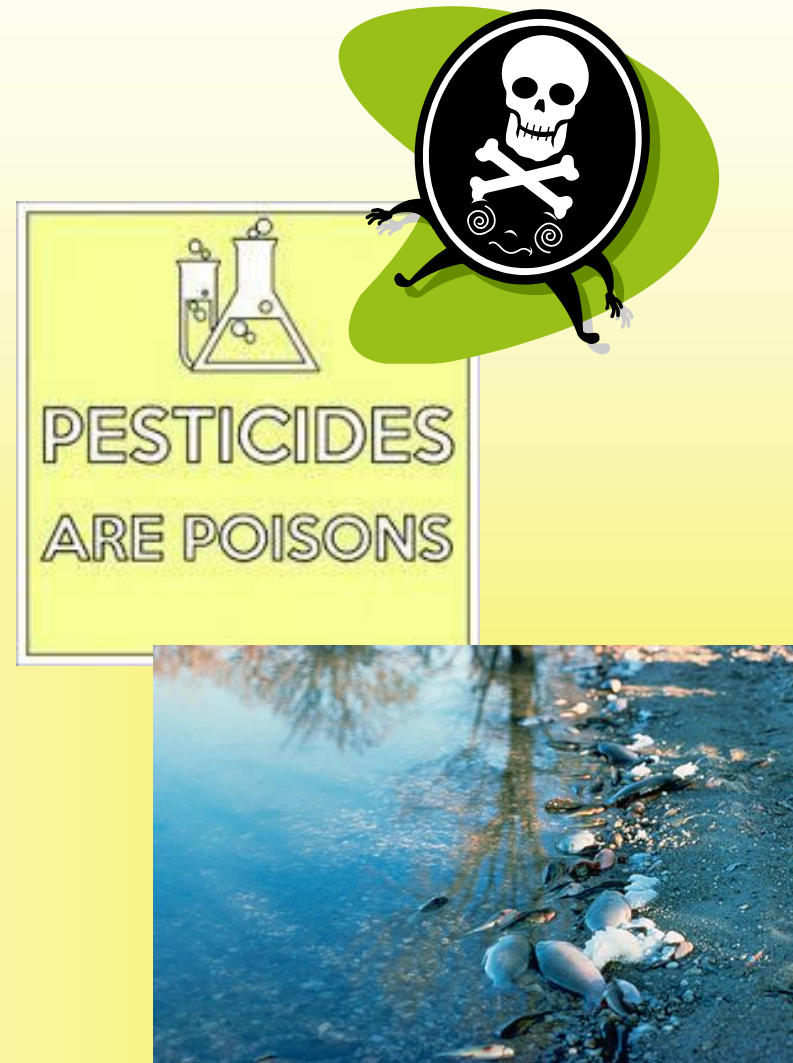


CURRENT ISSUES AND DRIFT CONTROL



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.





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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

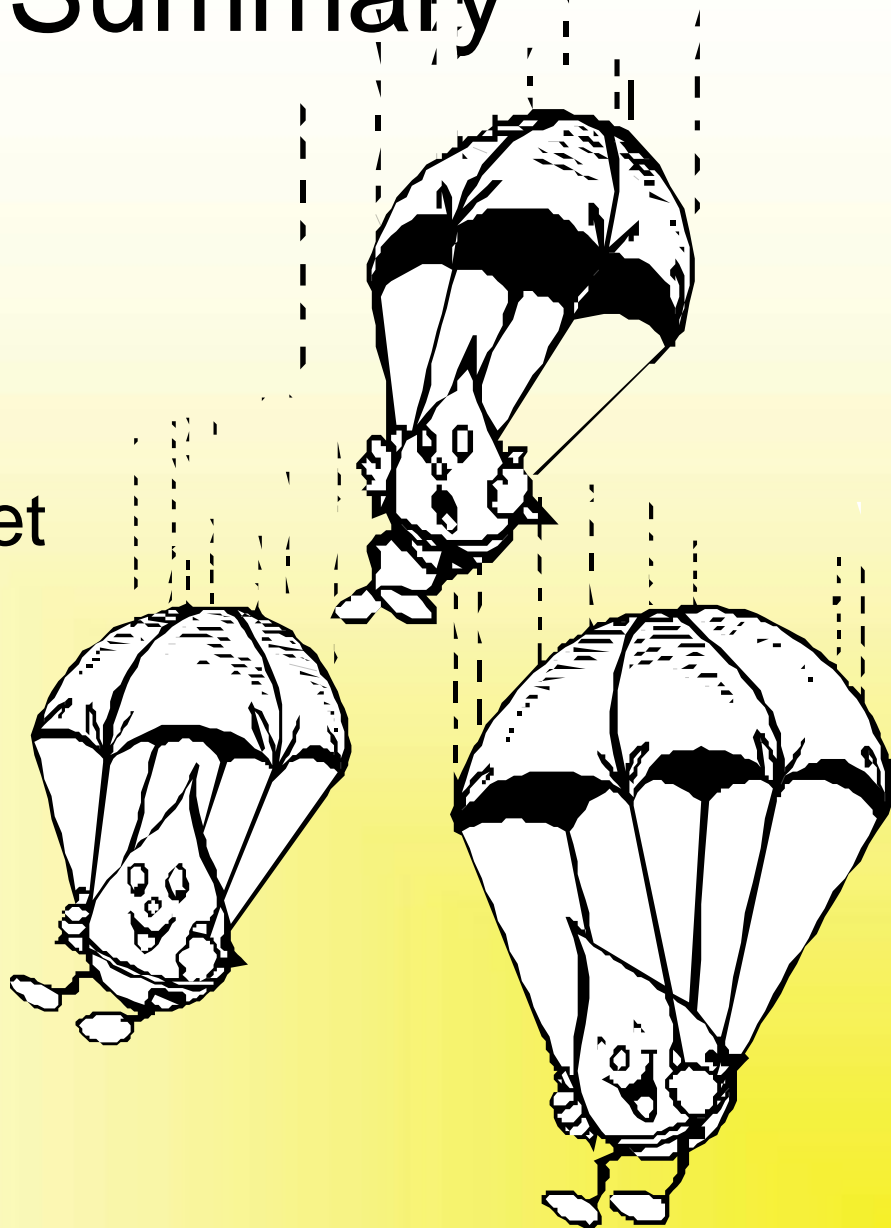
- Newer technologies, adjuvants, and application techniques can significantly reduce drift.
- Environmental impact receiving much attention.





Summary

- Reducing Drift:
 - Better Control.
 - Lower Off-Target Damage.
 - Lower Negative Environmental Impact.
 - Lower Costs.





Questions?

Thank You!