
Strategies for Managing
Pesticide Spray Drift
EPA

Tips for Participants


Strategies for Managing
Pesticide Spray Drift
EPA

Presenter

Greg Kruger, Ph.D.

- Weed science and pesticide application technology specialist
- University of Nebraska-Lincoln, Department of Agronomy and Horticulture
- Director of the Pesticide Application Technology Laboratory
- Areas of research: droplet size and efficacy, spray drift deposition and canopy penetration, influence of nozzle type, orifice size, spray pressure, and carrier volume rate on spray droplet size
- Weed Science Society of America liaison to EPA

Strategies for Managing Pesticide Spray Drift

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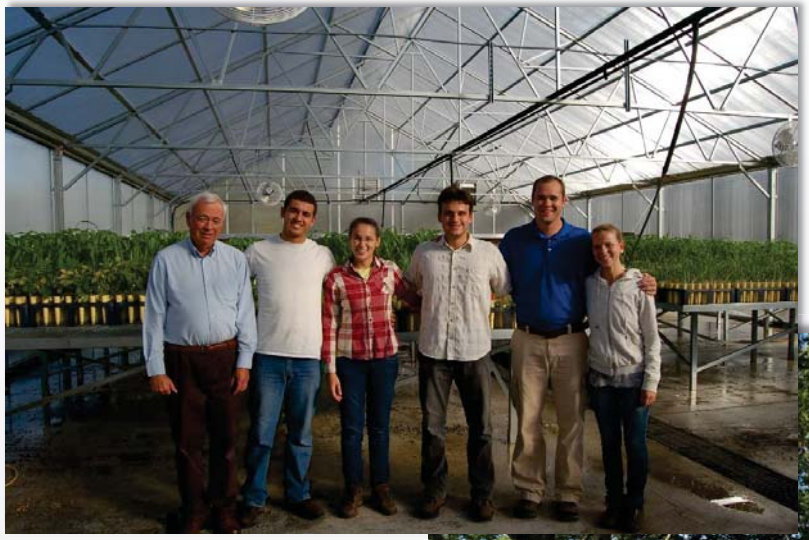
University of Nebraska West Central Research and Extension Center
March 15, 2018

University of Nebraska Lincoln

PAT LAB
Pesticide Application Technology Research and Extension




PESTICIDE APPLICATION TECHNOLOGY LABORATORY

Definition of Drift:

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

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

Types of Drift:

Vapor Drift - associated with volatilization (gas, fumes)

Particle Drift - movement of spray particles during or after the spray application

Particle Drift – *Big 4*

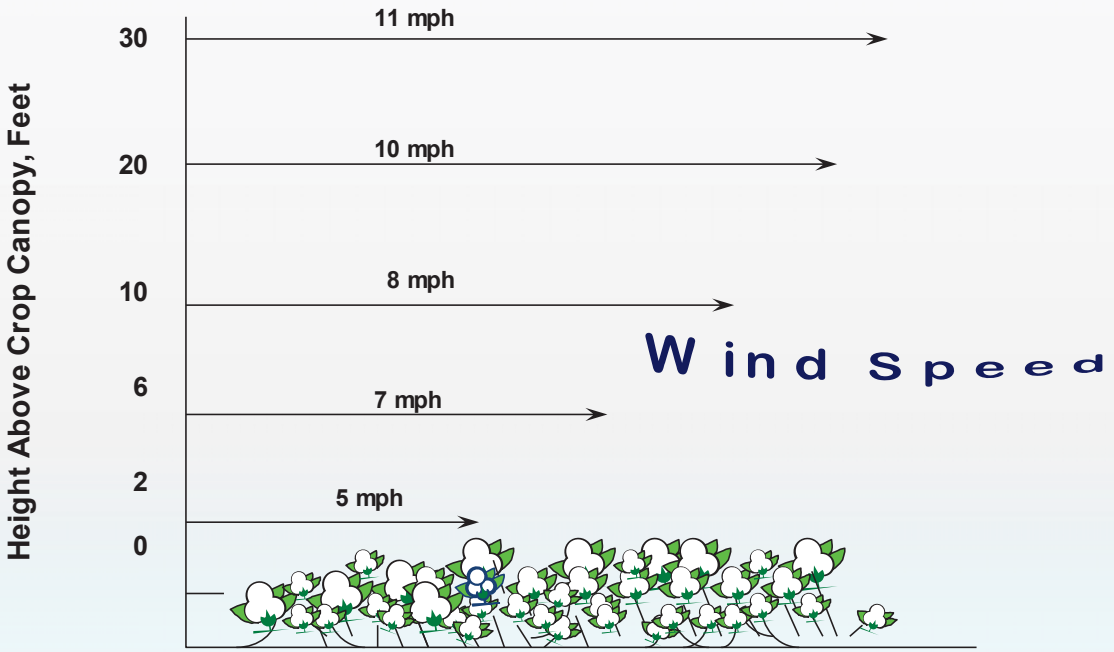
1. Wind Speed

Wind Speed

When the wind speed doubles, there is almost a 700% increase in drift when readings are taken from 90 feet downwind from the sprayer. Hence the recommendation of spraying in 10 mph winds or less.

700% Increase → **90 ft.**

Wind Speeds Gradients:



The relation between height above the canopy of a crop like cotton or soybean and the speed of wind.

Dicamba injury on tomato – XR 110015 (40 PSI)

5 mph

11 mph

6 ft | 9 ft | 12 ft | 24 ft | 36 ft

Dicamba injury on tomato – AIXR 110015 (40 PSI)

5 mph

11 mph

6 ft | 9 ft | 12 ft | 24 ft | 36 ft

Dicamba injury on tomato – AI 110015 (40 PSI)

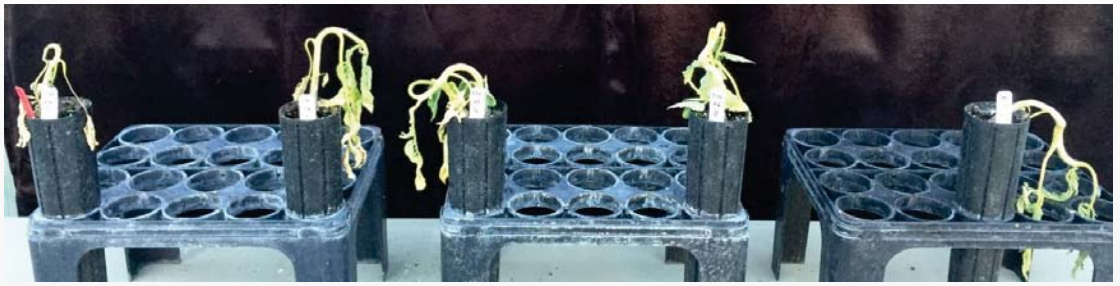
5 mph

11 mph

6 ft | 9 ft | 12 ft | 24 ft | 36 ft

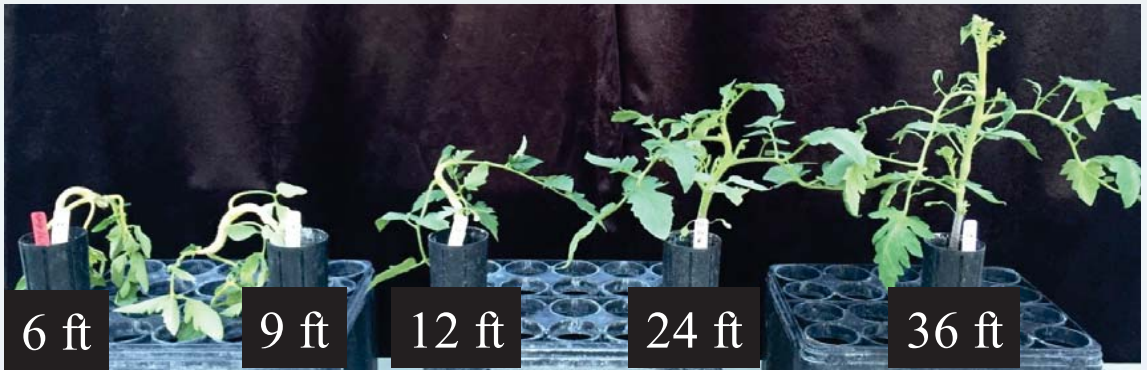
Dicamba injury on tomato – 11 mph (40 PSI)

XR



AIXR

AI



(ALVES et al., xx)

Particle Drift – *Big 4*

1. Wind Speed
2. Boom Height

Boom Height

When the boom height was increased from 18 to 36 inches, the amount of drift increased 350% at 90 feet downwind.

350% Increase → **90 ft.**

Particle Drift – *Big 4*

1. Wind Speed
2. Boom Height
3. Distance from Susceptible Vegetation

Distance Downwind

If the distance downwind is doubled, the amount of drift decreases five-fold. If the distance downwind increases from 100 to 200 feet, you have only 20% as much drift at 200 feet as at 100 feet.

80% Decrease

200 ft.

Particle Drift – *Big 4*

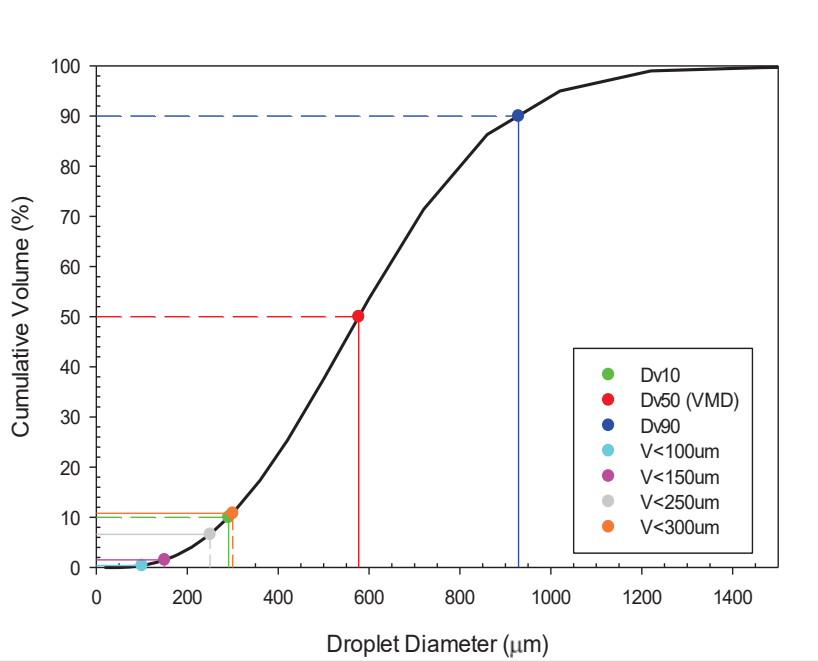
1. Wind Speed
2. Boom Height
3. Distance from Susceptible Vegetation
4. Spray Particle Size

Comparison of Micron Sizes (approximate values)

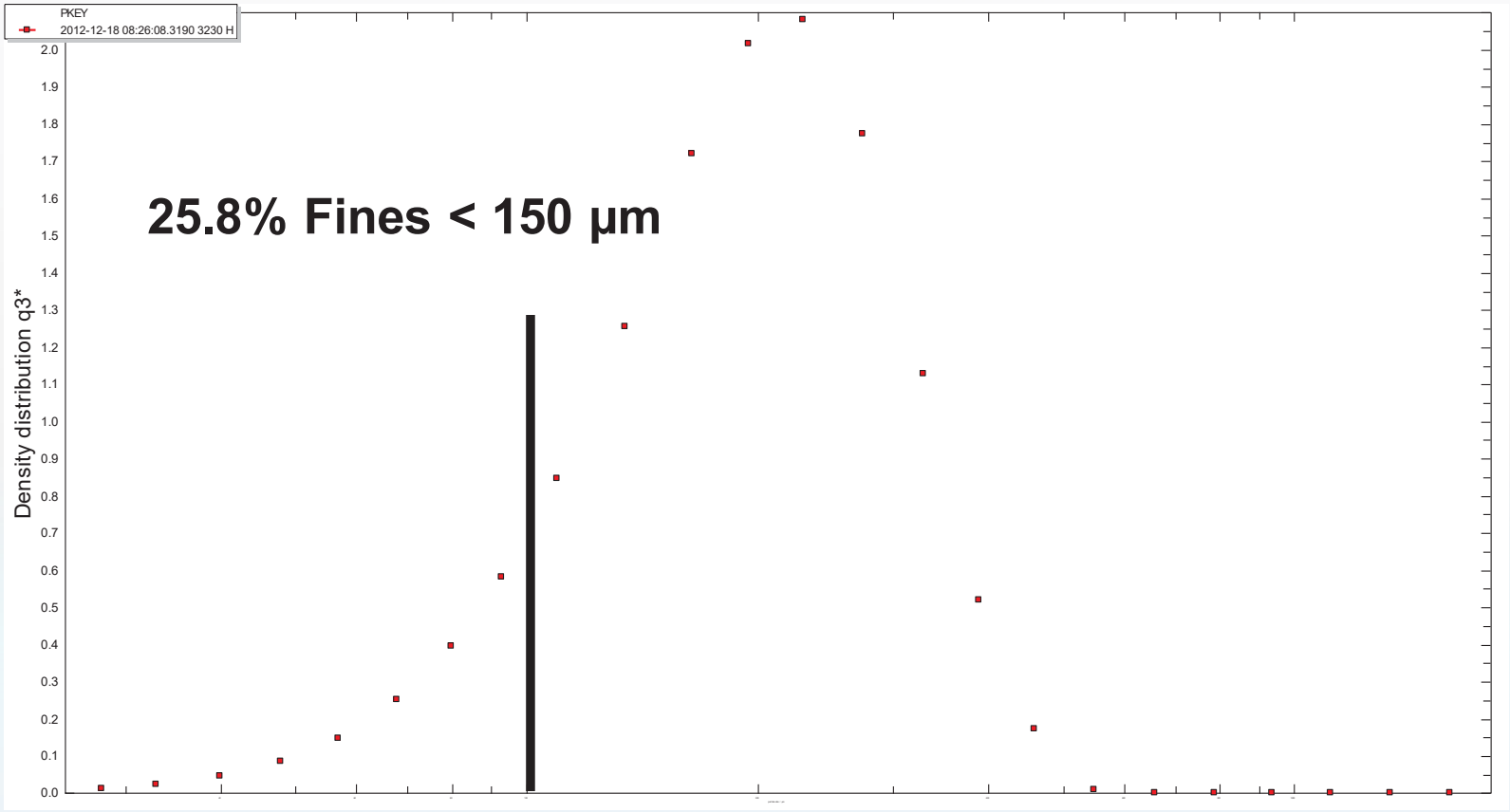
Pencil lead	2000 μm
Paper clip	850 μm
Staple	420 μm
Toothbrush bristle	300 μm
Sewing thread	150 μm
Human hair	100 μm

Data Analysis

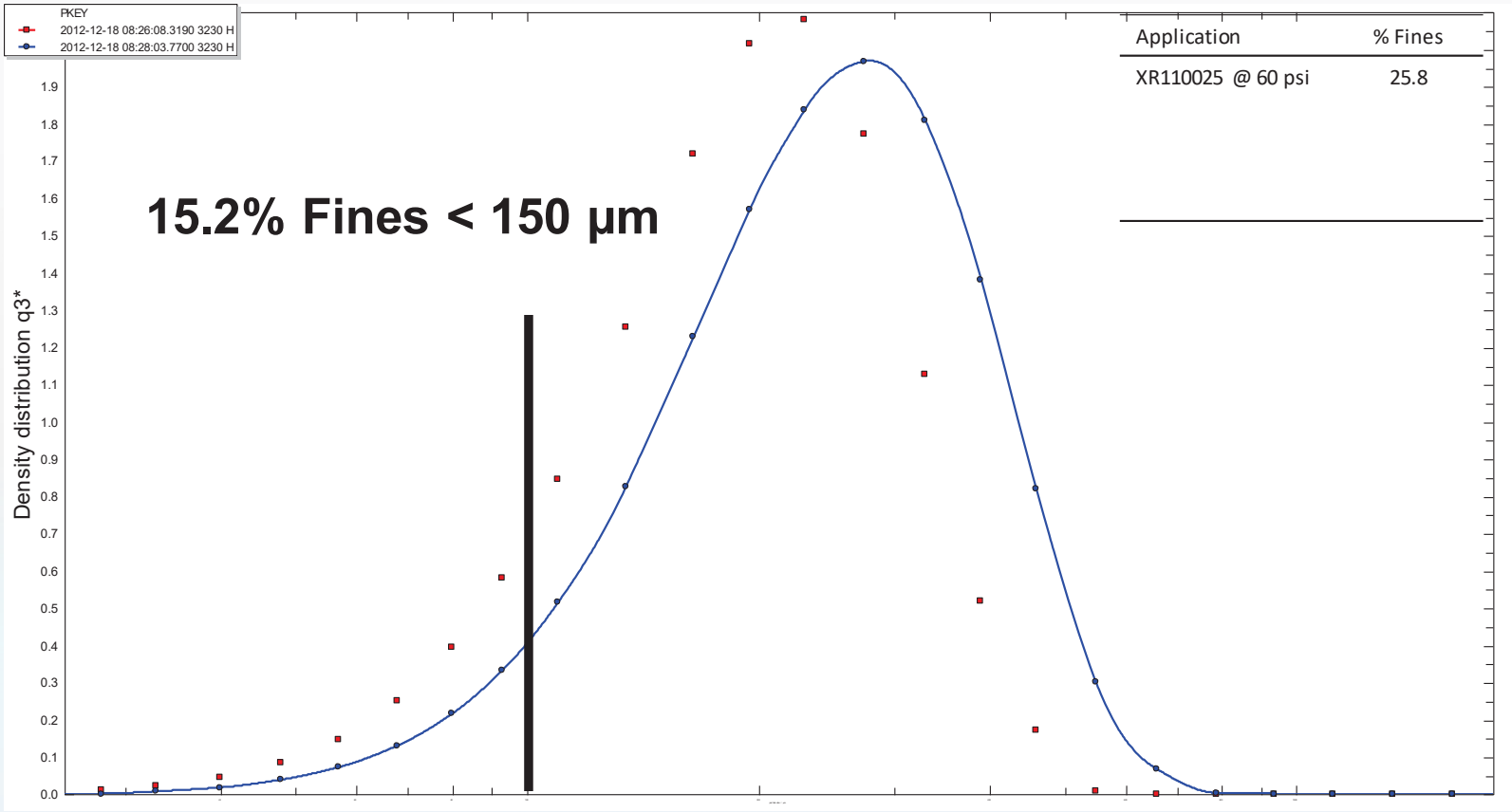
- Droplet size data were statistically analyzed using a full factorial response surface model
- Four main model factors along with potential interaction effects were evaluated
  - Nozzle
  - Application Volume Rate
  - Orifice Size
  - Formulation
- All possible factorial combinations of the four main factors were tested
- Percent fine droplets to relate to drift potential – Vol < 150 µm (%)
- $D_{v0.5}$ (VMD) relates to efficacy



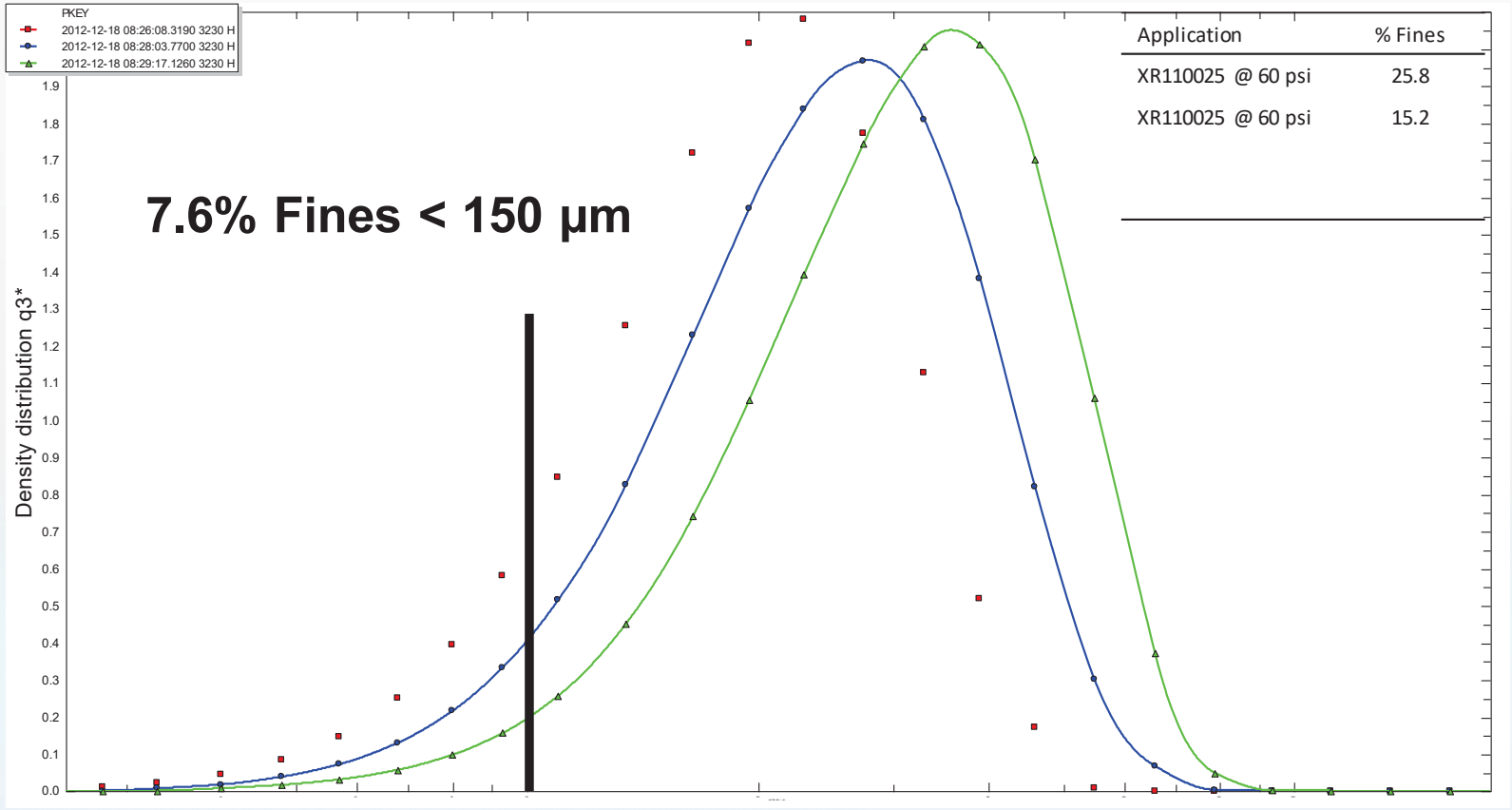
XR110025 at 60 psi using Water



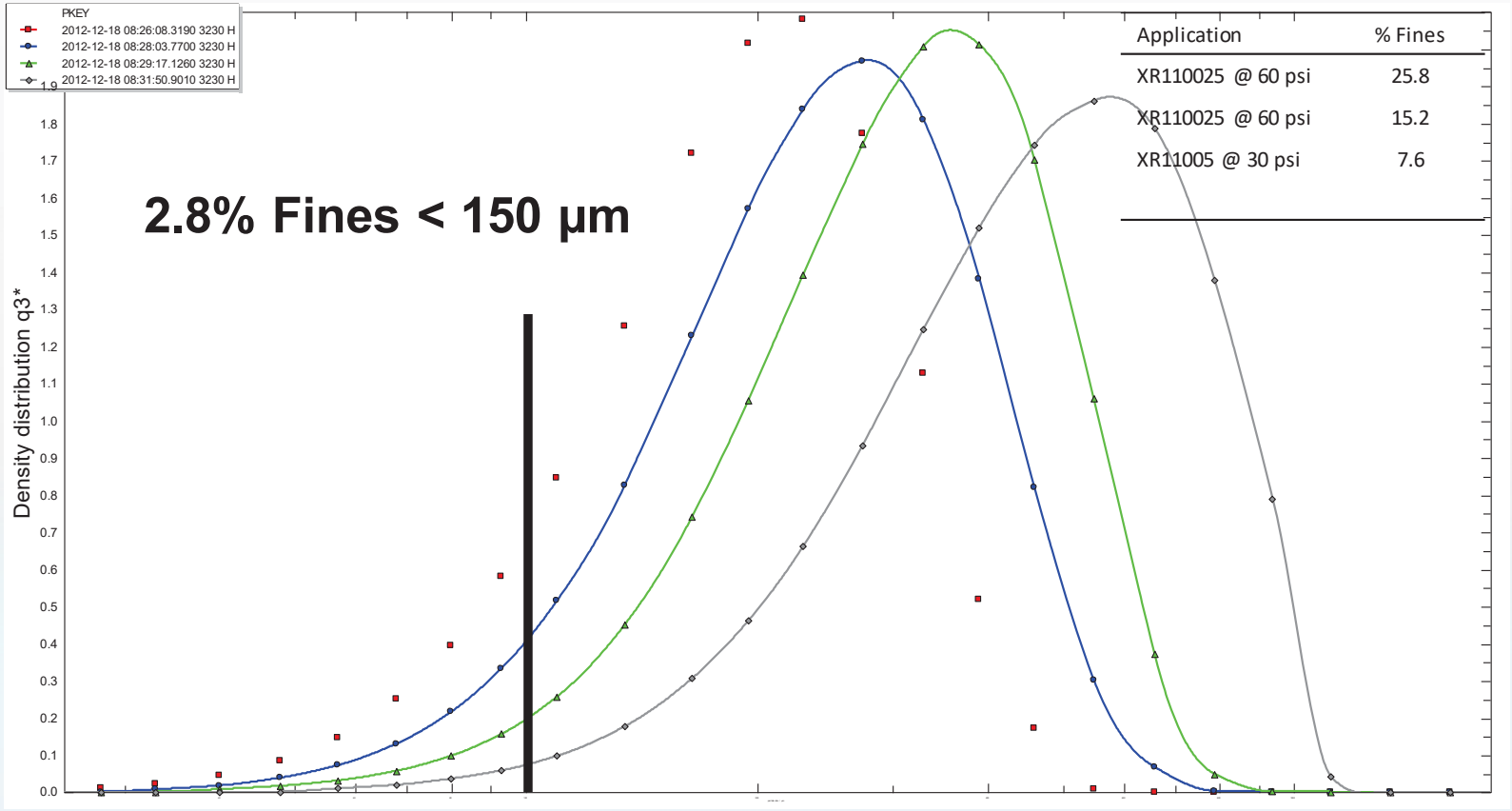
XR110025 at 30 psi using Water



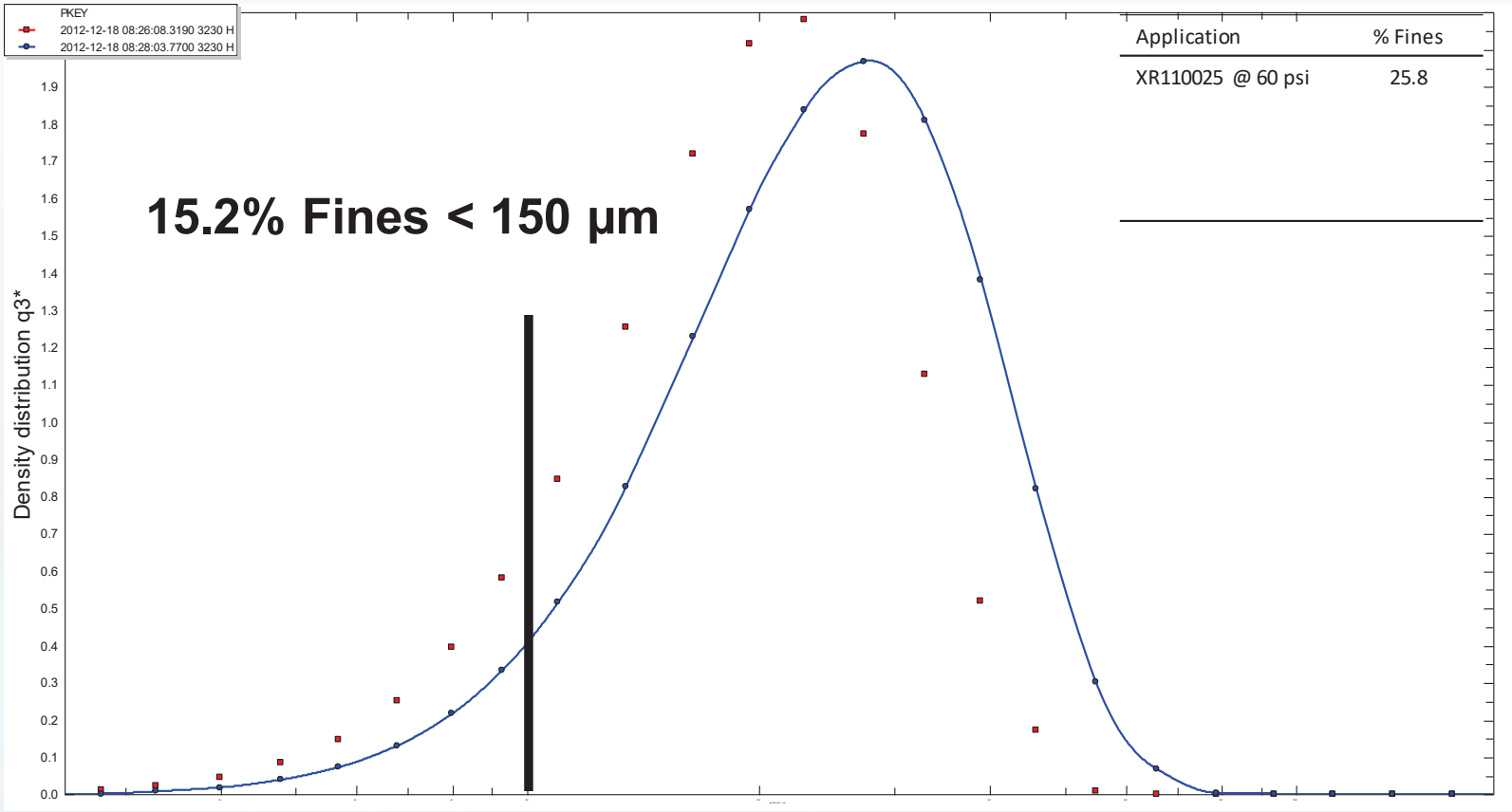
XR11005 at 30 psi using Water



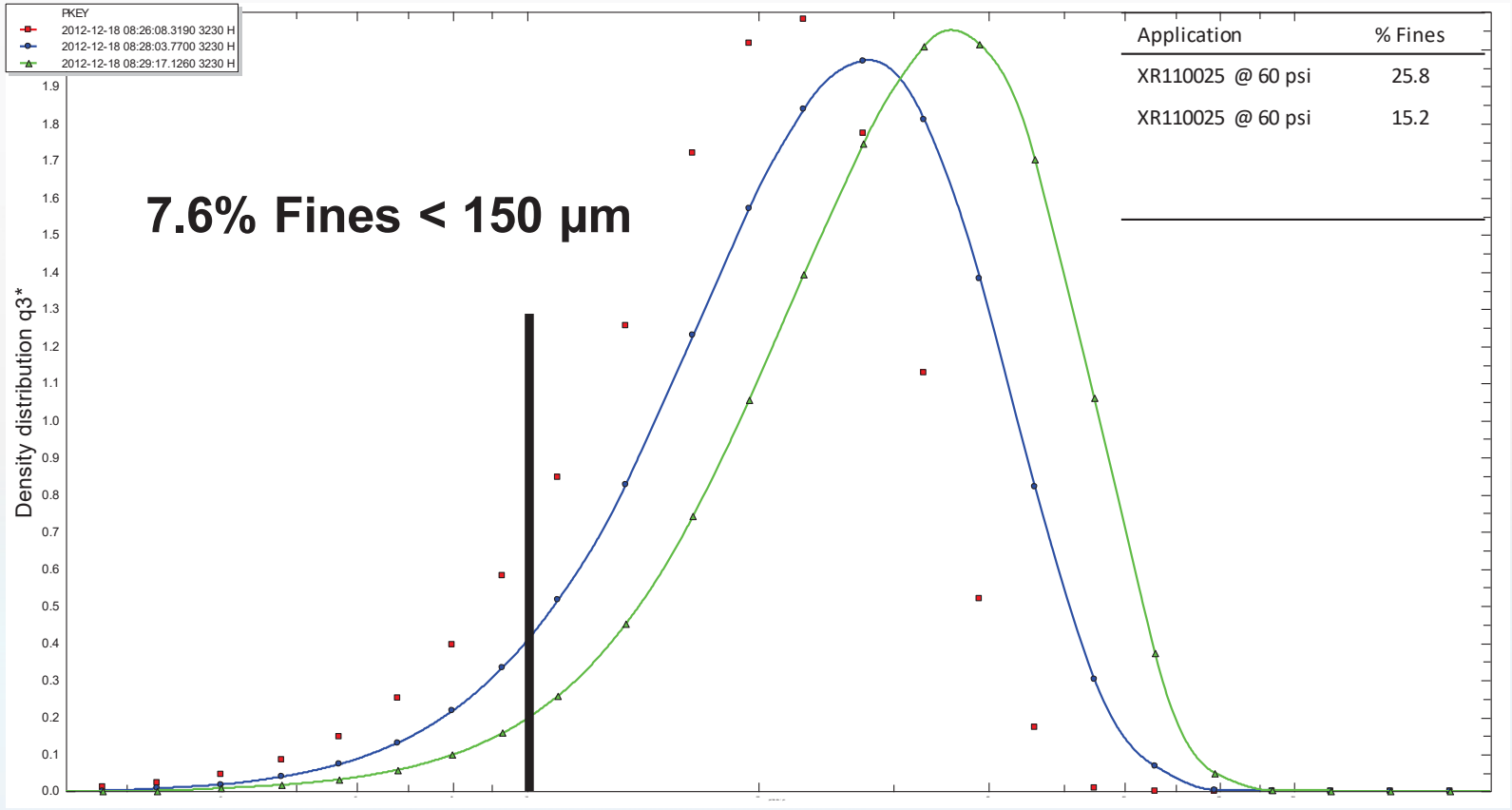
TT11005 at 30 psi using Water



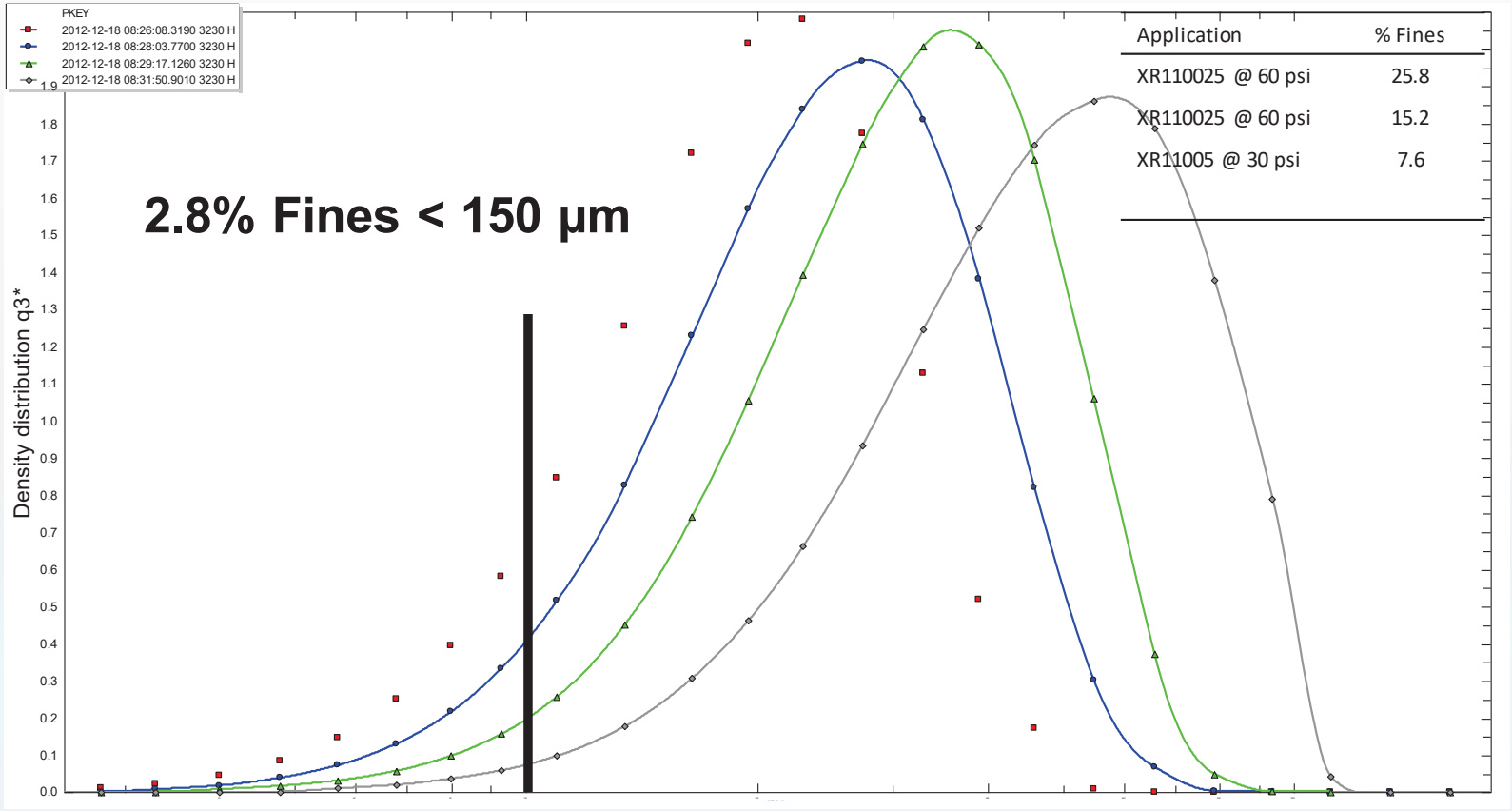
XR110025 at 30 psi using Water



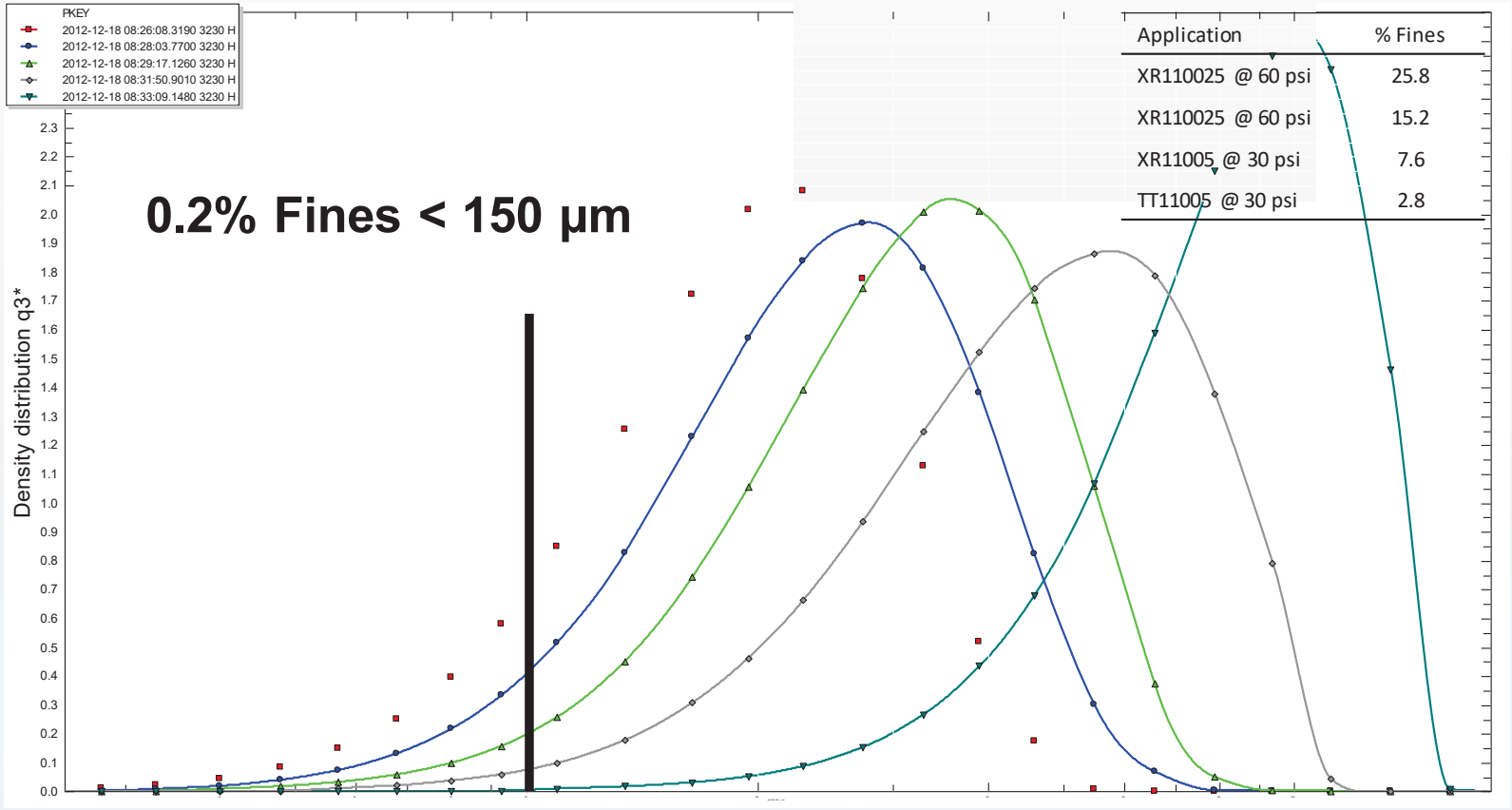
XR11005 at 30 psi using Water



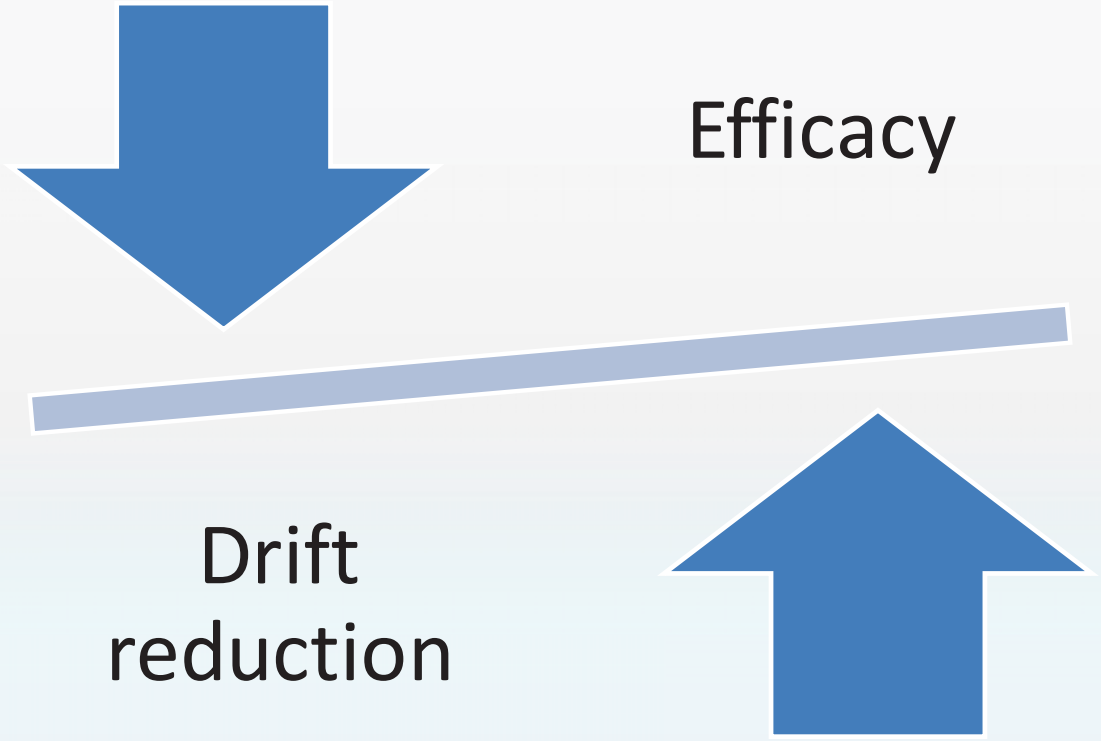
TT11005 at 30 psi using Water



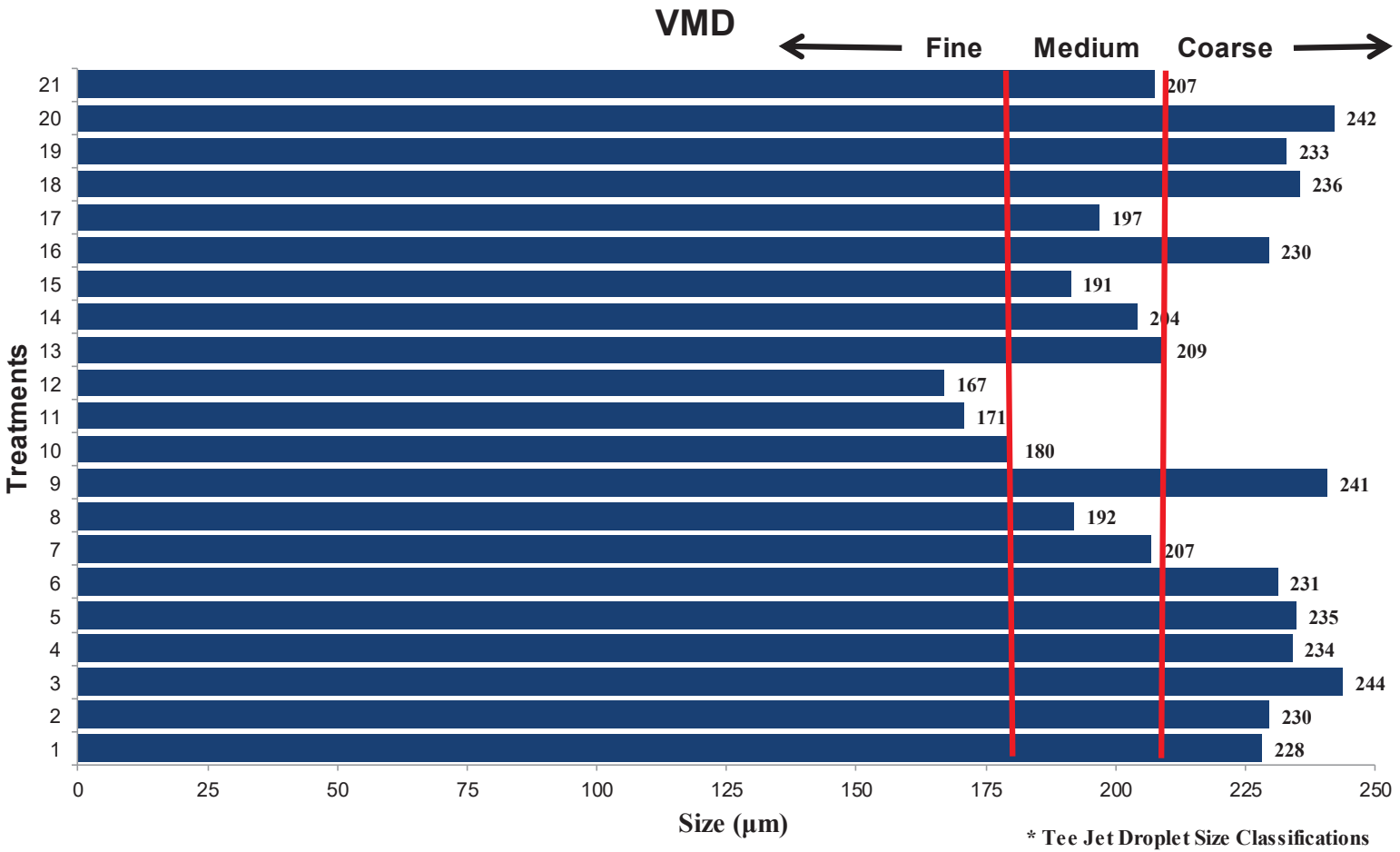
TTI11005 at 30 psi using Water



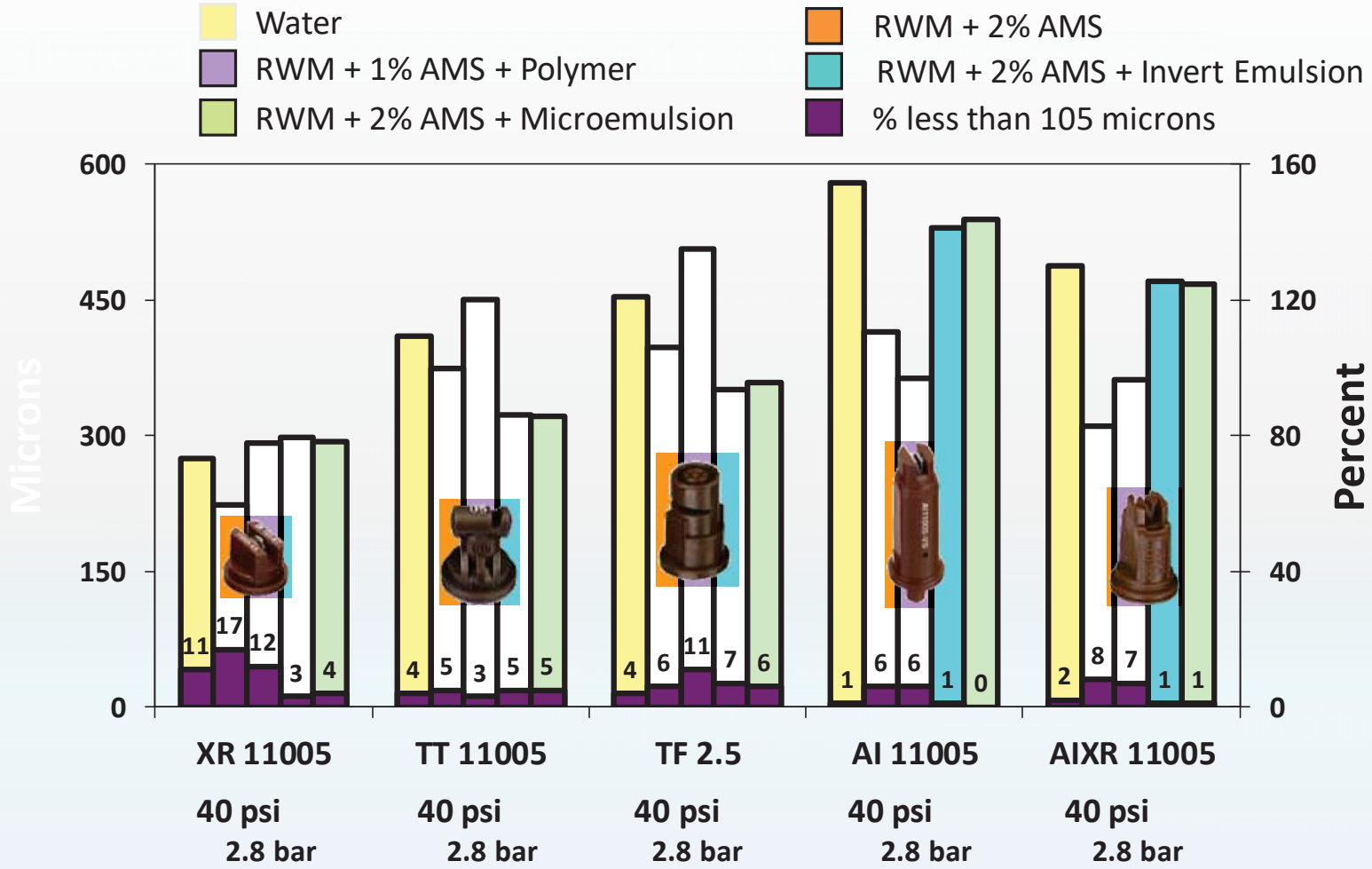
Relationship Between Drift and Efficacy



Effect of Various Herbicides & Adjuvants on a "Medium" Spray Quality



Volume Median Diameter (VMD)



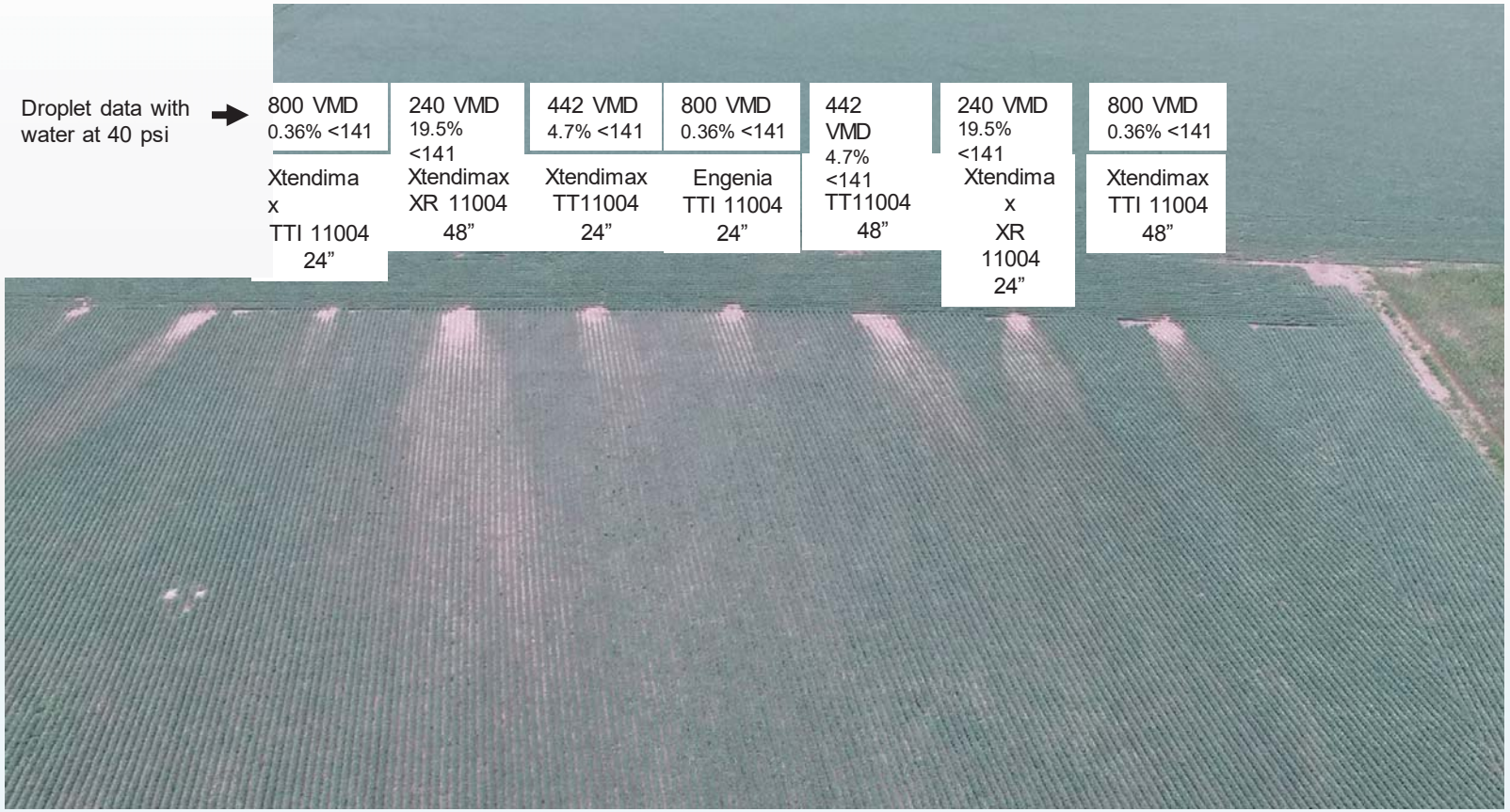
How far will particles go?

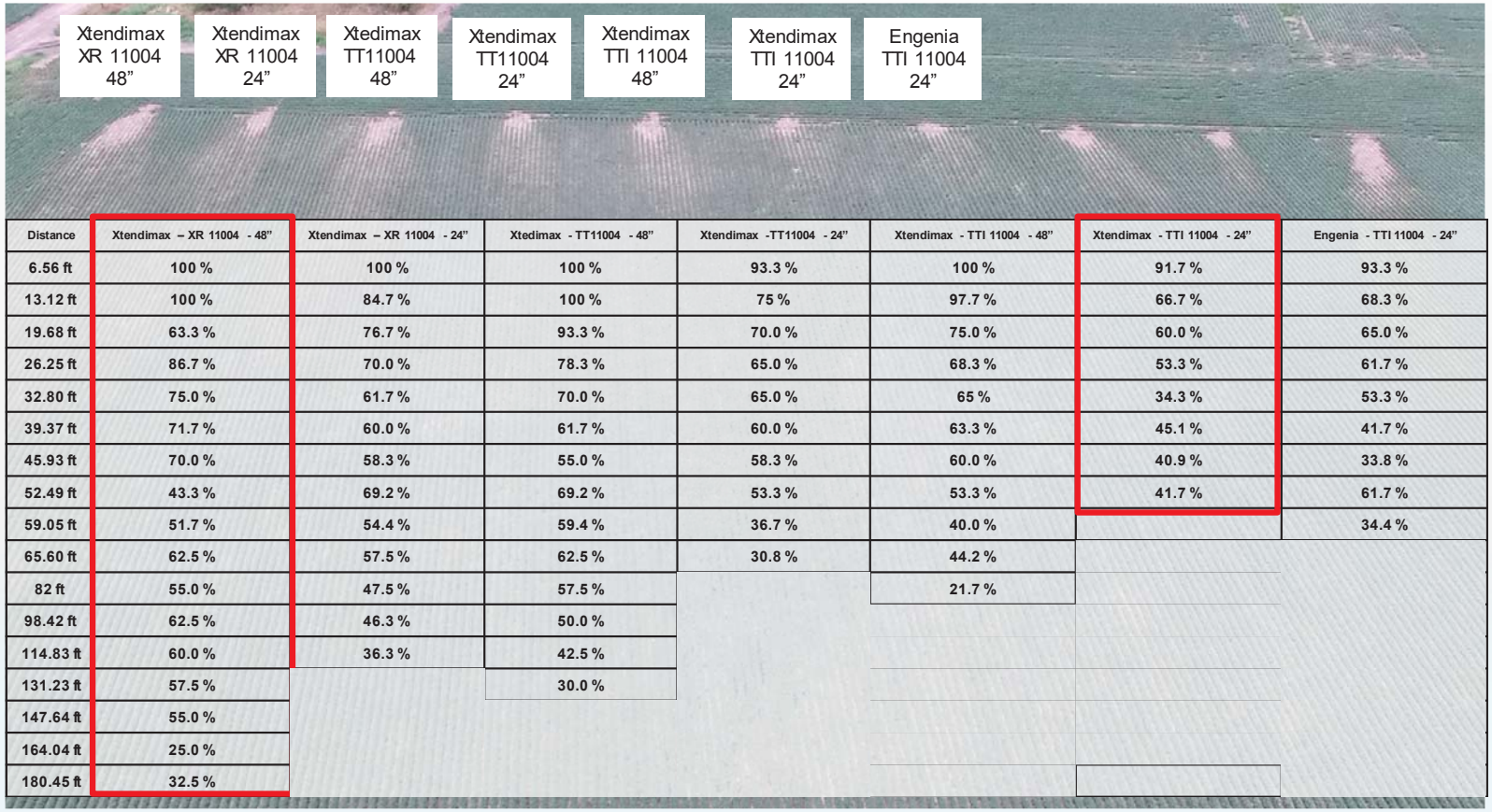
Droplet	Diameter (in μm)	Time to fall 10 ft	Travel distance in 3 mph wind
Fog	5	66 min	15,840 ft
Very fine	20	4.2 min	1,100 ft
Fine	100	10 sec	44 ft
Medium	240	6 sec	28 ft
Coarse	400	2 sec	8.5 ft
Fine rain	1,000	1 sec	< 5 ft

Source: *Herbicide Spray Drift,* NDSU Extension

Cutting Droplet Size in Half

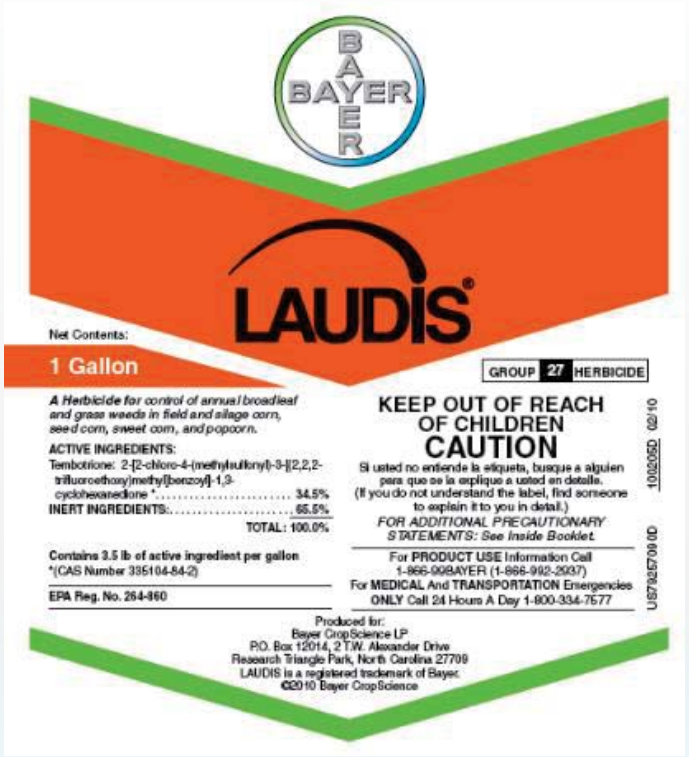
Results in Eight Times the Number of Droplets


Droplet data with water at 40 psi
800 VMD 0.36% <141
Xtendimax TTI 11004 24”
240 VMD 19.5% <141
Xtendimax XR 11004 48”
442 VMD 4.7% <141
Xtendimax TT11004 24”
800 VMD 0.36% <141
Engenia TTI 11004 24”
442 VMD 4.7% <141
TT11004 48”
240 VMD 19.5% <141
Xtendimax XR 11004 24”
800 VMD 0.36% <141
Xtendimax TTI 11004 48”



Distance	Xtendimax – XR 11004 - 48”	Xtendimax – XR 11004 - 24”	Xtedimax - TT11004 - 48”	Xtendimax -TT11004 - 24”	Xtendimax - TTI 11004 - 48”	Xtendimax - TTI 11004 - 24”	Engenia - TTI 11004 - 24”
6.56 ft	100 %	100 %	100 %	93.3 %	100 %	91.7 %	93.3 %
13.12 ft	100 %	84.7 %	100 %	75 %	97.7 %	66.7 %	68.3 %
19.68 ft	63.3 %	76.7 %	93.3 %	70.0 %	75.0 %	60.0 %	65.0 %
26.25 ft	86.7 %	70.0 %	78.3 %	65.0 %	68.3 %	53.3 %	61.7 %
32.80 ft	75.0 %	61.7 %	70.0 %	65.0 %	65 %	34.3 %	53.3 %
39.37 ft	71.7 %	60.0 %	61.7 %	60.0 %	63.3 %	45.1 %	41.7 %
45.93 ft	70.0 %	58.3 %	55.0 %	58.3 %	60.0 %	40.9 %	33.8 %
52.49 ft	43.3 %	69.2 %	69.2 %	53.3 %	53.3 %	41.7 %	61.7 %
59.05 ft	51.7 %	54.4 %	59.4 %	36.7 %	40.0 %		34.4 %
65.60 ft	62.5 %	57.5 %	62.5 %	30.8 %	44.2 %		
82 ft	55.0 %	47.5 %	57.5 %		21.7 %		
98.42 ft	62.5 %	46.3 %	50.0 %				
114.83 ft	60.0 %	36.3 %	42.5 %				
131.23 ft	57.5 %		30.0 %				
147.64 ft	55.0 %						
164.04 ft	25.0 %						
180.45 ft	32.5 %						

Know the Label – The Label is the Law!



BAYER

LAUDIS®

Net Contents:

1 Gallon

GROUP 27 HERBICIDE

A Herbicide for control of annual broadleaf and grass weeds in field and silage corn, seed corn, sweet corn, and popcorn.

ACTIVE INGREDIENTS:

Tembotrione: 2-[2-chloro-4-(methylsulfonyl)-3-[(2,2,2-trifluoroethoxy)methyl]benzoyl]-1,3-cyclohexanedione *..... 34.5%

INERT INGREDIENTS:..... 65.5%

TOTAL: 100.0%

Contains 3.5 lb of active ingredient per gallon

*(CAS Number 335104-84-2)

EPA Reg. No. 264-960

KEEP OUT OF REACH OF CHILDREN

CAUTION

Si usted no entiende la etiqueta, busque a alguien para que se la explique a usted en detalle.
(If you do not understand the label, find someone to explain it to you in detail.)

FOR ADDITIONAL PRECAUTIONARY STATEMENTS: See Inside Booklet.

For **PRODUCT USE** Information Call 1-866-99BAYER (1-866-992-2937)
For **MEDICAL** And **TRANSPORTATION** Emergencies **ONLY** Call 24 Hours A Day 1-800-334-7577

Produced for:
Bayer CropScience LP
P.O. Box 12014, 2 T.W. Alexander Drive
Research Triangle Park, North Carolina 27709
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10/2010 02/10

U8792570 00

APPLICATION INFORMATION

Uniform, thorough spray coverage is important to achieve consistent weed control. Select nozzles and pressure that deliver MEDIUM spray droplets as indicated in nozzle manufacturer's catalogs and in accordance with ASAE Standard S-572. Nozzles that deliver COARSE spray droplets may be used to reduce spray drift provided spray volume per acre (GPA) is increased to maintain coverage of weeds. Flat fan nozzles of 80° or 110° are recommended for optimum post emergence coverage.

• Do not use nozzles that produce FINE (e.g. - Cone) or EXTRA COARSE (e.g. - Flood jet) spray droplets.

Ground Application

LAUDIS can be applied broadcast in a minimum of 10 gallons of water per acre (unless a higher volume is specified for a tank-mix partner). For weed control in dense weed populations or under adverse growing conditions, 15 to 20 gallons of water per acre is recommended. Good coverage is essential to achieve optimum weed control.

Typically, flat-fan nozzles operated at 30-60 PSI will deliver MEDIUM spray droplets, providing optimum spray coverage and canopy penetration. Lower pressure operation and/or higher volume flat fan nozzles typically deliver COARSE sprays. Refer to nozzle manufacturer catalogs.

- Boom height should be based on the height of the crop – at least 15 inches above the crop canopy.
- Air induction nozzles should be used at or near 80 psi to produce a medium droplet size.
- Proper agitation should be maintained within the tank to keep the product dispersed.
- See the Spray Drift Management section of this label for additional information on proper application of LAUDIS.

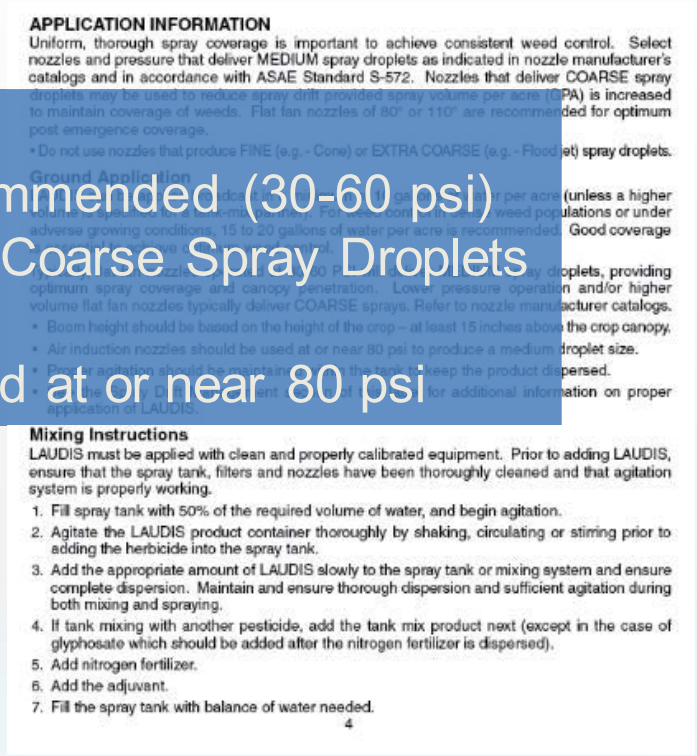
Mixing Instructions

LAUDIS must be applied with clean and properly calibrated equipment. Prior to adding LAUDIS, ensure that the spray tank, filters and nozzles have been thoroughly cleaned and that agitation system is properly working.

1. Fill spray tank with 50% of the required volume of water, and begin agitation.
2. Agitate the LAUDIS product container thoroughly by shaking, circulating or stirring prior to adding the herbicide into the spray tank.
3. Add the appropriate amount of LAUDIS slowly to the spray tank or mixing system and ensure complete dispersion. Maintain and ensure thorough dispersion and sufficient agitation during both mixing and spraying.
4. If tank mixing with another pesticide, add the tank mix product next (except in the case of glyphosate which should be added after the nitrogen fertilizer is dispersed).
5. Add nitrogen fertilizer.
6. Add the adjuvant.
7. Fill the spray tank with balance of water needed.

Know the Label – The Label is the Law!

Medium Spray Droplets
Flat fan nozzles are recommended (30-60 psi)
Do not use Fine or Extra Coarse Spray Droplets
10 GPA minimum
Al nozzles should be used at or near 80 psi



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7. Fill the spray tank with balance of water needed.

BASF
The Chemical Company

Group 14 Herbicide

SPECIMEN

SHARPEN™

POWERED BY KIXOR® HERBICIDE

A broadleaf herbicide for use in the following field and row agricultural crops: chickpea (garbanzo beans), corn (field, pop, silage), cotton, fallow and postharvest, field pea, small grains, sorghum (grain), soybean, sunflower (harvest aid/desiccation only); and noncropland areas

Active Ingredient:

saflufenacil: N'-[2-chloro-4-fluoro-5-(3-methyl-2,6-dioxo-4-(trifluoromethyl)-3,6-dihydro-1(2H)-pyrimidinyl)benzoyl]-N-isopropyl-N-methylsulfamide	29.74%
Other Ingredients:	70.26%
Total:	100.00%

Contains 2.85 pounds active ingredient saflufenacil per gallon formulated as a water-based suspension concentrate.

EPA Reg. No. 7969-278 **EPA Est. No.**

KEEP OUT OF REACH OF CHILDREN

CAUTION/PRECAUCION

Si usted no entiende la etiqueta, busque a alguien para que se la explique a usted en detalle. (If you do not understand the label, find someone to explain it to you in detail.)

See inside for complete **First Aid**, **Precautionary Statements**, **Directions For Use**, **Conditions of Sale and Warranty**, and state-specific crop and/or use site restrictions.

In case of an emergency endangering life or property involving this product, call day or night 1-800-832-HELP (4357).

Net Contents:

BASF Corporation
26 Davis Drive, Research Triangle Park, NC 27709

Mode of Action

Sharpen™ herbicide is a potent inhibitor of protoporphyrinogen-oxidase belonging to herbicide mode of action **Group 14** (WSSA)/**Group E** (HRAC). **Sharpen** is rapidly absorbed by roots and foliage. Following inhibition of protoporphyrinogen-oxidase, plant death is the result of membrane damage. Under active growing conditions, susceptible emerged weeds usually develop chlorotic and necrotic injury symptoms within hours and die within a few days. Susceptible emerging weed seedlings will usually die as they reach the soil surface or shortly after emergence.

Resistance Management

While weed resistance to protoporphyrinogen-oxidase inhibiting herbicides is relatively infrequent, populations of resistant biotypes are known to exist. Resistance management practices include:

1. Following labeled application rate and weed growth stage recommendations
2. Avoiding repeated applications of herbicides with the same mode of action
3. Utilizing tank mixes and sequential applications with other effective herbicides possessing different modes of action
4. Using crop rotation so that crop competition, tillage or herbicides with alternative modes of action can be used to control weed escapes

Crop Tolerance

Crops are tolerant to **Sharpen** when applied according to label directions as a preplant to preemergence treatment and under normal environmental conditions. Crop injury may occur under stressful growing conditions (e.g. low soil fertility, seedling disease, extreme hot or cold weather, excessive moisture, high soil pH, high soil salt concentration, or drought).

Severe crop injury will result if **Sharpen** is applied post-emergence (over the top) to any crop.

Application Instructions

Sharpen may only be applied prior to crop emergence, except for harvest aid/desiccation uses.

Application Rates

Application rates of **Sharpen** may vary depending on soil texture and organic matter. Refer to **Table 3** for soil texture groups used in this label.

Table 3. Soil Texture Groups

Coarse	Medium	Fine
Sand Loamy sand Sandy loam	Silt Silt loam Loam Sandy clay loam	Sandy clay Silty clay Silty clay loam Clay loam Clay

Application Methods and Equipment

Sharpen may be applied by ground or air. Thorough spray coverage is required for optimum broadleaf weed control and can be improved with proper adjuvant, nozzle and spray volume selection.

Use and configure application equipment to provide an adequate spray volume, an accurate and uniform distribution of spray droplets over the treated area, and to avoid spray drift to nontarget areas. Equipment should be adjusted to maintain continuous agitation during spraying with good mechanical or bypass agitation. Avoid overlaps that will increase rates above the use rates specified in this label.

Sharpen may be applied using either water or sprayable fluid nitrogen fertilizer solutions as the spray carrier. Additionally, **Sharpen** may be impregnated on and applied with dry bulk fertilizer.

Aerial Application Requirements

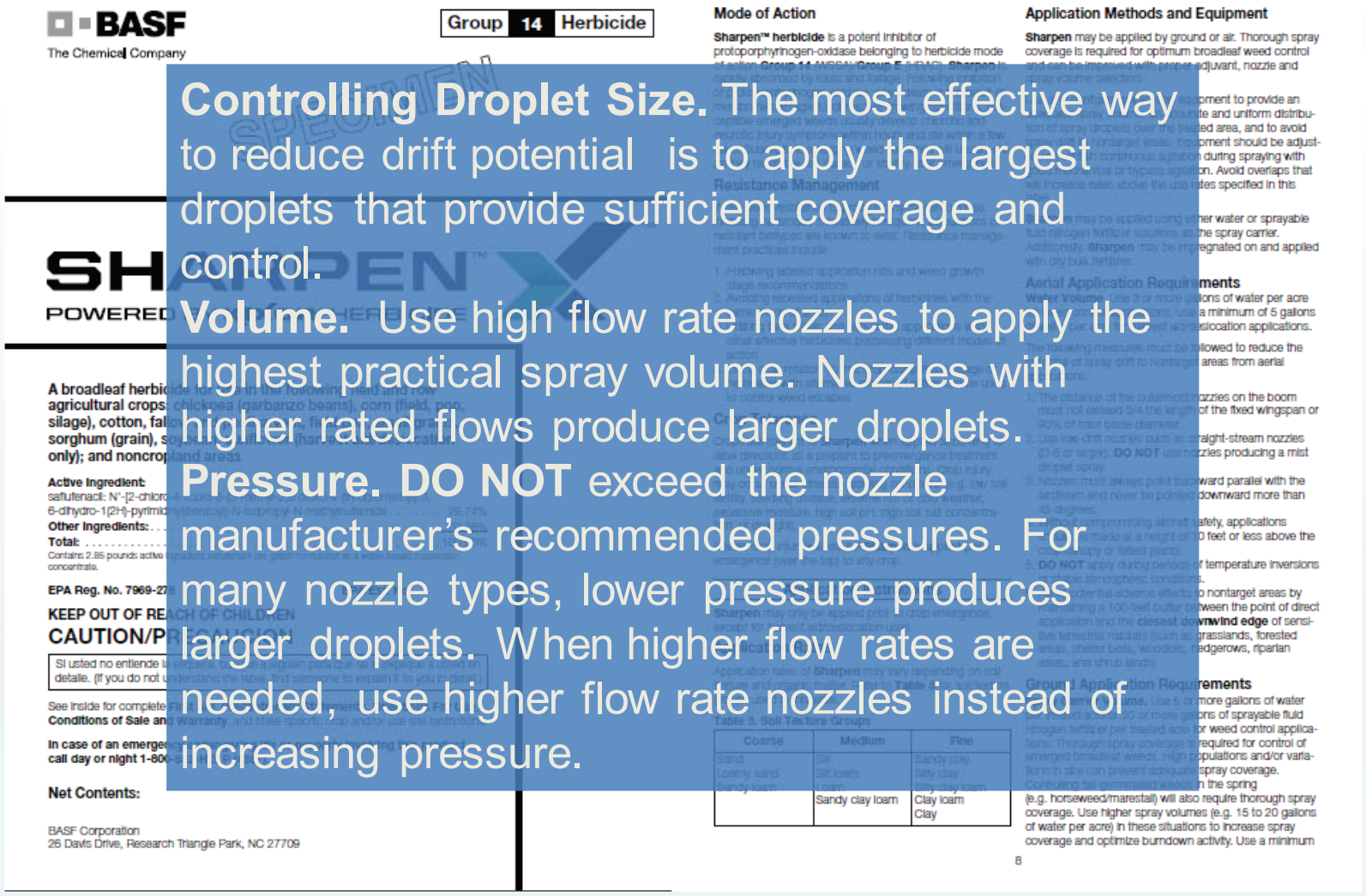
Water Volume. Use 3 or more gallons of water per acre for weed control applications. Use a minimum of 5 gallons of water per acre for harvest aid/desiccation applications.

The following measures must be followed to reduce the potential of spray drift to nontarget areas from aerial applications:

1. The distance of the outermost nozzles on the boom must not exceed 3/4 the length of the fixed wingspan or 90% of rotor blade diameter.
2. Use low-drift nozzles such as straight-stream nozzles (D-8 or larger). **DO NOT** use nozzles producing a mist droplet spray.
3. Nozzles must always point backward parallel with the airstream and never be pointed downward more than 45 degrees.
4. Without compromising aircraft safety, applications should be made at a height of 10 feet or less above the crop canopy or tallest plants.
5. **DO NOT** apply during periods of temperature inversions or stable atmospheric conditions.
6. Avoid potential adverse effects to nontarget areas by maintaining a 100-feet buffer between the point of direct application and the **closest downwind edge** of sensitive terrestrial habitats (such as grasslands, forested areas, shelter belts, woodlots, hedgerows, riparian areas, and shrub lands).

Ground Application Requirements

Spray Carrier Volume. Use 5 or more gallons of water per treated acre or 20 or more gallons of sprayable fluid nitrogen fertilizer per treated acre for weed control applications. Thorough spray coverage is required for control of emerged broadleaf weeds. High populations and/or variations in size can prevent adequate spray coverage. Controlling fall-germinated weeds in the spring (e.g. horseweed/marestail) will also require thorough spray coverage. Use higher spray volumes (e.g. 15 to 20 gallons of water per acre) in these situations to increase spray coverage and optimize burndown activity. Use a minimum



BASF
The Chemical Company

Group 14 Herbicide

SHARPEN™

POWERED

A broadleaf herbic
agricultural crops
silage), cotton, fal
sorghum (grain), s
only); and noncrop

Active Ingredient:
saflufenacil: N'-[2-chlorc
6-dihydro-1(2H)-pyrimic
Other Ingredients:
Total:
Contains 2.85 pounds active
concentrate.

EPA Reg. No. 7969-27

KEEP OUT OF RE
CAUTION/P

Si usted no entiende
detalle. (If you do not

See inside for complete
Conditions of Sale an

In case of an emerge
call day or night 1-80

Net Contents:

BASF Corporation
26 Davis Drive, Research Triangle Park, NC 27709

Controlling Droplet Size. The most effective way to reduce drift potential is to apply the largest droplets that provide sufficient coverage and control.

Volume. Use high flow rate nozzles to apply the highest practical spray volume. Nozzles with higher rated flows produce larger droplets.

Pressure. DO NOT exceed the nozzle manufacturer's recommended pressures. For many nozzle types, lower pressure produces larger droplets. When higher flow rates are needed, use higher flow rate nozzles instead of increasing pressure.

Mode of Action

Sharpen™ herbicide is a potent inhibitor of protoporphyrinogen-oxidase belonging to herbicide mode

Resistance Management

1. Following labeled application rate and weed growth

Application rates of **Sharpen** may vary depending on soil

Table 3. Soil Texture Groups

Coarse	Medium	Fine
Sand	Silt	Sandy clay
Loamy sand	Silt loam	Silty clay
Sandy loam	Loam	Clay loam
	Sandy clay loam	Clay loam Clay

Application Methods and Equipment

Sharpen may be applied by ground or air. Thorough spray coverage is required for optimum broadleaf weed control

Aerial Application Requirements

Water Volume. Use 3 or more gallons of water per acre

(e.g. horseweed/marestail) will also require thorough spray coverage. Use higher spray volumes (e.g. 15 to 20 gallons of water per acre) in these situations to increase spray coverage and optimize burndown activity. Use a minimum

8

BASF
The Chemical Company

Group 14 Herbicide

SPECIMEN

Medium to Coarse Spray Droplets
10 MPH Winds or Less
50’ Set back from the Downwind Edge of Susceptible Species

A broadleaf herbicide for use in the following field and row agricultural crops: chickpea (garbanzo beans), corn (field, pop, silage), cotton, fallow and postharvest, field pea, small grains, sorghum (grain), soybean, sunflower (harvest aid/desiccation only); and noncropland areas

Active Ingredient:

saflufenacil: N'-[2-chloro-4-fluoro-5-(3-methyl-2,6-dioxo-4-(trifluoromethyl)-3,6-dihydro-1(2H)-pyrimidinyl)benzoyl]-N-isopropyl-N-methylsulfamide	29.74%
Other Ingredients:	70.26%
Total:	100.00%

Contains 2.85 pounds active ingredient saflufenacil per gallon formulated as a water-based suspension concentrate.

EPA Reg. No. 7969-278 **EPA Est. No.**

KEEP OUT OF REACH OF CHILDREN

CAUTION/PRECAUCION

Si usted no entiende la etiqueta, busque a alguien para que se la explique a usted en detalle. (If you do not understand the label, find someone to explain it to you in detail.)

See inside for complete **First Aid**, **Precautionary Statements**, **Directions For Use**, **Conditions of Sale and Warranty**, and state-specific crop and/or use site restrictions.

In case of an emergency endangering life or property involving this product, call day or night 1-800-832-HELP (4357).

Net Contents:

BASF Corporation
26 Davis Drive, Research Triangle Park, NC 27709

Mode of Action

Sharpen™ herbicide is a potent inhibitor of protoporphyrinogen-oxidase belonging to herbicide mode of action **Group 14** (WSSA)/**Group E** (HRAC). **Sharpen** is rapidly absorbed by roots and foliage. Following inhibition of protoporphyrinogen-oxidase, plant death is the result of membrane damage. Under active growing conditions, susceptible emerged weeds usually develop chlorotic and necrotic injury symptoms within hours and die within a few days. Susceptible emerging weed seedlings will usually die as they reach the soil surface or shortly after emergence.

Resistance Management

to control weed escapes

Crop Tolerance

Crops are tolerant to **Sharpen** when applied according to label directions as a preplant to preemergence treatment and under normal environmental conditions. Crop injury may occur under stressful growing conditions (e.g. low soil fertility, seedling disease, extreme hot or cold weather, excessive moisture, high soil pH, high soil salt concentration, or drought).

Severe crop injury will result if **Sharpen** is applied post-emergence (over the top) to any crop.

Application Instructions

Sharpen may only be applied prior to crop emergence, except for harvest aid/desiccation uses.

Application Rates

Application rates of **Sharpen** may vary depending on soil texture and organic matter. Refer to **Table 3** for soil texture groups used in this label.

Table 3. Soil Texture Groups

Coarse	Medium	Fine
Sand Loamy sand Sandy loam	Silt Silt loam Loam Sandy clay loam	Sandy clay Silty clay Silty clay loam Clay loam Clay

Application Methods and Equipment

Sharpen may be applied by ground or air. Thorough spray coverage is required for optimum broadleaf weed control and can be improved with proper adjuvant, nozzle and spray volume selection.

Use and configure application equipment to provide an adequate spray volume, an accurate and uniform distribution of spray droplets over the treated area, and to avoid spray drift to nontarget areas. Equipment should be adjusted to maintain continuous agitation during spraying with good mechanical or bypass agitation. Avoid overlaps that will increase rates above the use rates specified in this label.

Sharpen may be applied using either water or sprayable fluid nitrogen fertilizer solutions as the spray carrier. Additionally, **Sharpen** may be impregnated on and applied with dry bulk fertilizer.

Aerial Application Requirements

Water Volume. Use 3 or more gallons of water per acre for weed control applications. Use a minimum of 5 gallons of water per acre for harvest aid/desiccation applications.

1. The distance of the outermost nozzles on the boom must not exceed 3/4 the length of the fixed wingspan or 90% of rotor blade diameter.
2. Use low-drift nozzles such as straight-stream nozzles (D-8 or larger). **DO NOT** use nozzles producing a mist droplet spray.
3. Nozzles must always point backward parallel with the airstream and never be pointed downward more than 45 degrees.
4. Without compromising aircraft safety, applications should be made at a height of 10 feet or less above the crop canopy or tallest plants.
5. **DO NOT** apply during periods of temperature inversions or stable atmospheric conditions.
6. Avoid potential adverse effects to nontarget areas by maintaining a 100-feet buffer between the point of direct application and the **closest downwind edge** of sensitive terrestrial habitats (such as grasslands, forested areas, shelter belts, woodlots, hedgerows, riparian areas, and shrub lands).

Ground Application Requirements

Spray Carrier Volume. Use 5 or more gallons of water per treated acre or 20 or more gallons of sprayable fluid nitrogen fertilizer per treated acre for weed control applications. Thorough spray coverage is required for control of emerged broadleaf weeds. High populations and/or variations in size can prevent adequate spray coverage. Controlling fall-germinated weeds in the spring (e.g. horseweed/marestail) will also require thorough spray coverage. Use higher spray volumes (e.g. 15 to 20 gallons of water per acre) in these situations to increase spray coverage and optimize burndown activity. Use a minimum

Aim® EW

HERBICIDE

For Agricultural or Commercial Use Only
NOT FOR SALE OR USE IN CALIFORNIA

EPA Reg. No. 279-3242 EPA Est. 279-

Active Ingredient:	By Wt.
Carfentrazone-ethyl	21.3%
Other Ingredients:	78.7%
	100.0%

This product contains 1.9 pounds active ingredient per gallon.
Contains Petroleum Distillates

KEEP OUT OF REACH OF CHILDREN

CAUTION

FIRST AID

If Inhaled: Move person to fresh air. If person is not breathing, call 911 or an ambulance, then give artificial respiration, preferably by mouth-to-mouth, if possible. Call a poison control center or doctor for further treatment advice.
If on Skin or Clothing: Take off contaminated clothing. Rinse skin immediately with plenty of water for 15 to 20 minutes. Call a poison control center or doctor for treatment advice.
If In Eyes: Hold eye open and rinse slowly and gently with water for 15 to 20 minutes. Remove contact lenses, if present, after the first 5 minutes, then continue rinsing eye. Call a poison control center or doctor for treatment advice.
If Swallowed: Call a poison control center or doctor immediately for treatment advice. Have person sip a glass of water if able to swallow. Do not induce vomiting unless told to do so by the poison control center or doctor. Do not give anything by mouth to an unconscious person.

HOTLINE NUMBER

Have the product container or label with you when calling a poison control center or doctor, or going for treatment. You may also contact 1-800-331-3148 for emergency medical treatment information.
Note to Physician: Carfentrazone-ethyl is expected to have low oral and dermal toxicity, and moderate inhalation toxicity. It is expected to be slightly irritating to the skin and minimally irritating to the eyes. Treatment is otherwise controlled removal of exposure followed by symptomatic and supportive care.

See other panels for additional precautionary information.

ACTIVE INGREDIENT MADE IN CHINA, FORMULATED AND PACKAGED IN USA.

FMC

FMC Corporation
Agricultural Products Group
Philadelphia, PA 19103
Aim EW_3_10-05-05(Field-C)

PRECAUTIONARY STATEMENTS

Hazards to Humans (and Domestic Animals)

Caution
Harmful if swallowed, absorbed through the skin or inhaled. Causes moderate eye irritation. Avoid breathing vapors. Avoid contact with eyes, skin or clothing. Wash thoroughly with soap and water after handling.
Personal Protective Equipment (PPE)
Applicators and other handlers must wear: long-sleeved shirt and long pants, waterproof gloves, and shoes plus socks.

Discard clothing and other absorbent materials that have been drenched or heavily contaminated with this product. Do not reuse them. Follow manufacturer's instructions for cleaning/maintaining PPE. If no such instructions for washables, use detergent and hot water. Keep and wash PPE separately from other laundry.

User Safety Recommendations:
Users should:
• Remove clothing immediately if pesticide gets inside. Then wash thoroughly and put on clean clothing.

Environmental Hazards

Carfentrazone-ethyl is very toxic to algae and moderately toxic to fish. Do not apply directly to water, to areas where surface water is present or to intertidal areas below the high water mark, except as specified on this label. Do not contaminate water when disposing of equipment wash waters.

Physical/Chemical Hazards

Do not use or store near heat or open flame.

TABLE OF CONTENTS

Avoid the overnight storage of Aim EW spray mixtures.

Premixing Aim EW spray solutions in nurse tanks is not recommended.

Maintain continuous and adequate spray solution agitation until all the spray solution has been used.

Do not use with tank additives that alter the pH of the spray solution below pH 5 or above pH 8. Buffer spray solution to alter the pH range as appropriate.

Spray Equipment Clean-Out

Many new pesticides are very active at low rates, especially to sensitive crops. Residues left in mixing equipment, spray tanks, hoses, spray booms and nozzles can cause crop effects if they are not properly cleaned. As soon as possible after spraying Aim EW and before using the sprayer equipment for any other applications, the sprayer equipment must be thoroughly cleaned using the following procedure. In addition, users must take appropriate steps to ensure proper equipment clean-out for any other products mixed with Aim EW as required on the other product labels. More complete cleaning can be achieved if the spray system is cleaned immediately following the application.

1. Drain sprayer tank, hoses, spray boom and spray nozzles. Use a high-pressure detergent wash to remove physical sediment and residues from the inside of the sprayer tank and thoroughly rinse. Then, thoroughly flush sprayer hoses, spray boom and spray nozzles with a clean water rinse. Remove and clean spray tips and all filters and screens (tank, spray hose and spray tips) separately in the ammonia solution of Step 2.

2. Next, prepare a sprayer cleaning solution by adding three gallons of ammonia (containing at least 3% active) per 100 gallons of clean water. Prepare sufficient cleaning solution to allow the operation of the spray system for a minimum of 15 minutes to thoroughly flush hoses, spray boom and spray nozzles.

3. Convenient and thorough cleaning of the sprayer can be achieved if the ammonia solution or fresh water is left in the spray tank, hoses, spray booms and spray nozzles overnight or during storage.

4. Before using the sprayer, completely drain the sprayer system. Rinse the tank with clean water and flush through the hoses, spray boom, and spray nozzles with clean water. Remove and clean spray tips and all filters and screens (tank, spray hose and spray tip) separately in an ammonia solution.

5. Properly dispose of all cleaning solution and rinsate in accordance with Federal, State, and local regulations and guidelines.

Do not apply sprayer cleaning solutions or rinsate to sensitive crops.

Do not store the sprayer overnight or for any extended period of time with Aim EW spray solution remaining in the tank, spray lines, spray boom plumbing, spray nozzles or strainers.

If the sprayer has been stored or idle, purge the spray boom and nozzles with clean water before beginning any application.

Should small quantities of Aim EW remain in inadequately cleaned mixing, loading and/or spray equipment, they may be released during subsequent applications potentially causing effects to certain crops and other vegetation. FMC accepts no liability for any effects due to inadequately cleaned equipment.

APPLICATION INFORMATION

GROUND APPLICATION

Use ground sprayers designed, calibrated and operated to deliver uniform spray droplets to the targeted plant or plant parts. Adjust sprayer nozzles to achieve uniform plant coverage. Overlaps and slower ground speeds (caused by continuing to spray while starting, stopping or turning) may result in higher application rates and possible crop response.
Spray Buffer for Ground Application

Spray buffer zones for ground applications, listed in chart below, are required where local indigenous endangered plant species are found.

Buffers to Indigenous Endangered Plant Species		
AIM USE RATE (lbs. ai per acre)	Low Spray Boom Buffer (ft.)	High Spray Boom Buffer (ft.)
0.024	20	33
0.031	26	46

Conventional Boom and Nozzle Sprayers
Use a boom and nozzle sprayer equipped with the appropriate nozzles, spray tips and screens and adjusted to provide optimum spray distribution and coverage at the appropriate operating pressures. Use nozzles that produce minimal amounts of fine spray droplets. Do not exceed 30 psi spray pressure unless otherwise required by the manufacturer of drift reducing nozzles. Apply a minimum of 10 gallons of finished spray per acre. Use higher spray volumes when there is a dense weed population or crop canopy. Adjust sprayers to position spray tips no lower than 18 inches above the crop. Operate the sprayer to avoid the application of high herbicide rates directly over the rows and/or into the whorl of treated crop plants.

Directed Sprayers
Aim EW may be applied with drop nozzles or other spray equipment capable of directing the spray to the target weeds and away from sensitive plant parts. Aim EW may be applied up to the maximum rate for the target crop for the control of larger weed sizes or weeds not controlled with lower use rates. Use appropriate rates of adjuvants such as nonionic surfactants, crop oil concentrates or methylated seed oils.

Hooded Sprayers
Hooded sprayers may be used to apply Aim EW. Refer to the Hooded Sprayer Section on page 6 for specific adjustment and operation instructions. For additional information, refer to the individual crop sections of this label.

AERIAL APPLICATION

Use nozzle types and arrangements that will provide optimum coverage while producing a minimal amount of fine droplets. Apply at a minimum of 3 gallons of finished spray per acre. Higher aerial spray volumes are required for harvest aid and defoliation treatments. Higher spray volumes are required when there is a dense weed population or crop canopy.

SPRAY DRIFT MANAGEMENT

AVOIDING SPRAY DRIFT AT THE APPLICATION SITE IS THE RESPONSIBILITY OF THE APPLICATOR AND THE GROWER.

The interaction of many equipment and weather related factors determine the potential for spray drift. The applicator and the grower are responsible for considering all these factors when making decisions.

The following drift management requirements must be followed to avoid off-target movement from applications to agricultural field crops. These requirements do not apply to forestry applications, public health uses or to applications of dry materials.

Where states have more stringent regulations, they must be observed.

INFORMATION ON DROPLET SIZE

The most effective way to reduce drift potential is to apply large droplets. The optimum drift management strategy is to apply the largest droplets that provide sufficient coverage and control. Applying larger droplets reduces drift potential, but will not prevent drift when applications are made improperly, or under unfavorable environmental conditions (See Wind, Temperature and Humidity, and Temperature Inversions).

Controlling Spray Droplet Size

VMD – VMD is the expression of the droplet size of the spray cloud. The VMD value means that 50% of the droplets are larger than the expressed value and 50% of the droplets are smaller than the expressed value. Optimum Aim EW spray clouds should be 450 microns with fewer than 10% of the droplets being 200 microns or less.

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EPA Reg. No. 279-3242 EPA Est. 279-

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Agricultural Products Group
Philadelphia, PA 19103
Aim EW_3_10-05-05(Field-C)

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Caution
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Equipment is not getting smaller!

2014

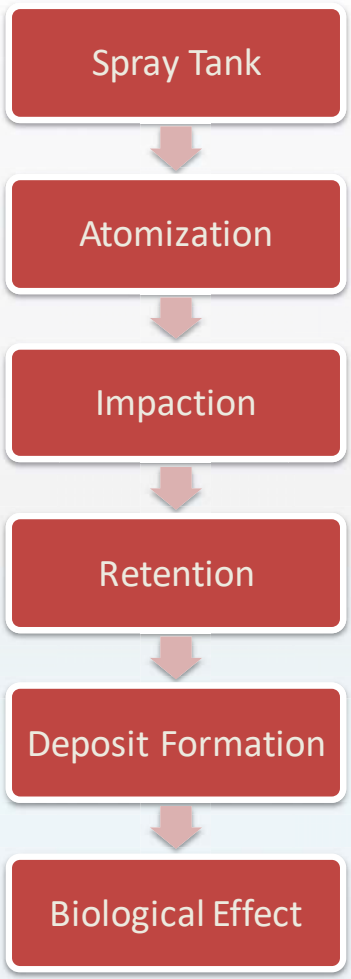
Future?

Courtesy of Dr. Joe Luck

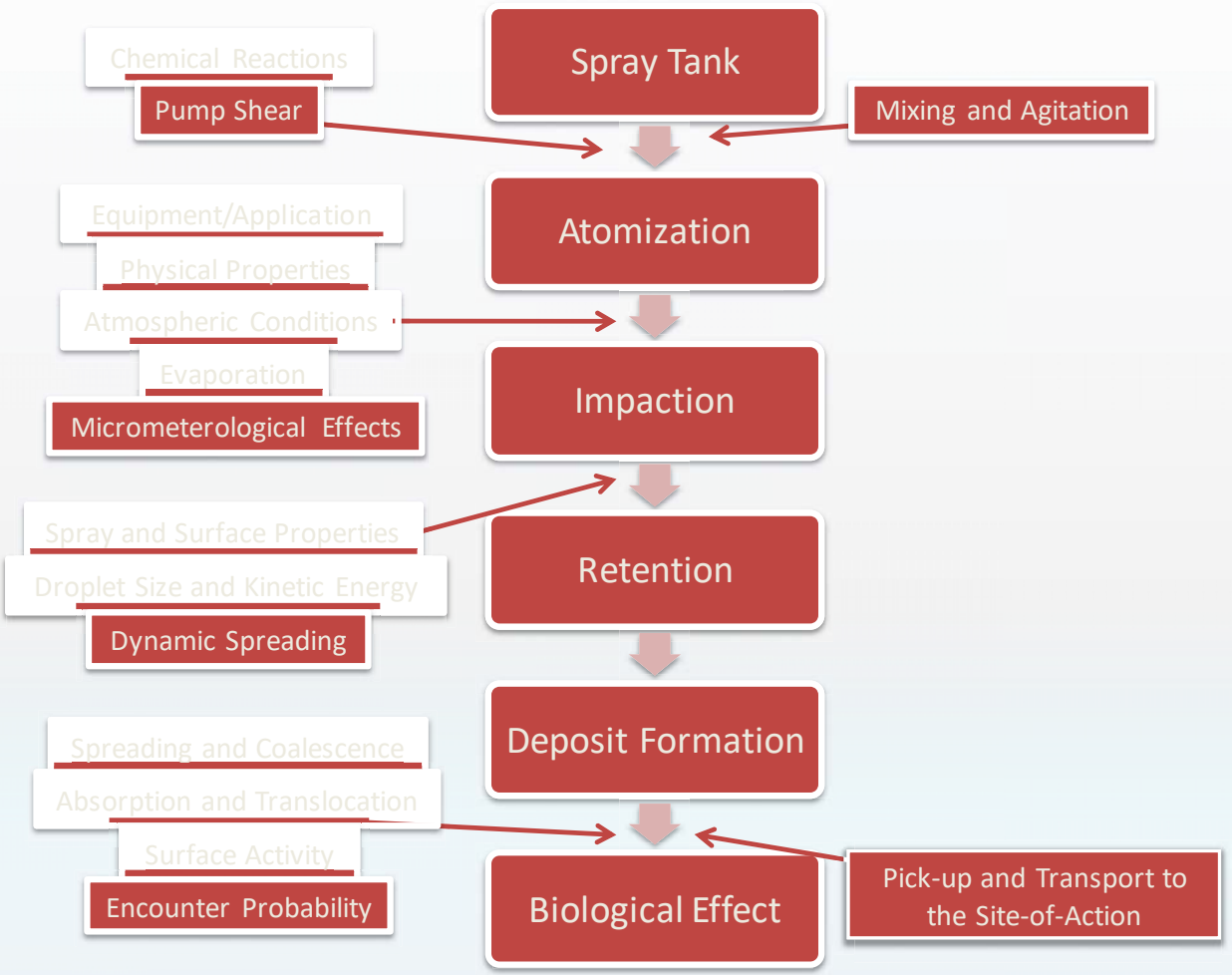
Equipment is not getting less sophisticated!

The Pesticide Application

Process for Pesticide Efficacy



Ebert et al. 1999



Ebert et al. 1999

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The Pesticide Application

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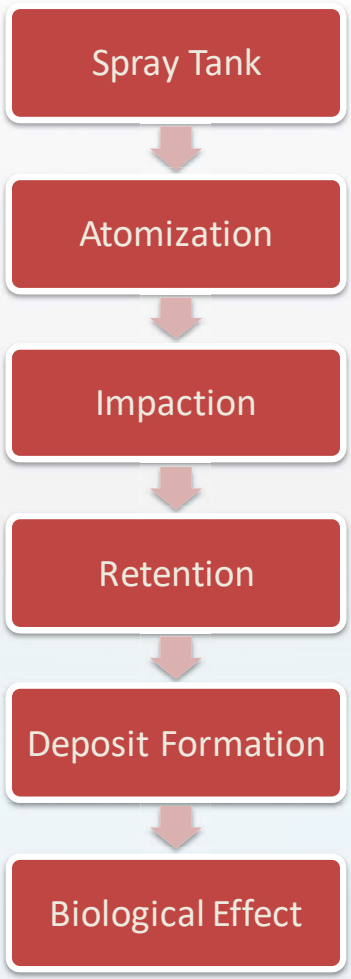

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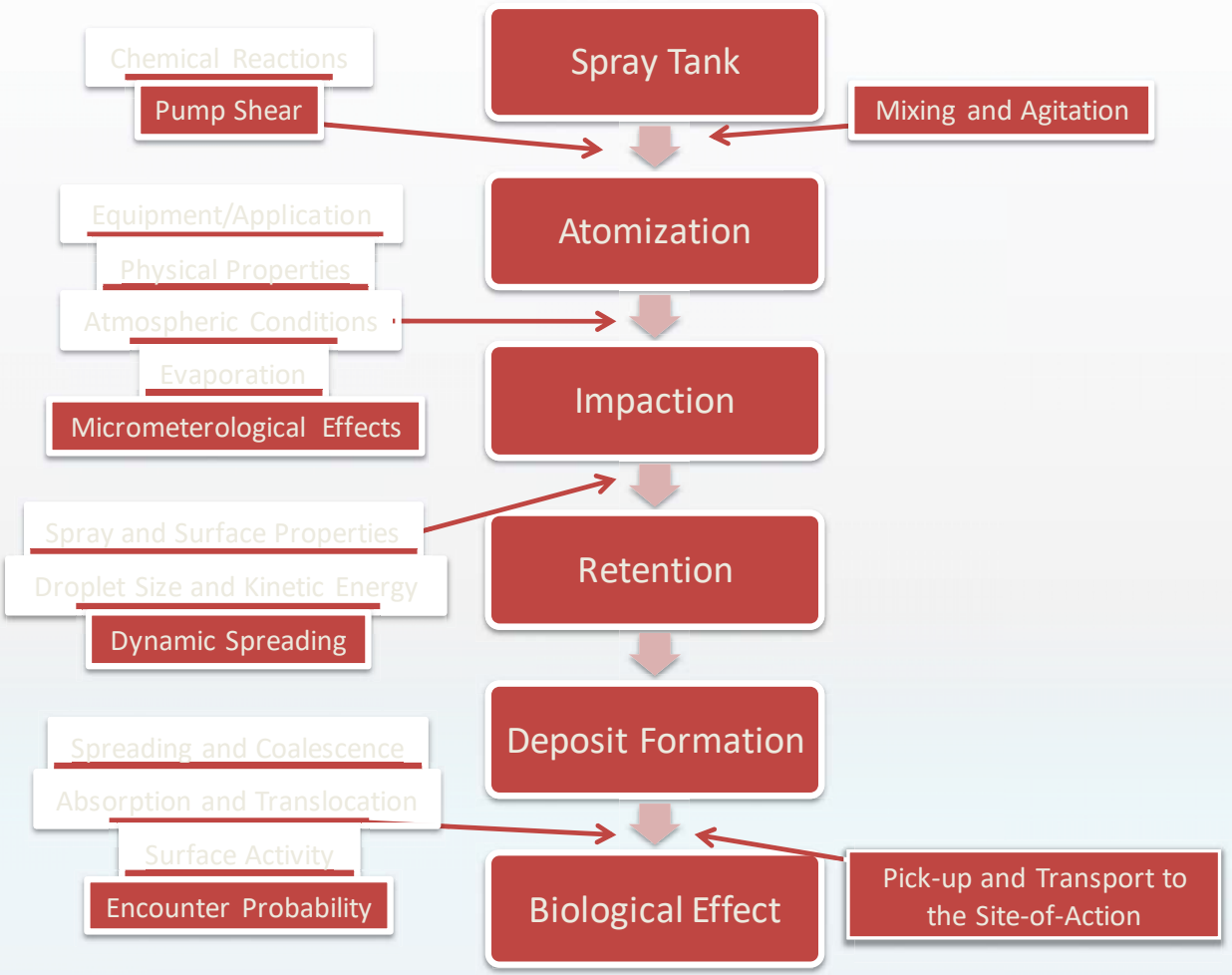

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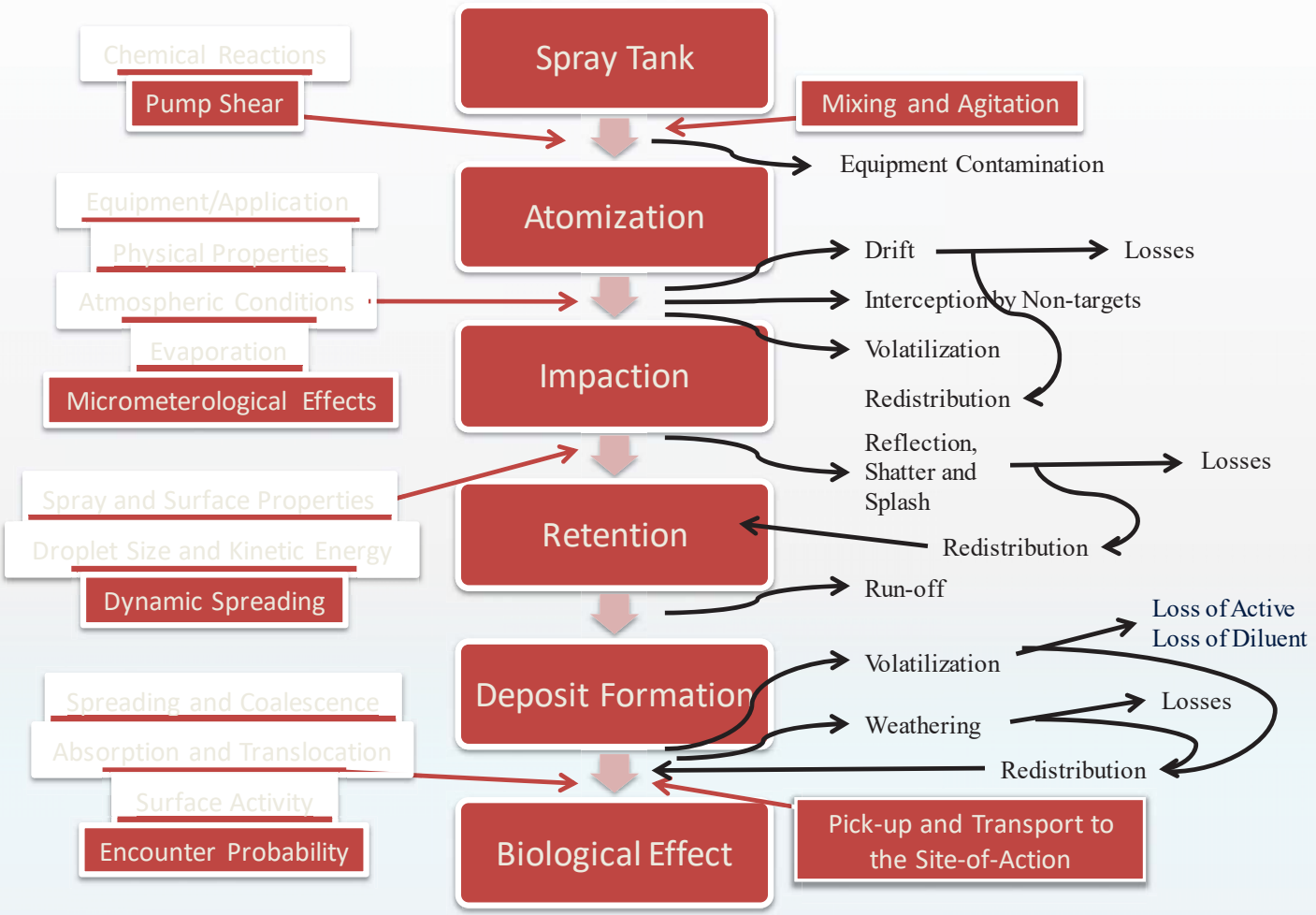

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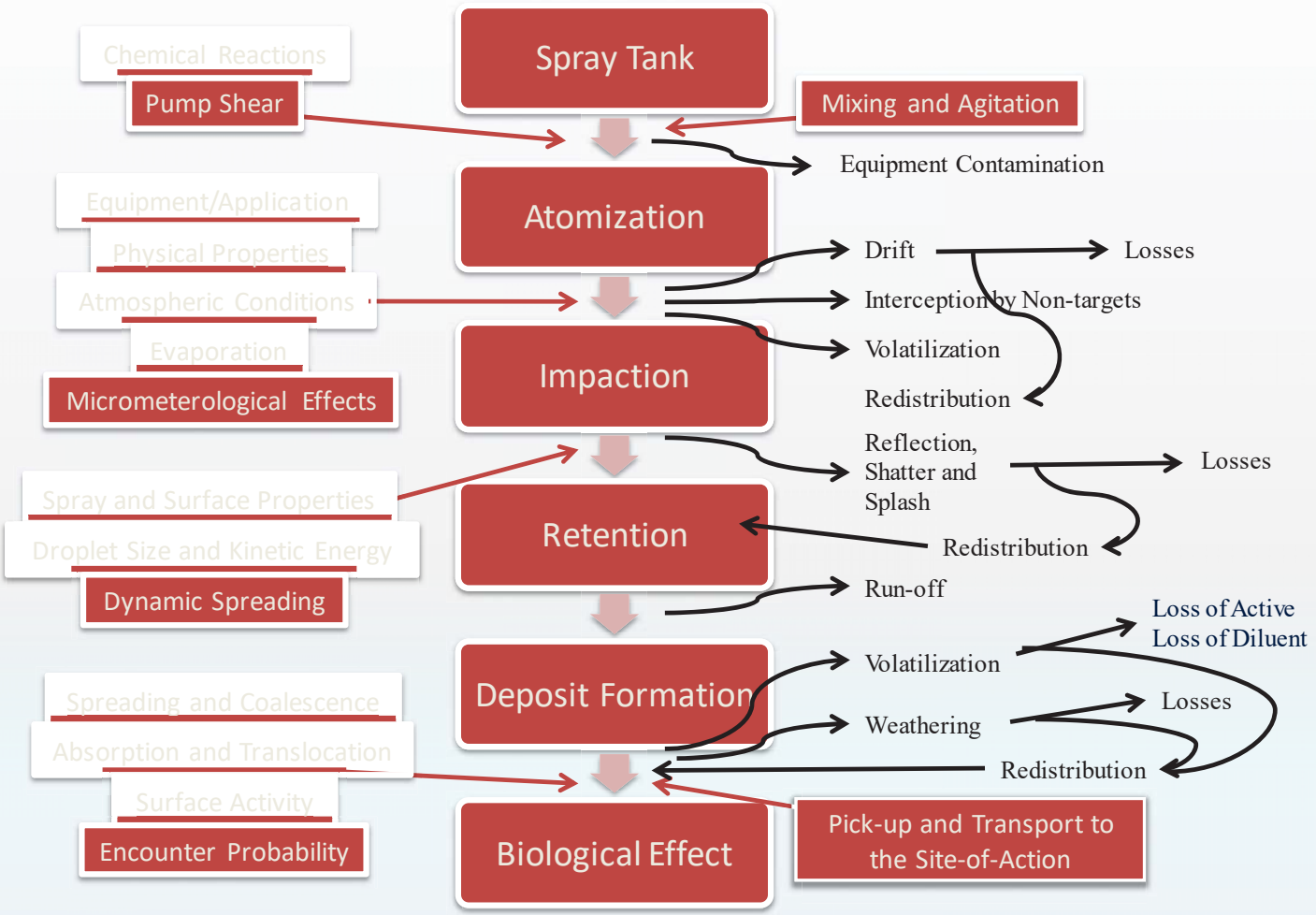


Ebert et al. 1999

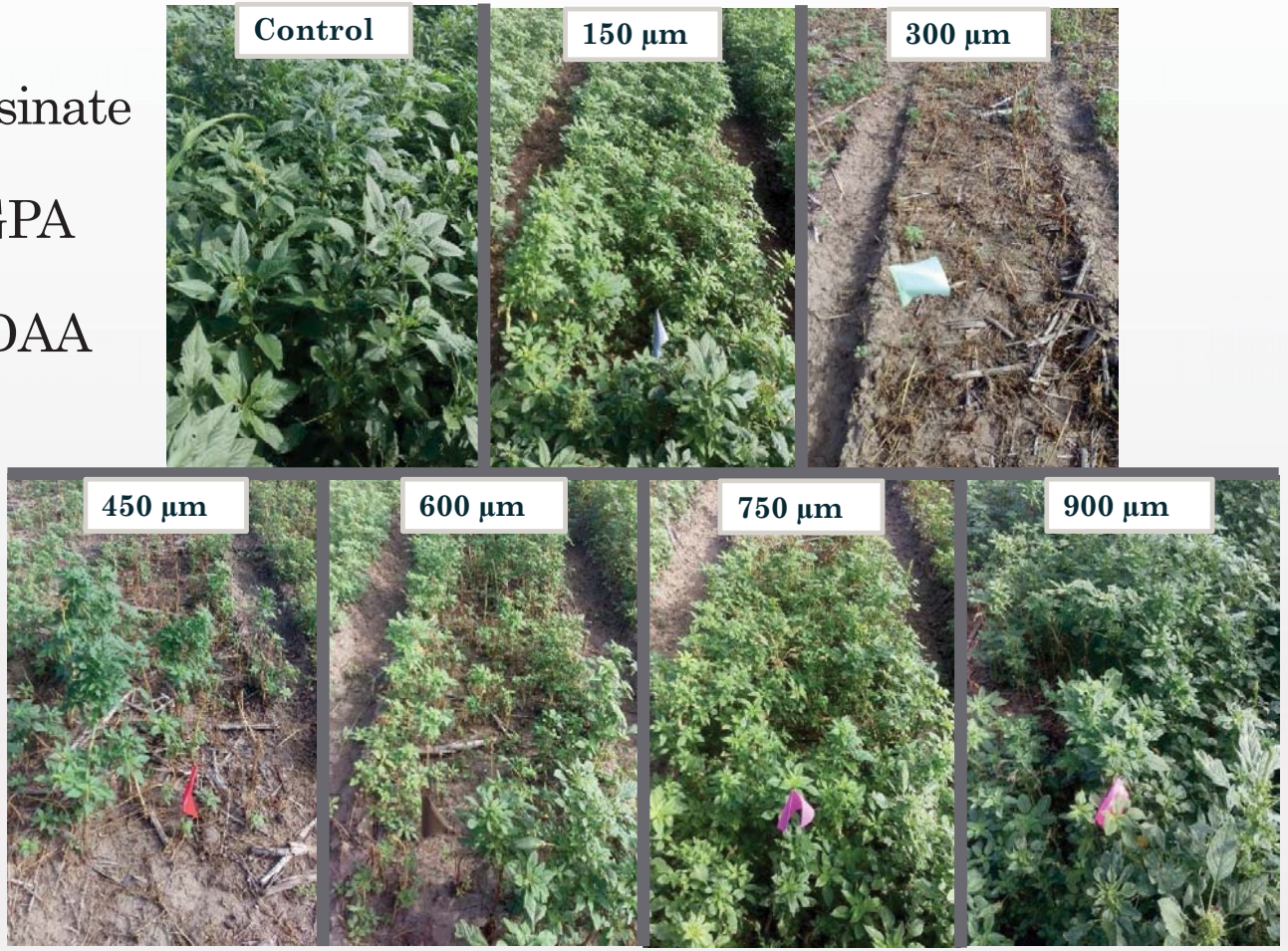
			Herbicide		Fungicide		Insecticide		
	Incorporated	Pre-Emergence	Contact	Systemic	Contact	Systemic	Contact	Systemic	Liquid Fertilizer
Turbo TeeJet	Good	Good	Good	Good+	Good	Good+	Good	Good+	Good
Air Induction	Good+	Good+	Good	Good+	Good	Good+	Good	Good+	Good+
Extended Range flat fan	-	-	Good+	Good	Good+	Good	Good+	Good	Good
Pre-orifice flat fan	Good+	Good+	Good	Good+	Good	Good+	Good	Good+	Good
Standard flat fan	-	-	Good	Good	Good	Good	Good	Good	-
Twin orifice flat fan	-	-	Good+	-	Good+	-	Good+	-	-
Turbo Flood Jet	Good+	Good+	-	Good	-	Good	-	Good	Good+
TurfJet	Good+	Good+	-	Good	-	Good	-	Good	Good+
Solid Cone	-	-	-	Good	-	Good	-	Good	Good+

Pgs. 2-3

Glufosinate

5 GPA

14 DAA



Dicamba

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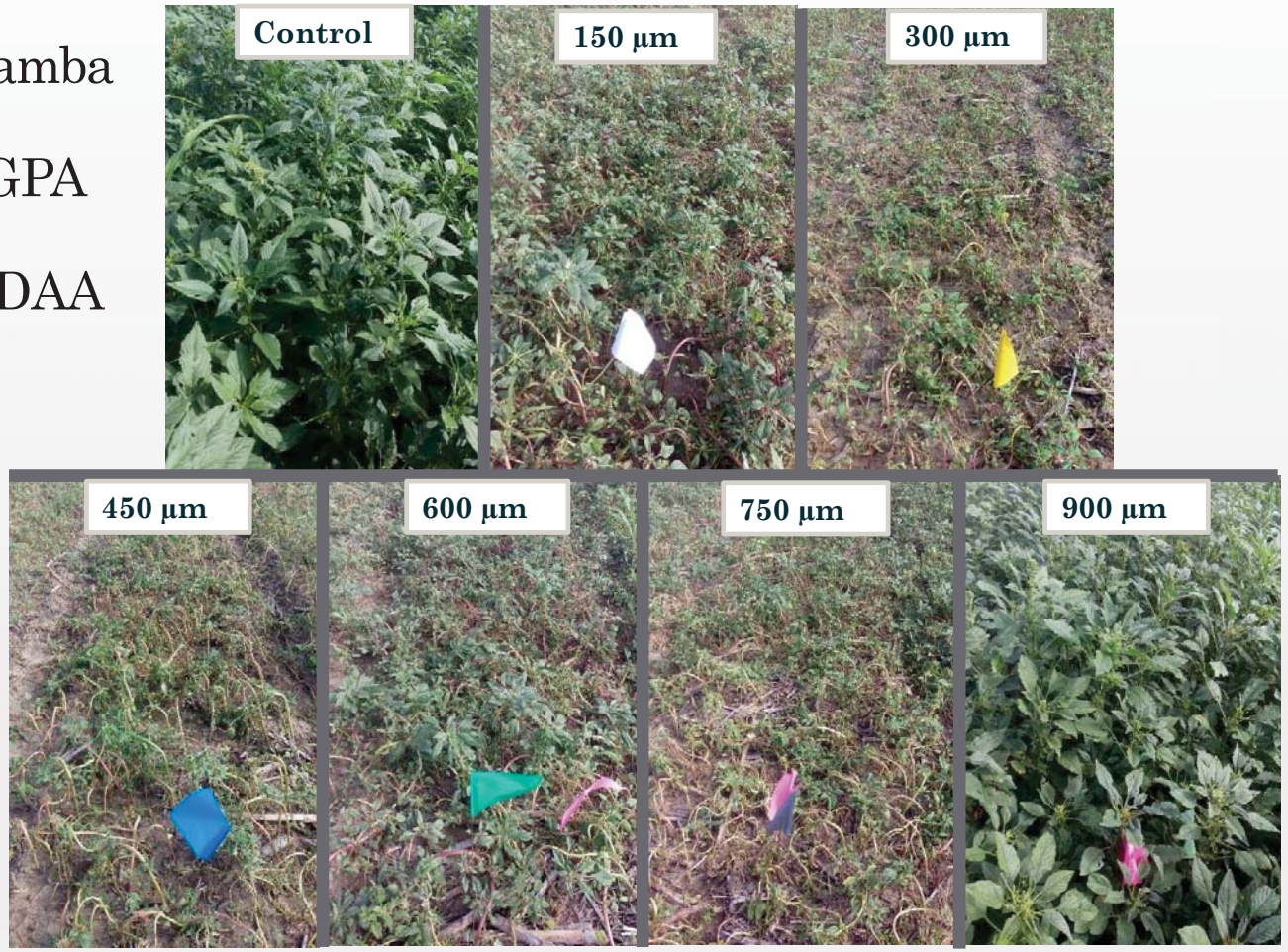
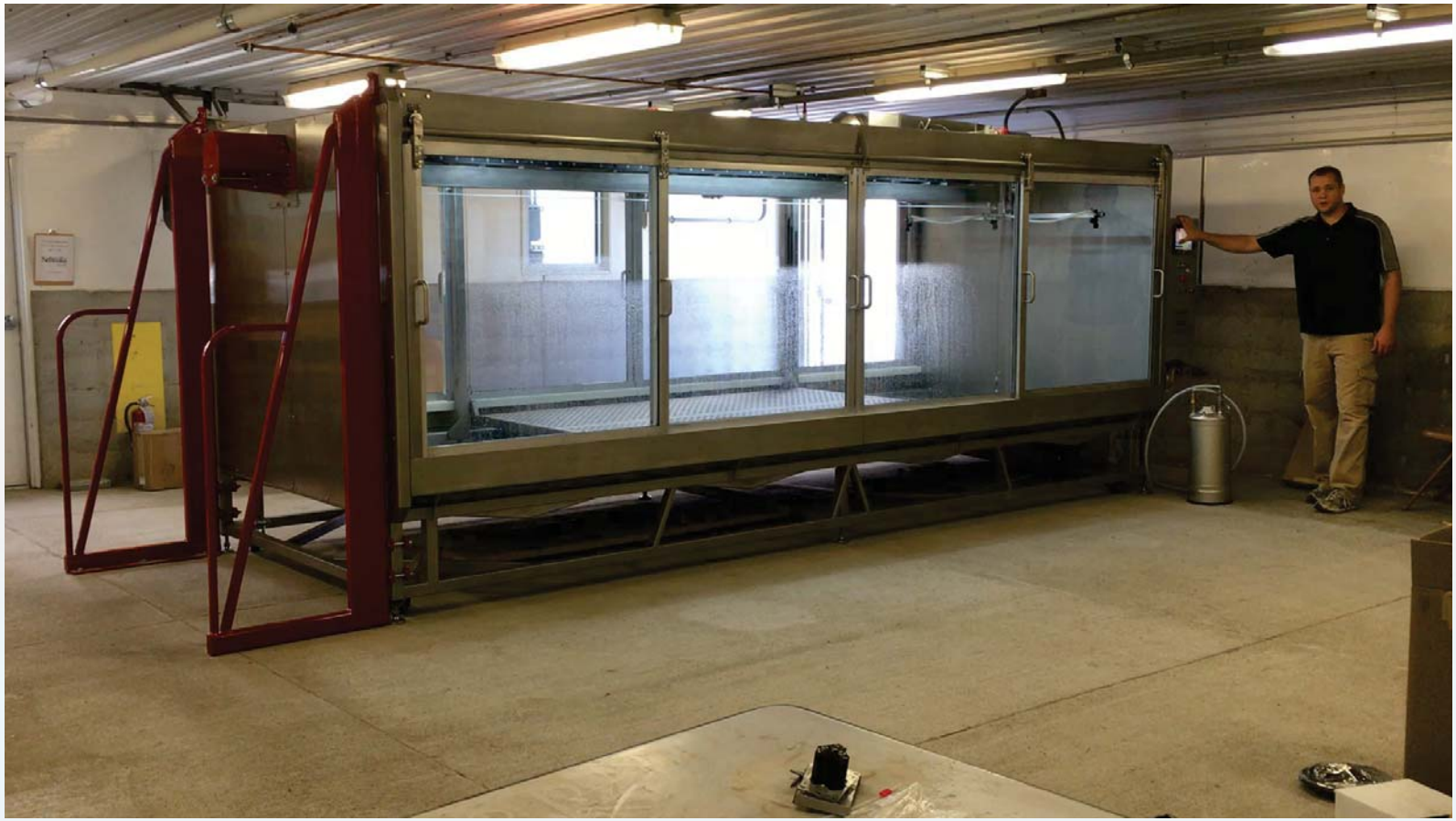
14 DAA



Take Home Messages!

- Particle drift can be influenced by formulation
- Nozzle selection has the greatest influence on particle size
- Adjuvants can reduce drift potential, but must be tested
- There is no substitute for common sense – if the wind is blowing droplets will move
- Pay attention to sensitive vegetation in surrounding areas
- Drift **WILL** happen! Mitigating drift is essential!

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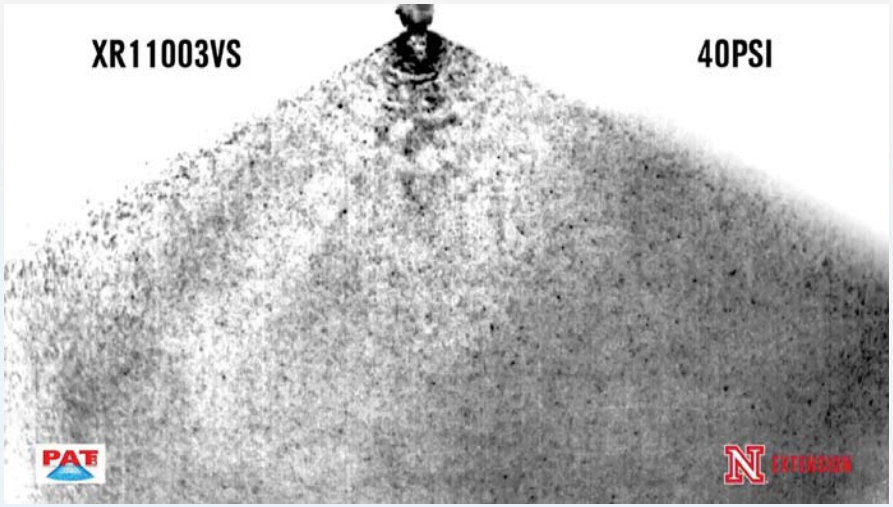
ZOOM AUTO
ZOOM OUT
ZOOM IN
PAN AUTO
RESTRICTED

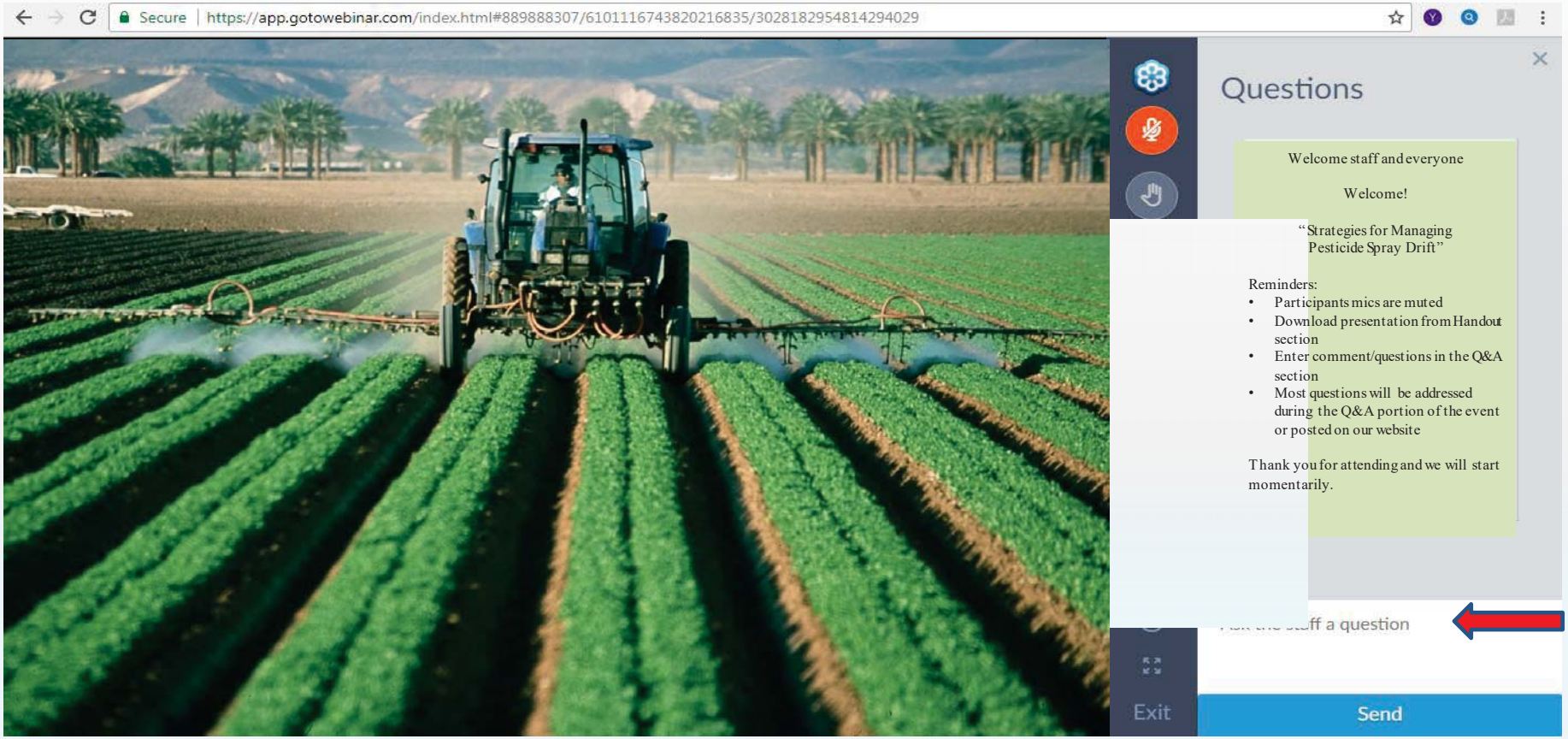
Questions?

- Greg Kruger
  - Cropping Systems Specialist
  - West Central Research and Extension Center
  - North Platte, NE
  - Website: pat.unl.edu
  - gkruger2@unl.edu
  - (308)696-6715

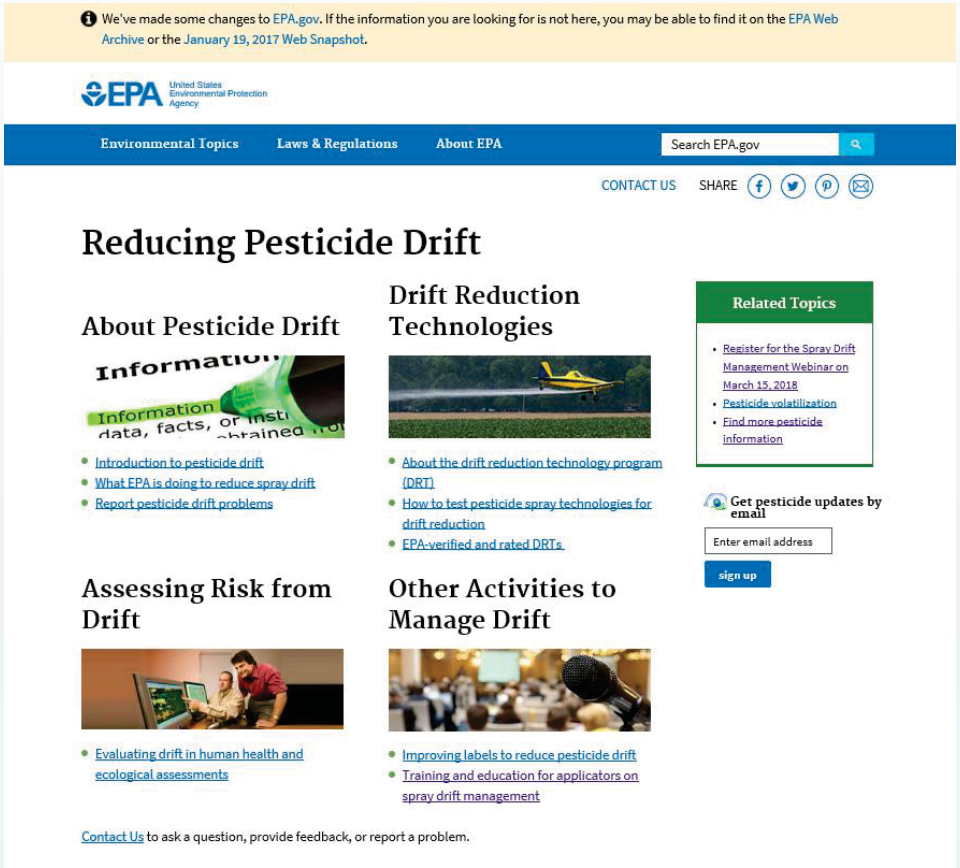
- Thank You!



Submit Your Questions



View Recorded Webinar



https://www.epa.gov/reducing-pesticide-drift

CERTIFICATE Of PARTICIPATION

This is to certify the above participant attended the 90-minute webinar entitled

Strategies for Managing Pesticide Spray Drift

PRESENTED BY: **EPA's Office of Pesticide Programs (OPP)**

ON THIS DAY: **March 15, 2018**


why
when
who
where
what
why
QUESTIONS
who
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when
EPA