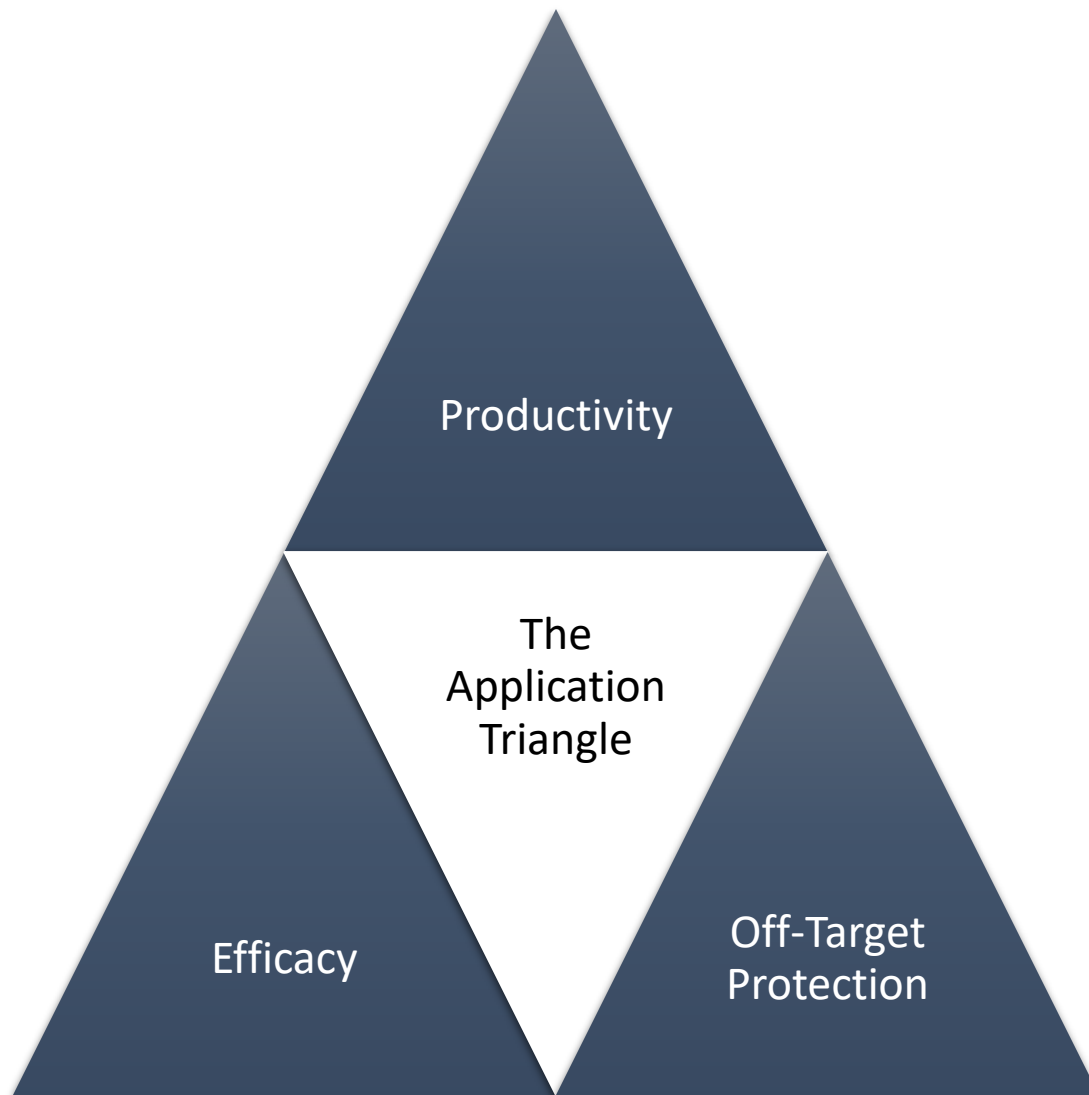


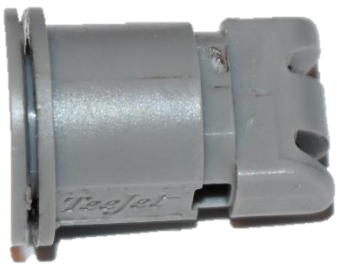
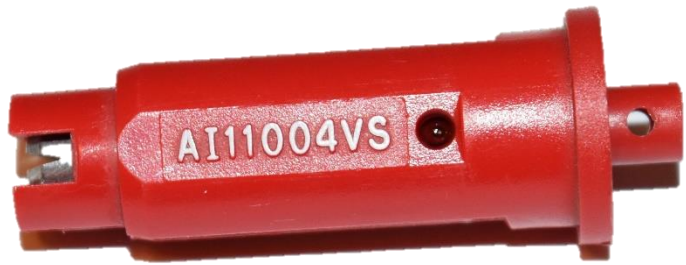
# Fundamentals of Sprayer Nozzles & Drift Control

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# Nozzles are important because...

1. Control the application amount (GPA)
2. Determine application uniformity
3. Affect coverage
4. Influence the drift potential

# Nozzles...



1. Control the application amount (GPA)

# Spray Equipment Calibration

- Calculation Method



- Select the proper nozzle to buy/use
- Known Ground Speed (MPH)

- Timing Method



- Shortcut for already purchased nozzle
- Desired Gear and Throttle (RPM)

# Calculation Method



1. Select and set our ground speed using GPS, Speedometer or Timing
  - 8 MPH
2. Determine our Application Rate
  - Roundup Pro Concentrate Label – 10-40 GPA
3. Measure Nozzle Spacing
4. Calculate the Gallons per Minute (GPM) output of each nozzle

# Calculation Method



$$GPM = \frac{MPH \times GPA \times Nozzle\_Spacing(in)}{5940}$$

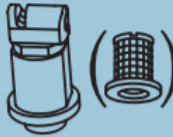

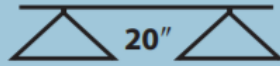
$$GPM = \frac{8(mph) \times 15\left(\frac{gal}{acre}\right) \times 20(in)}{5940}$$

$$= 0.40 \text{ gallons/minute}$$

$$128 \text{ fl. oz.} = 1 \text{ gallon}$$

$$= 51.7 \text{ fluid ounces/minute}$$



	 PSI	DROP SIZE	CAPACITY ONE NOZZLE IN GPM	CAPACITY ONE NOZZLE IN OZ./MIN.	 20"							
					GPA							
					4 MPH	5 MPH	6 MPH	8 MPH	10 MPH	12 MPH	15 MPH	20 MPH
TTI11003 (50)	15	UC	0.18	23	13.4	10.7	8.9	6.7	5.3	4.5	3.6	2.7
	20	UC	0.21	27	15.6	12.5	10.4	7.8	6.2	5.2	4.2	3.1
	30	UC	0.26	33	19.3	15.4	12.9	9.7	7.7	6.4	5.1	3.9
	40	UC	0.30	38	22	17.8	14.9	11.1	8.9	7.4	5.9	4.5
	50	UC	0.34	44	25	20	16.8	12.6	10.1	8.4	6.7	5.0
	60	UC	0.37	47	27	22	18.3	13.7	11.0	9.2	7.3	5.5
	70	XC	0.40	51	30	24	19.8	14.9	11.9	9.9	7.9	5.9
	80	XC	0.42	54	31	25	21	15.6	12.5	10.4	8.3	6.2
	90	XC	0.45	58	33	27	22	16.7	13.4	11.1	8.9	6.7
	100	XC	0.47	60	35	28	23	17.4	14.0	11.6	9.3	7.0
TTI11004 (50)	15	UC	0.24	31	17.8	14.3	11.9	8.9	7.1	5.9	4.8	3.6
	20	UC	0.28	36	21	16.6	13.9	10.4	8.3	6.9	5.5	4.2
	30	UC	0.35	45	26	21	17.3	13.0	10.4	8.7	6.9	5.2
	40	UC	0.40	51	30	24	19.8	14.9	11.9	9.9	7.9	5.9
	50	UC	0.45	58	33	27	22	16.7	13.4	11.1	8.9	6.7
	60	UC	0.49	63	36	29	24	18.2	14.6	12.1	9.7	7.3
	70	XC	0.53	68	39	31	26	19.7	15.7	13.1	10.5	7.9
	80	XC	0.57	73	42	34	28	21	16.9	14.1	11.3	8.5
	90	XC	0.60	77	45	36	30	22	17.8	14.9	11.9	8.9
	100	XC	0.63	81	47	37	31	23	18.7	15.6	12.5	9.4
TTI11005 (50)	15	UC	0.31	40	23	18.4	15.3	11.5	9.2	7.7	6.1	4.6
	20	UC	0.35	45	26	21	17.3	13.0	10.4	8.7	6.9	5.2
	30	UC	0.43	55	32	26	21	16.0	12.8	10.6	8.5	6.4
	40	UC	0.50	64	37	30	25	18.6	14.9	12.4	9.9	7.4
	50	UC	0.56	72	42	33	28	21	16.6	13.9	11.1	8.3
	60	UC	0.61	78	45	36	30	23	18.1	15.1	12.1	9.1
	70	XC	0.66	84	49	39	33	25	19.6	16.3	13.1	9.8
	80	XC	0.71	91	53	42	35	26	21	17.6	14.1	10.5
	90	XC	0.75	96	56	45	37	28	22	18.6	14.9	11.1
	100	XC	0.79	101	59	47	39	29	23	19.6	15.6	11.7
TTI11006 (50)	15	UC	0.37	47	27	22	18.3	13.7	11.0	9.2	7.3	5.5
	20	UC	0.42	54	31	25	21	15.6	12.5	10.4	8.3	6.2
	30	UC	0.52	67	39	31	26	19.3	15.4	12.9	10.3	7.7
	40	UC	0.60	77	45	36	30	22	17.8	14.9	11.9	8.9
	50	UC	0.67	86	50	40	33	25	19.9	16.6	13.3	9.9
	60	UC	0.73	93	54	43	36	27	22	18.1	14.5	10.8
	70	XC	0.79	101	59	47	39	29	23	19.6	15.6	11.7
	80	XC	0.85	109	63	50	42	32	25	21	16.8	12.6
	90	XC	0.90	115	67	53	45	33	27	22	17.8	13.4
	100	XC	0.95	122	71	56	47	35	28	24	18.8	14.1



# Nozzle Color Code

0050 Blue Lilac	015 Traffic Green	035 Brown Red	08 Traffic White
0067 Olive Green	02 Zinc Yellow	04 Flame Red	10 Light Blue
0075 Light Pink	025 Signal Violet	05 Nut Brown	15 Yellow Green
01 Pure Orange	03 Gentian Blue	06 Signal Grey	20 Black

Droplet Category	Color Code		Approx. VMD (in microns)
Extremely Fine	XF	Purple	<60
Very Fine	VF	Red	60-145
Fine	F	Orange	146-225
Medium	M	Yellow	226-325
Coarse	C	Blue	326-400
Very Coarse	VC	Green	401-500
Extremely Coarse	XC	White	501-650
Ultra Coarse	UC	Black	>650

Source: ASABE S572.1

30 - 40 MICRONS ● VISIBILITY THRESHOLD



100 MICRONS



HUMAN HAIR

**< 150  
microns**



500 MICRONS



TABLE SALT



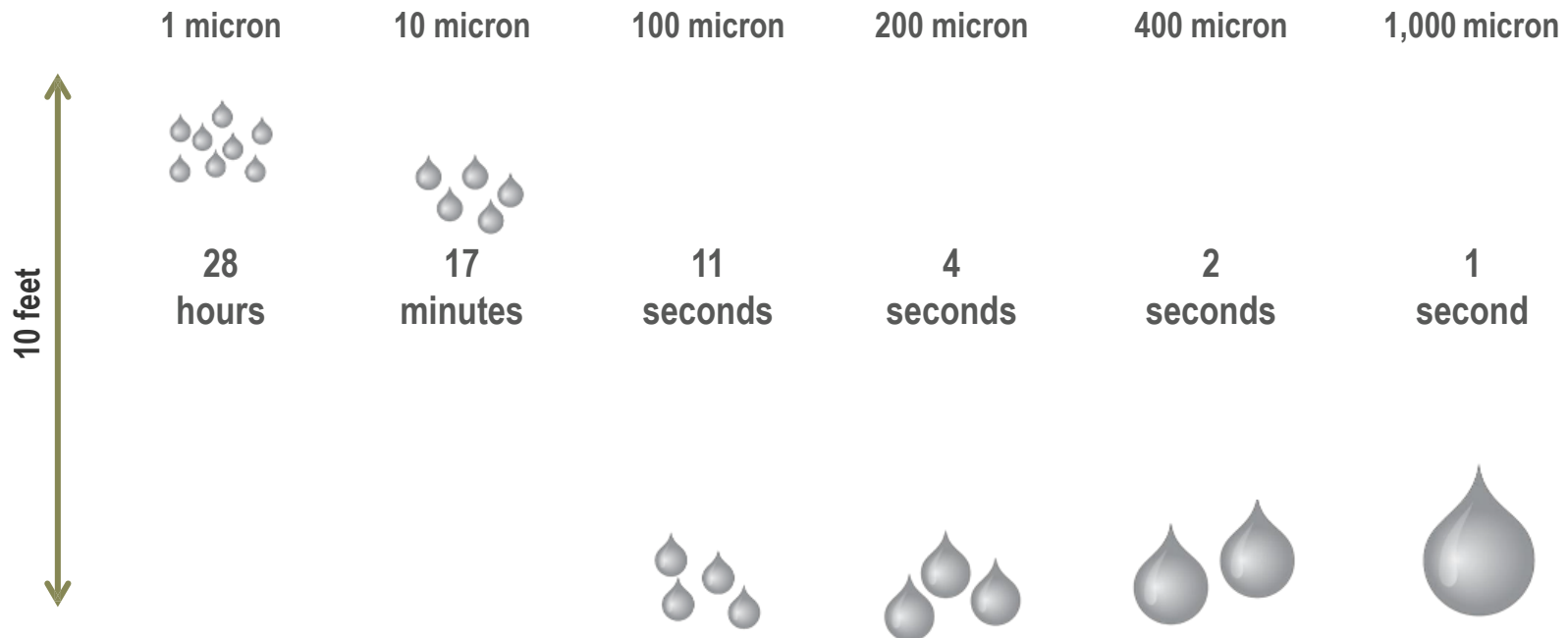
1000 MICRONS

THICKNESS OF A DIME

**0.001 inch = 25.4 microns**

# EFFECT OF DROPLET SIZE (MICRONS) – *TIME IT TAKES TO FALL 10 FEET*

Adapted from: Ross and Lembi, 1985. *For illustrative purposes only.*

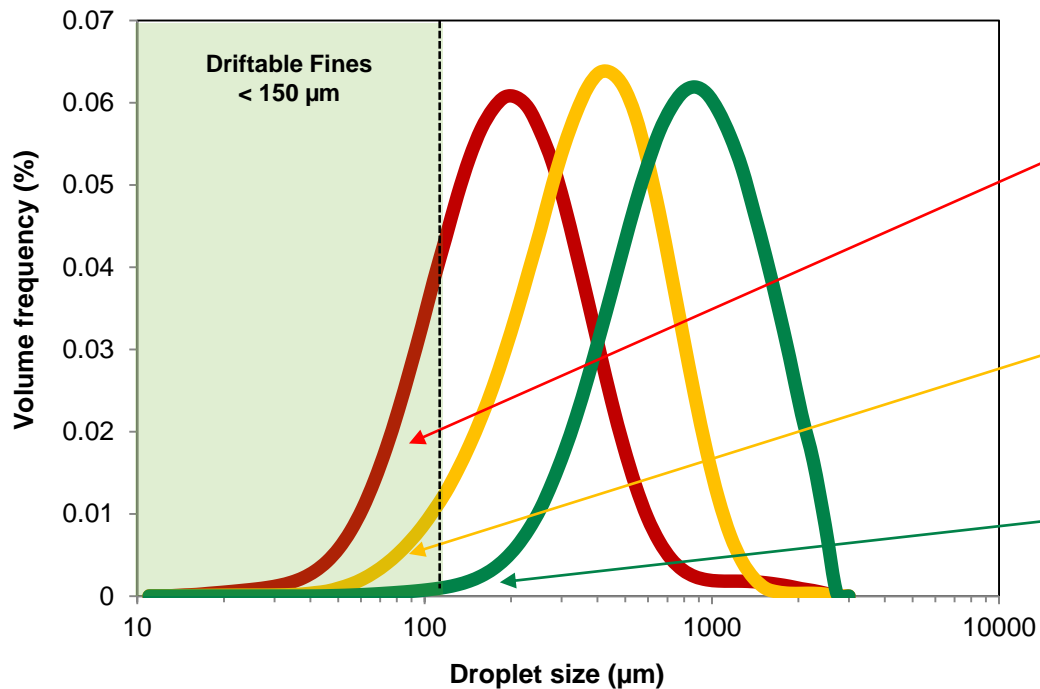






# Nozzle Technology

dicamba + glyphosate



Driftable  
Fines

35%

7%

<1%

Nozzle  
Type



XR 11004



AIXR 11004



TTI 11004

# Nozzles...



## 2. Determine Application Uniformity



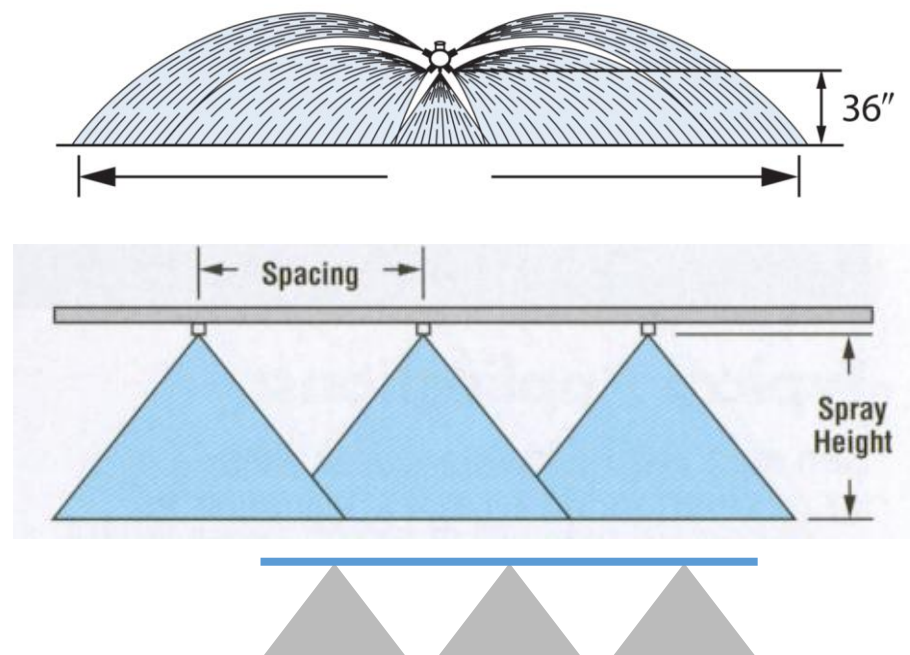
# Proper Pressure



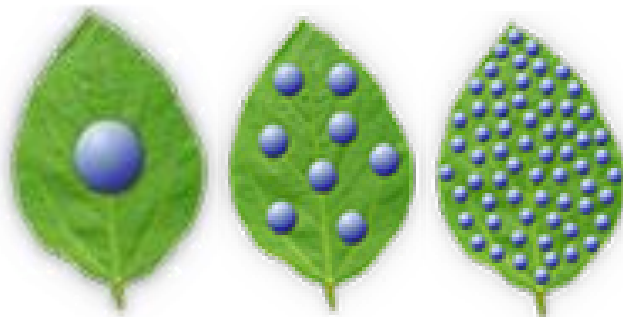
TTI11004 - Catalog Range: 15-90psi

# Nozzle/Boom Height

- Nozzle spacing and fan angle determine optimal spray height
- For  $110^\circ$  fan angle, spacing=height
- Boomless = 2-3ft



# Nozzles...



## 3. Affect Coverage

# What is the Intended Target?

- Weed
- Fungus
- Insect
- Soil Surface



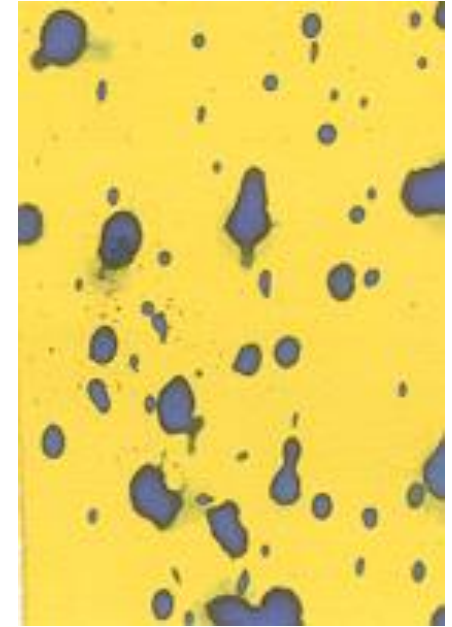
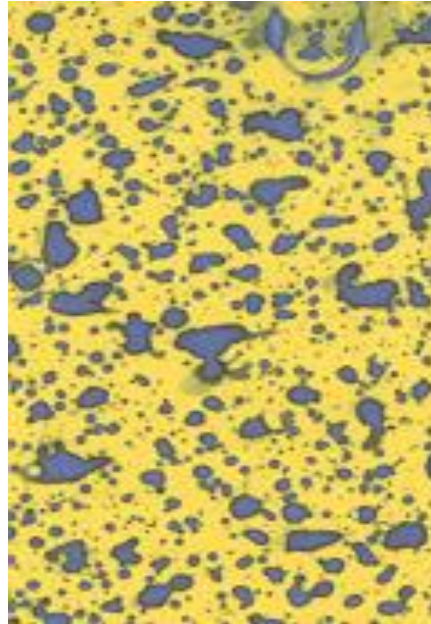
# What about Target Characteristics?

- Grass or Broadleaf
- Surface
  - Smooth
  - Hairy
  - Waxy
- Growth Stage
- Leaf Orientation
  - Time of Day
  - Stress

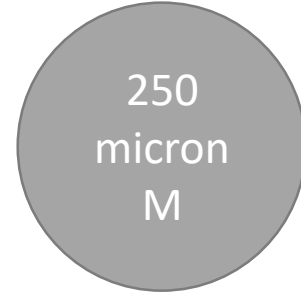
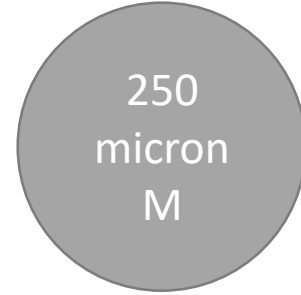
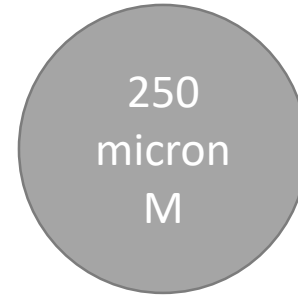
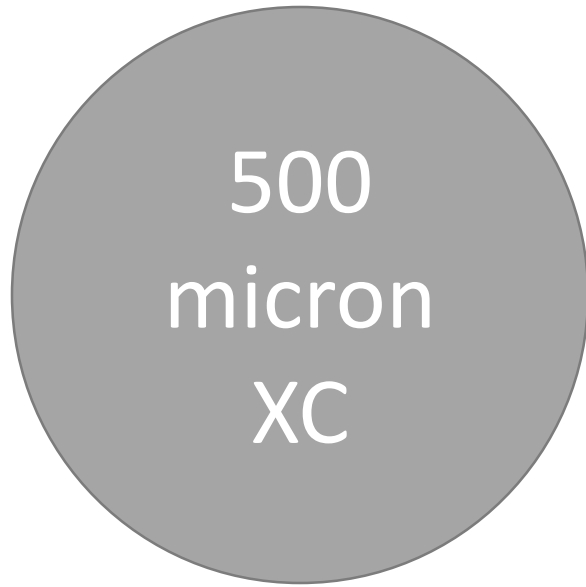


# What is the Pesticide Mode of Action?

- Systemic
- Contact
- Translaminar



**If we cut droplet diameter in half...**



**We will get 8X the number for  
the same spray volume**

125

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micron

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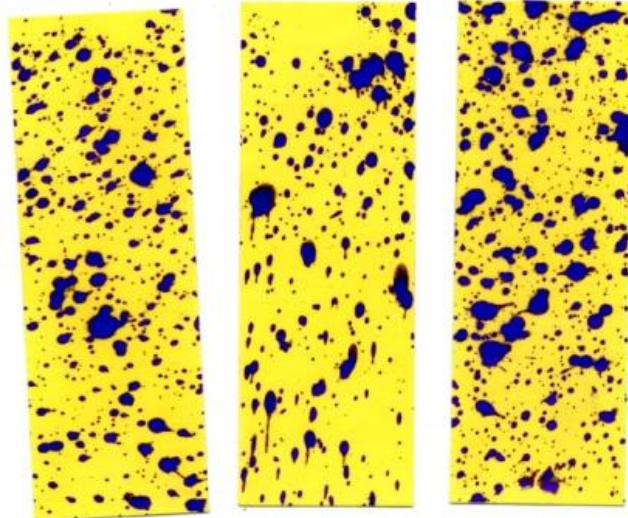
500  
micron

# Increase Spray Volume?

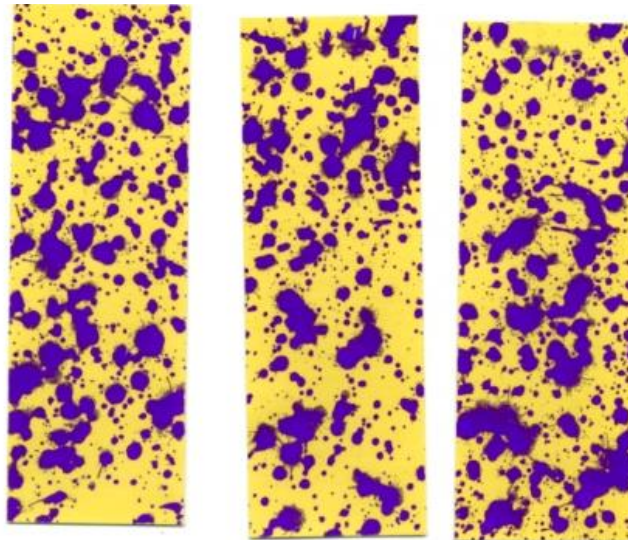


Tee Jet AI XR

12MPH/40psi



10 GPA  
-04



15 GPA  
-06

# Nozzles...



## 4. Influence Drift Potential

# Drift is...

*Movement of pesticide off-target:*

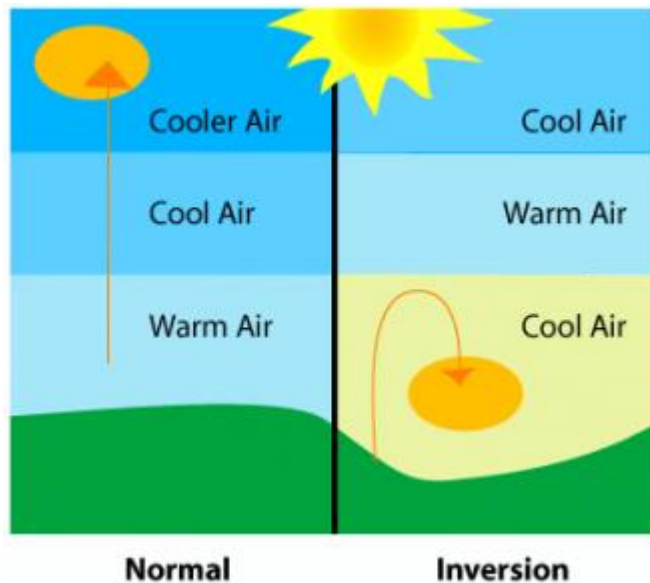
Particle Drift (% Fines & Boom Height)

Vapor Drift (Chemical & Timing)

# When Should I Spray?

- Avoid low humidity and high temperature combinations
- Wind Speeds <10 mph
- Avoid Temperature Inversions

# Temperature Inversions



- Cool air is trapped below a warm air layer
- Small droplets, particles and vapor move horizontal instead of vertical



# Be Aware of Possible Temperature Inversion Signs:

Little Cloud Cover

Calm Wind Conditions (<3mph)  
w/Little Vertical Mixing



Dust Particles Hanging Mid-air

Sounds and Odors Traveling Further  
Late Afternoon to Early Morning Hours



# Drift From an Application Standpoint

- 1. Nozzle technology (coarse droplet)**
- 2. Lower pressure**
- 3. Larger nozzle orifice**
- 4. Lower boom height (< 24")**
- 5. Winds less than 10 mph**
- 6. Know wind direction**
- 7. Avoid inversions (very calm <3mph winds)**
- 8. Consider tank additives for drift control**



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