Orchard Spraying and Orchard Sprayer Calibration

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What is being sprayed?

What is being sprayed?

- **Insecticides**
- **Fungicides**
- **Fertilizer**
- **Plant Growth Regulators**
  - **Crop load**
  - **Plant and fruit growth**
  - **Disease management**
  - **Harvest aid**

What is being sprayed?

- **Where, when and how to be delivered?**
  - **Mode of action**
  - **Targeted problem**
  - **Window of opportunity for addressing the problem**

What is being sprayed?

- **Insecticides (contact vs. attract and kill)**
- **Fungicides (surface vs. systemic)**
- **Fertilizer (low mobility or targeted time)**
- **Plant Growth Regulators**
  - **Semi-systemic**
  - **narrow window of opportunity**

Management considerations

- **Timing**
  - **Hitting critical response window**
  - **When weather conditions are appropriate (rain, wind, temperature and humidity)**
- **Sprayer factors**
  - **Appropriate spray volume**
  - **Match sprayer design to orchard**
  - **Sprayer configuration for optimum distribution**
  - **Sprayer calibration**

Sprayer factors

- **Spray volume**
  - **Adjusting for tree row volume**

Canopy diameter, tree height, tree spacing

TRV = diameter (ft) x height (ft) x row length/acre

Units = cubic feet

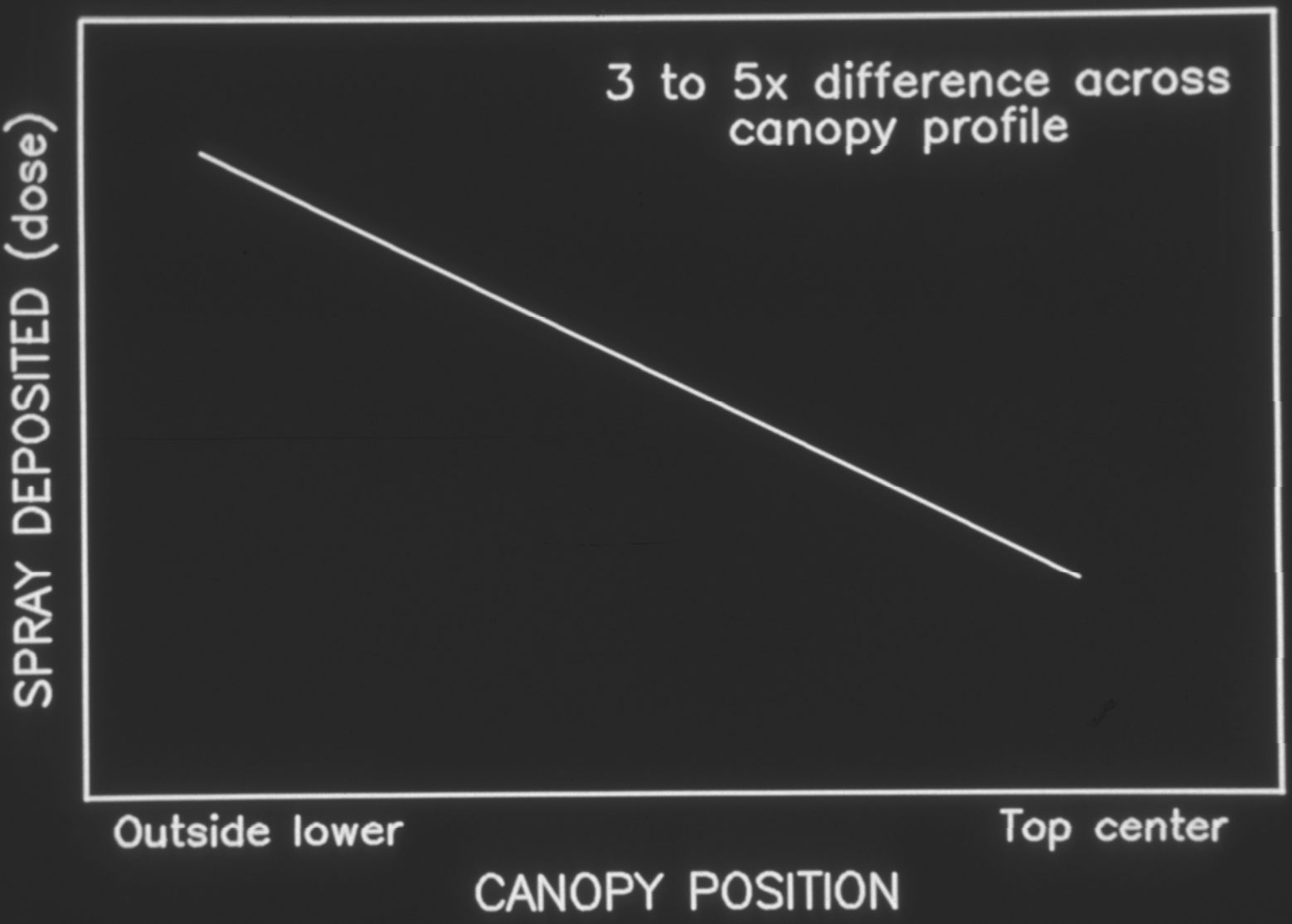
0.7 to 1.0 gallons of spray per 1000 cu.ft. of canopy

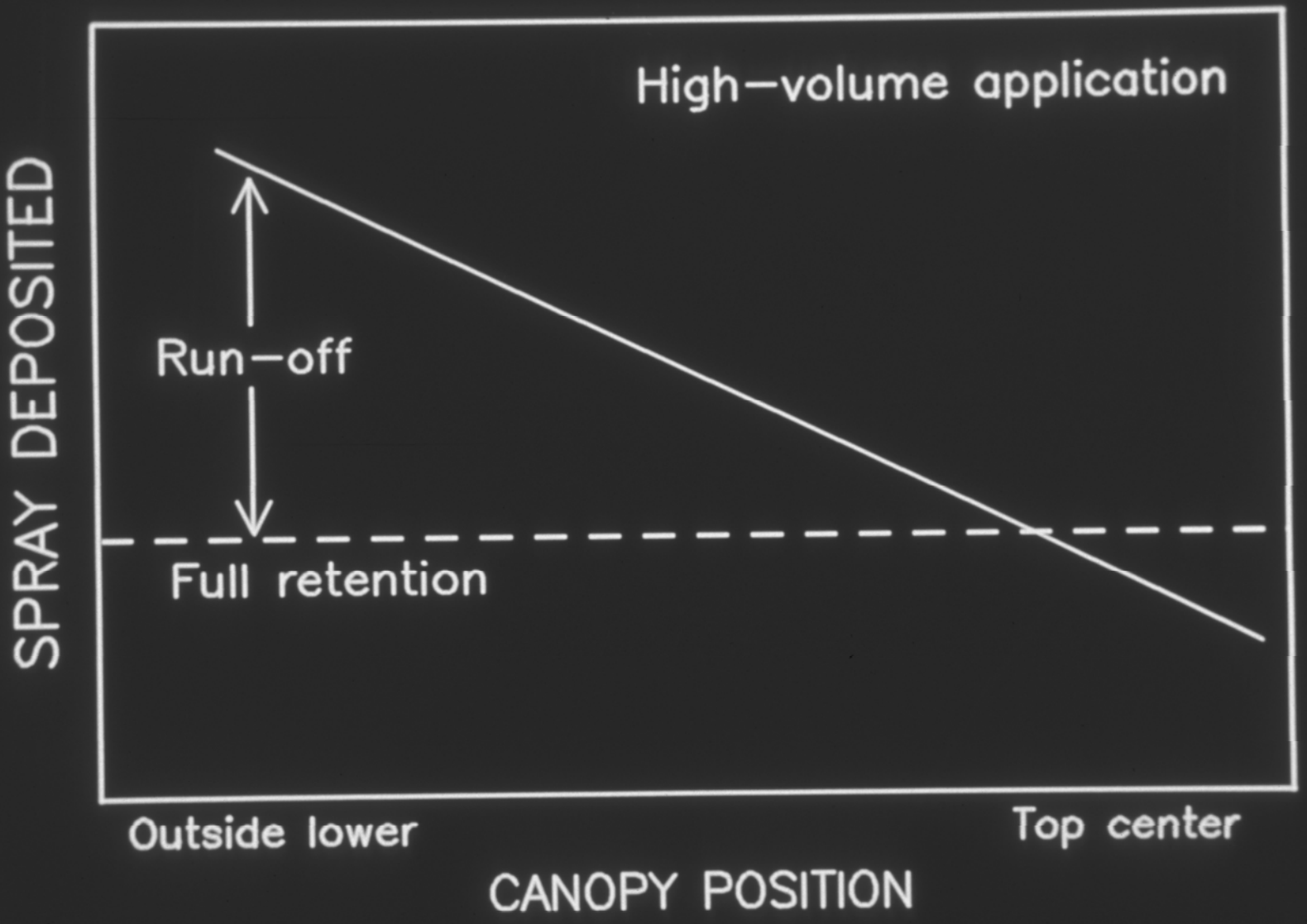
Sprayer factors

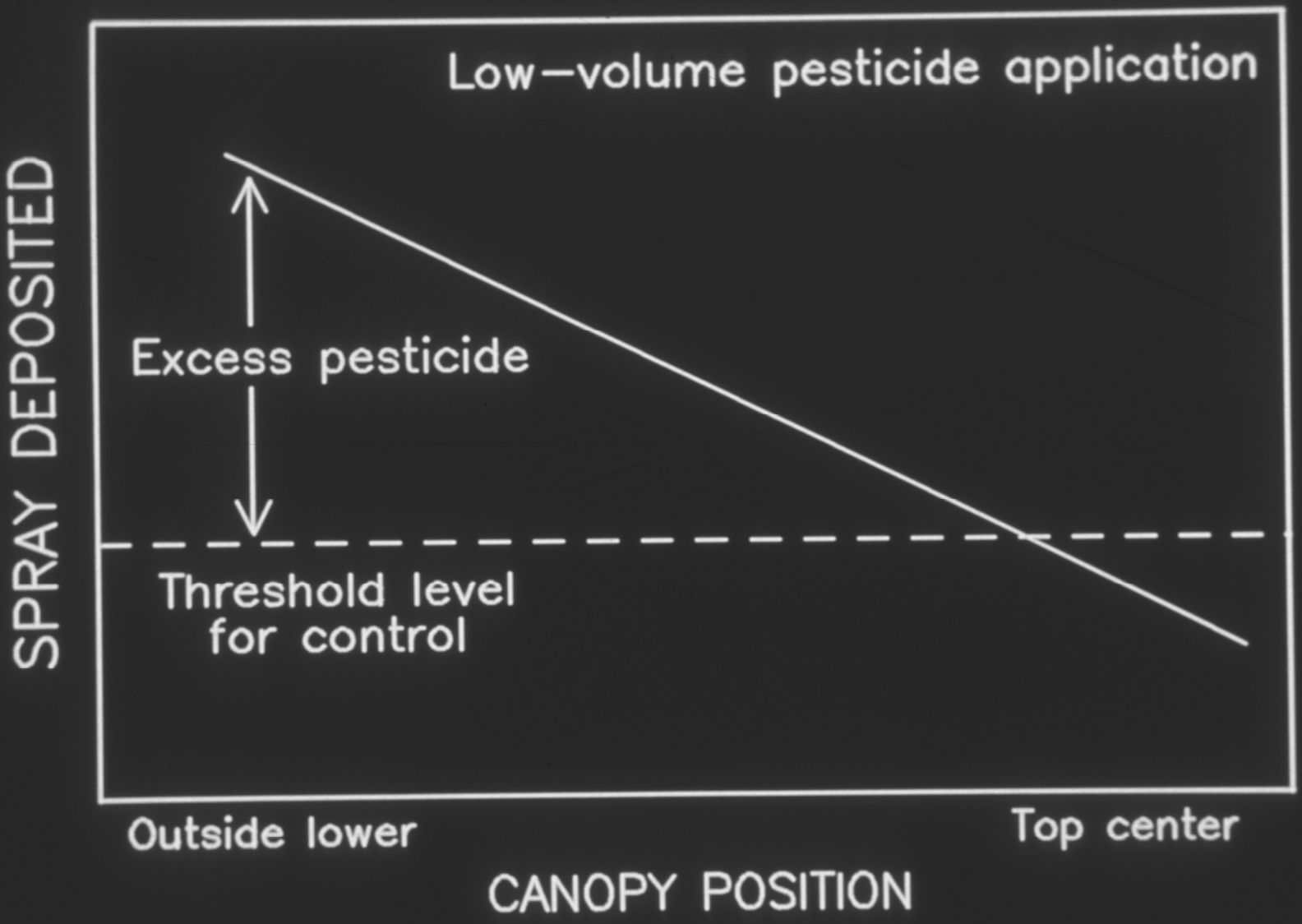
- **Spray volume**
  - **Low volume vs. high volume (dilute) spraying**

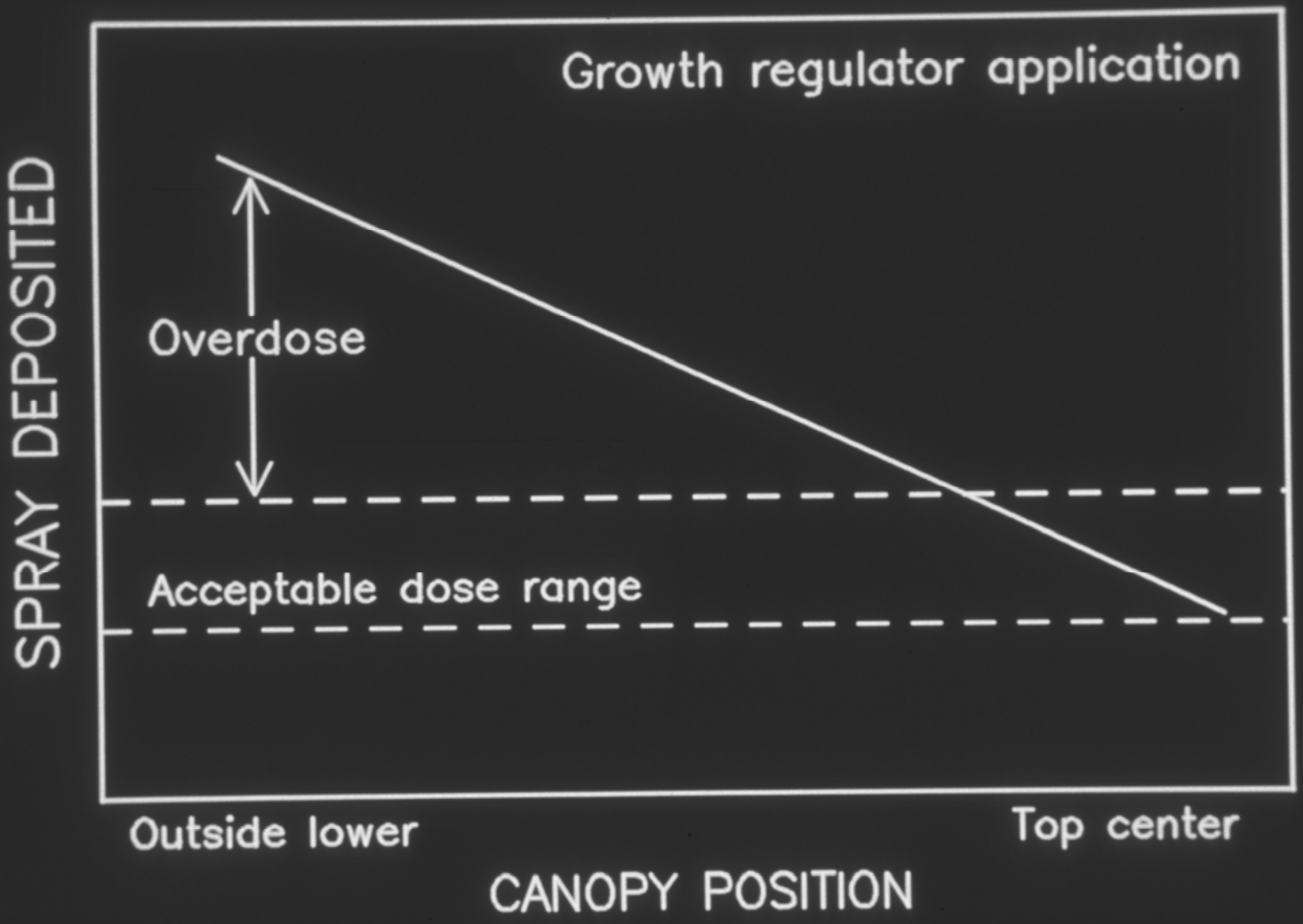
Many growth regulators and foliar nutrients need a dilute spray

Some insecticides and fungicides can be applied in low volume sprays


3 to 5x difference across canopy profile
SPRAY DEPOSITED (dose)
Outside lower
Top center
CANOPY POSITION


High—volume application
SPRAY DEPOSITED
Run—off
Full retention
Outside lower
Top center
CANOPY POSITION


Low—volume pesticide application
SPRAY DEPOSITED
Excess pesticide
Threshold level
for control
Outside lower
Top center
CANOPY POSITION


Growth regulator application
SPRAY DEPOSITED
Overdose
Acceptable dose range
Outside lower
Top center
CANOPY POSITION

Sprayer Design

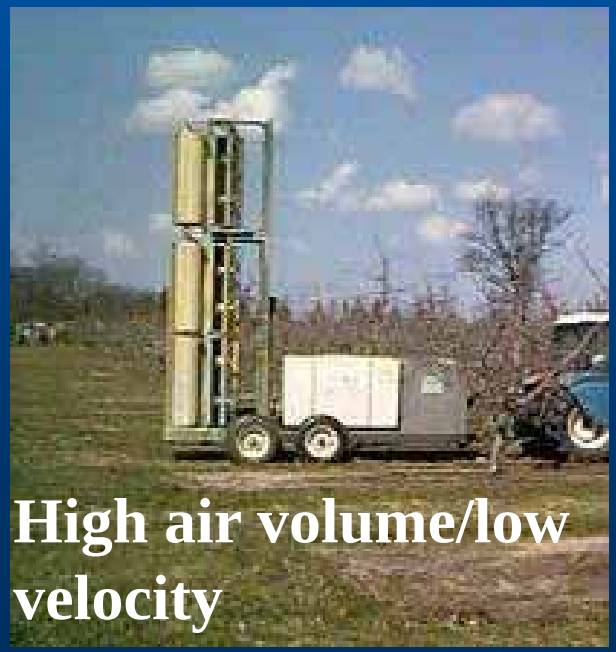
Spray pattern

Sprayer Design

Spray pattern

Air volume and velocity

(laminar vs. turbulent)



Sprayer Design

- Spray pattern
- Air volume and velocity
- Droplet size
  - small = drift
  - large = bounce/shatter

Delivery factors

- **“Smart” sprayer technology**



Sprayer factors

- **Design**
- **Configuration**
- **Sprayer calibration**

Horticulture

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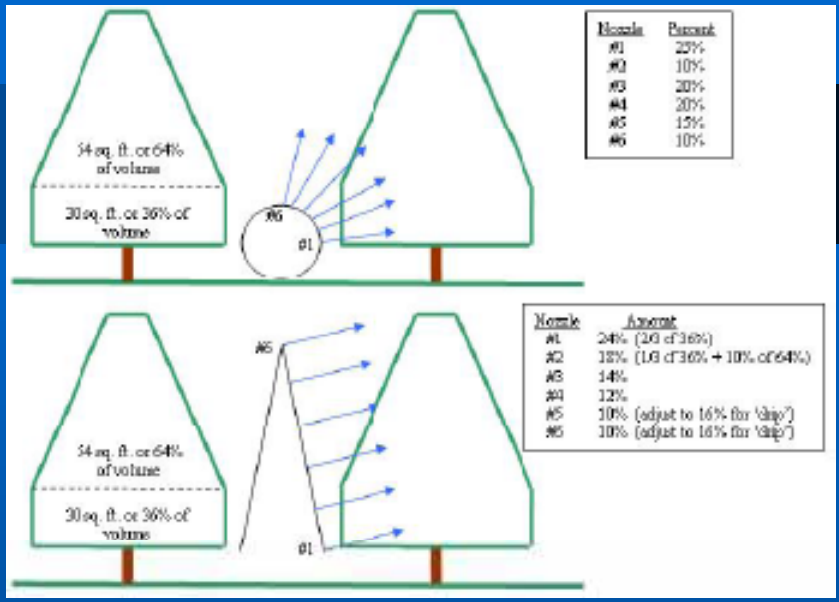
CALIBRATING YOUR ORCHARD SPRAYER



Ground speed	2.1	mph	Feet per minute =	184.8
			Row feet per acre =	3630
Row spacing	12	feet	Minutes per acre =	19.6
			Gallons per minute =	5.09
Gallons per acre	100		GPM one side =	2.55

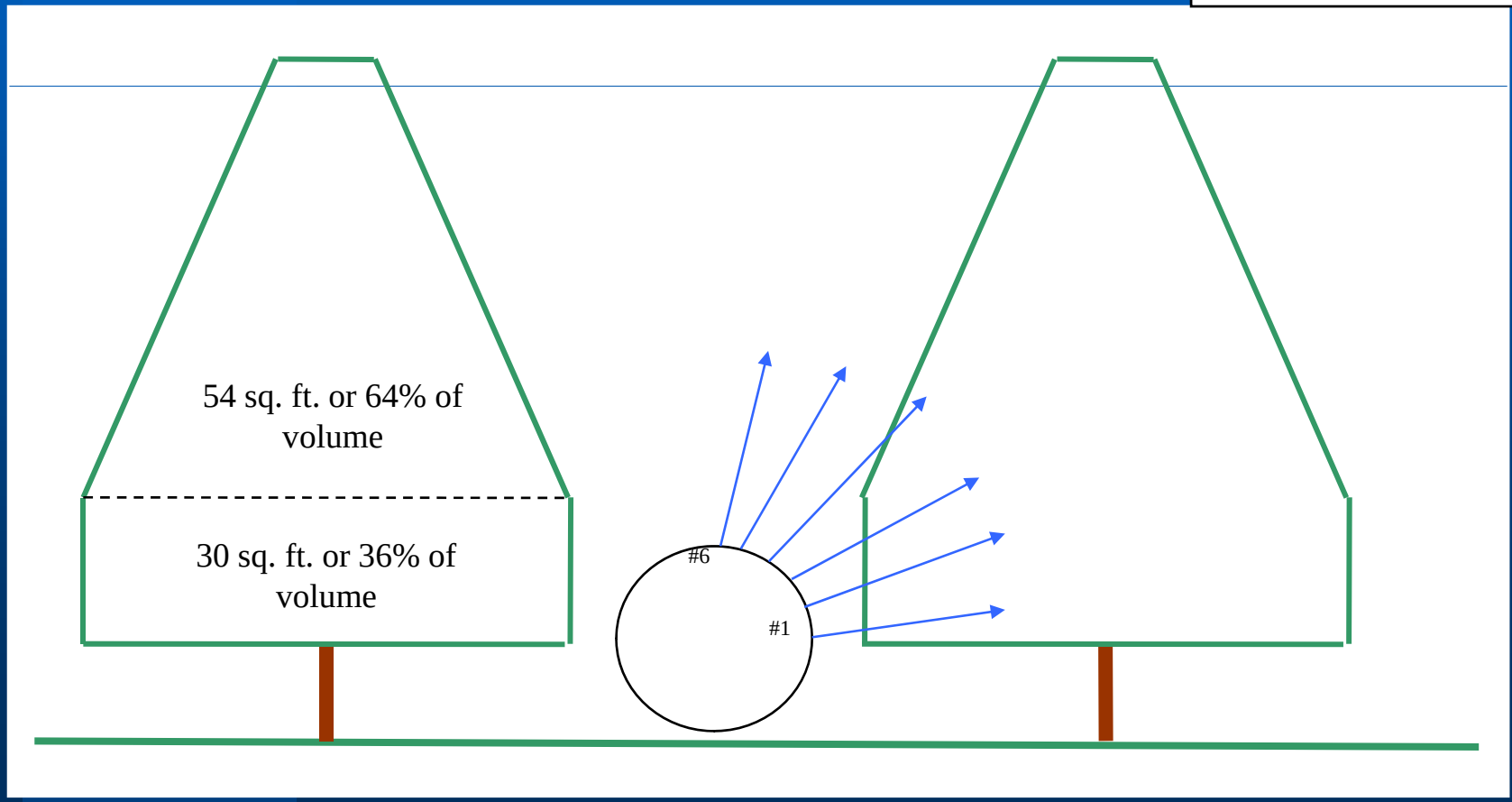
Spray Nozzle Arrangement

Nozzle configuration for TeeJet®/Spray Systems nozzles

	Nozzle #	Fraction each nozzle	GPM per nozzle	100 psi	150 psi
Top	12	0.18	0.407	D4/DC25	D3/DC25
	11	0	0.000	off	off
	10	0.18	0.407	D4/DC25	D3/DC25
	9	0	0.000	off	off
	8	0.12	0.305	D3/DC25	D2/DC25
	7	0	0.000	off	off
	6	0.14	0.356	D3/DC25	D3/DC25
	5	0	0.000	off	off
	4	0.18	0.458	D4/DC25	D3/DC45
	3	0	0.000	off	off
	2	0.24	0.611	D4/DC25	D4/DC25
Bottom	1	0	0.000	off	off
		Total	Total		
		1.00	2.55		

Distribution

Nozzle	Percent
#1	25%
#2	10%
#3	20%
#4	20%
#5	15%
#6	10%



Round plenum configuration

Instructions: Replace numbers in red text with values specific to your situation

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Ground speed	2.1	mph
Row spacing	12	feet
Gallons per acre	100	

Feet per minute =	184.8
Row feet per acre =	3630
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Gallons per minute =	5.09
GPM one side =	2.55

Spray Nozzle Arrangement

	Nozzle #	Percent each nozzle	GPM per nozzle	Nozzle configuration for TeeJet/Spray Systems nozzles 100 psi	150 psi
Top	12	0.1	0.255	D2/DC25	D1.5/DC25
	11	0	0.000	off	off
	10	0.15	0.382	D3/DC45	D3/DC25
	9	0	0.000	off	off
	8	0.2	0.509	D4/DC25	D4/DC25
	7	0	0.000	off	off
	6	0.2	0.509	D4/DC25	D4/DC25
	5	0	0.000	off	off
	4	0.1	0.255	D2/DC25	D1.5/DC25
	3	0	0.000	off	off
	2	0.25	0.636	D4/DC25	D4/DC25
Bottom	1	0	0.000	off	off
		Total 1.00	Total 2.55		

Round plenum configuration

Instructions: Replace numbers in red text with values specific to your situation

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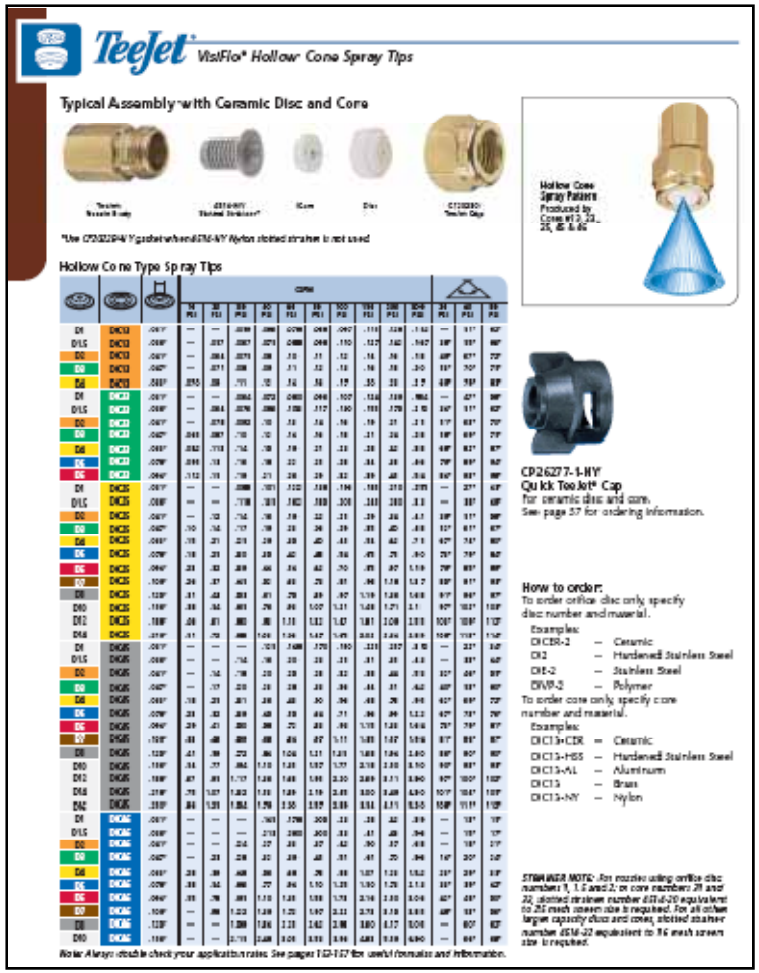
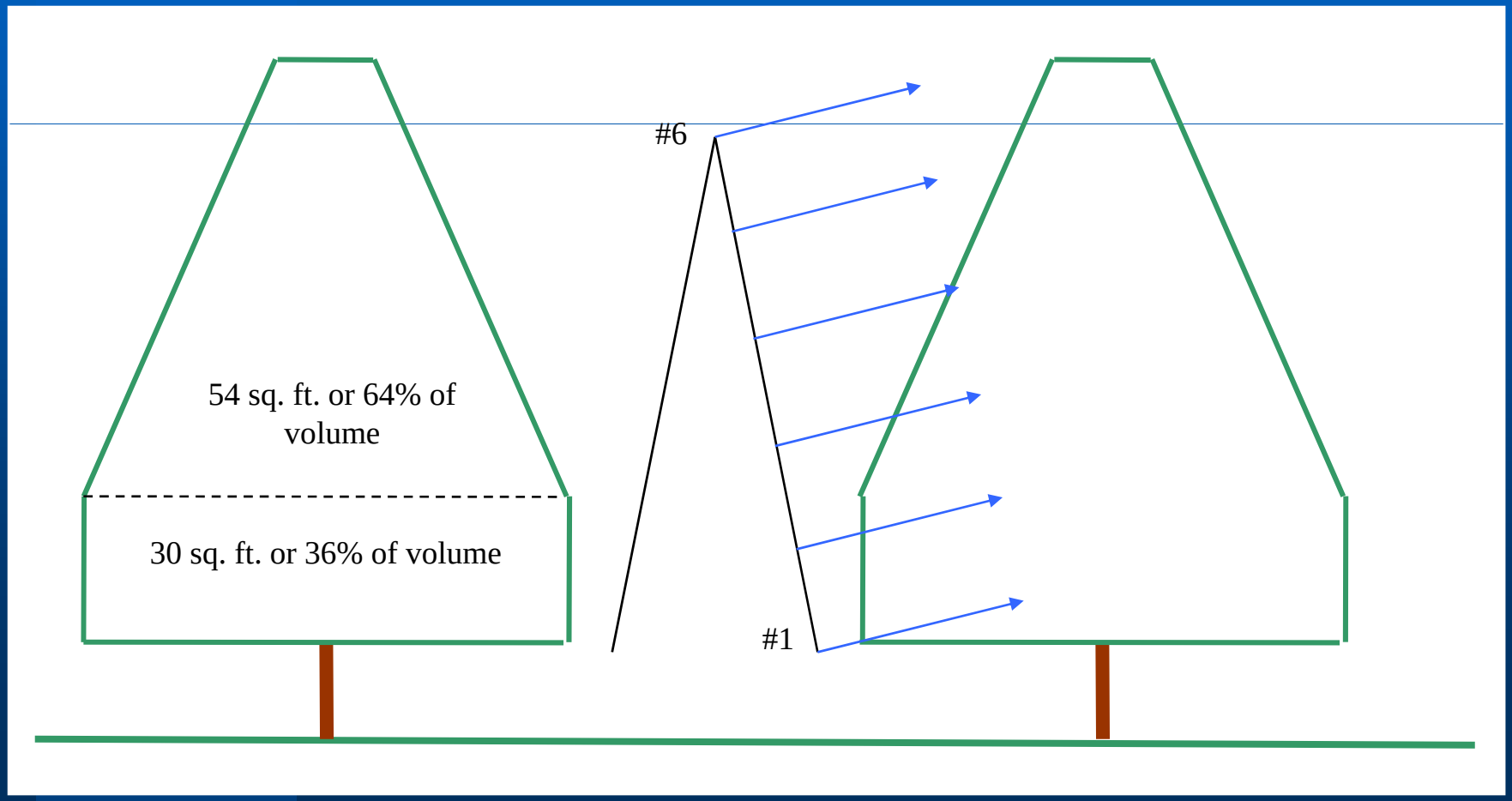


Feet per minute =	184.8
Row feet per acre =	3630
Minutes per acre =	19.6
Gallons per minute =	5.09
GPM one side =	2.55

GPM per nozzle	Nozzle configuration for TeeJet/Spray Systems nozzles	
	100 psi	150 psi
0.255	D2/DC25	D1.5/DC25
0.000	off	off
0.382	D3/DC45	D3/DC25
0.000	off	off
0.509	D4/DC25	D4/DC25
0.000	off	off
0.509	D4/DC25	D4/DC25
0.000	off	off
0.255	D2/DC25	D1.5/DC25
0.000	off	off
0.636	D4/DC25	D4/DC25
0.000	off	off
Total		
2.55		

Spray Distribution

Nozzle	Amount	
#1	24%	(2/3 of 36%)
#2	18%	(1/3 of 36% + 10% of 64%)
#3	14%	
#4	12%	
#5	10%	(adjust to 16% for ‘drip’)
#6	10%	(adjust to 16% for ‘drip’)



Tower configuration

Instructions: Replace numbers in red text with values specific to your situation

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Ground speed	2.1	mph
Row spacing	12	feet
Gallons per acre	100	

Feet per minute =	184.8
Row feet per acre =	3630
Minutes per acre =	19.6
Gallons per minute =	5.09
GPM one side =	2.55

Spray Nozzle Arrangement

	Nozzle #	Percent each nozzle	GPM per nozzle	Nozzle configuration for TeeJet/Spray Systems nozzles 100 psi	150 psi
Top	12	0.16	0.407	D4/DC25	D3/DC25
	11	0	0.000	off	off
	10	0.16	0.407	D4/DC25	D3/DC25
	9	0	0.000	off	off
	8	0.12	0.305	D3/DC25	D2/DC25
	7	0	0.000	off	off
	6	0.14	0.356	D3/DC25	D3/DC25
	5	0	0.000	off	off
	4	0.18	0.458	D4/DC25	D3/DC45
	3	0	0.000	off	off
	2	0.24	0.611	D4/DC25	D4/DC25
Bottom	1	0	0.000	off	off
		Total 1.00	Total 2.55		

Static testing

1. Fill sprayer with water
2. Park on a level spot
3. Bring to operating rpm
4. Open nozzles and spray 10 minutes
5. Measure total water sprayed
6. Divide by 10 for GPM and compare to desired GPM
7. If different, fine tune by pressure adjustment
8. Repeat steps 1-6

Frequent recalibration

As nozzles wear, flow rates increase.

Key Points

- **Spray when timing and weather are optimal**
- **Configure sprayer for orchard and target**
- **Keep sprayer properly calibrated**

- **Calibration aid is available as an excel file, or can be accessed via the internet at http://www.hort.usu.edu/sprayCalc/Page.htm**

Don’t Forget

- **Bushwhackers Working Group Meeting**
- **Tomorrow at 8:00 a.m. in Extension Conference Room, AGS 207**