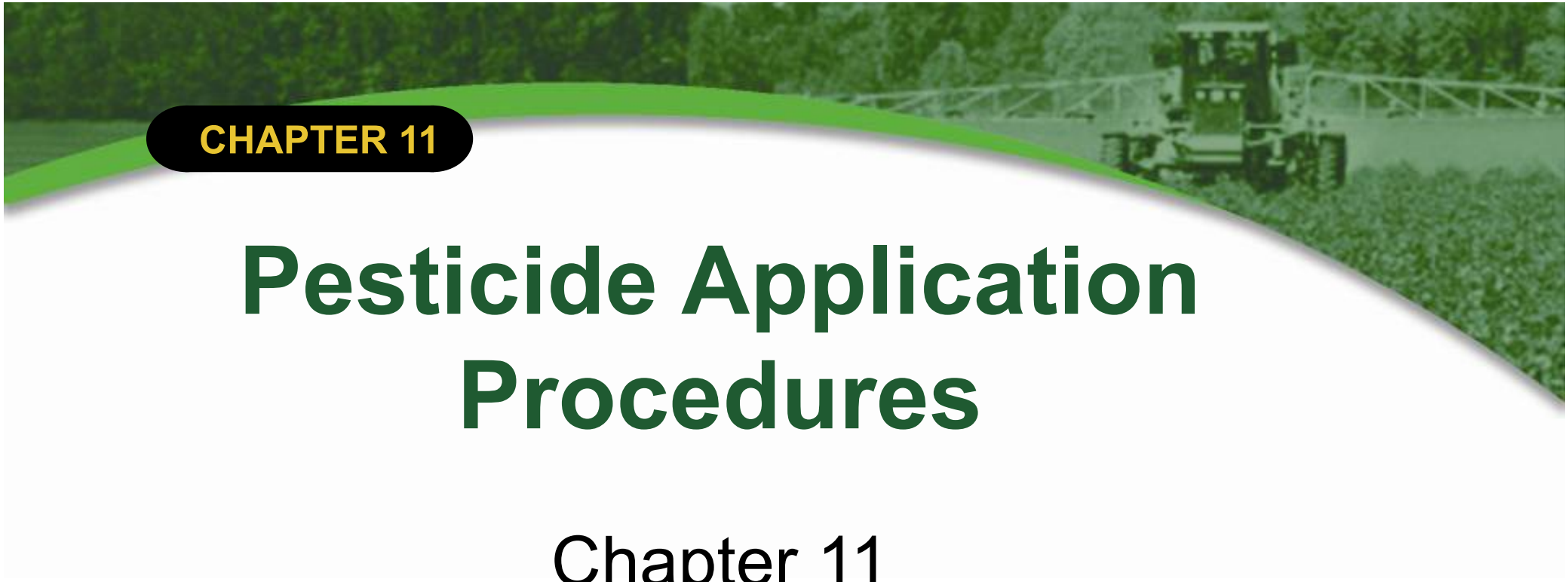


CHAPTER 11

Pesticide Application Procedures

Chapter 11

National Pesticide Applicator Certification Core Manual

Washington State University Extension

CHAPTER 11

Pesticide Application Procedures

This module will help you:

- Select appropriate application equipment and pesticide formulations
- Understand equipment components
- Determine pesticide application rates
- Chose drift reduction practices

Application Methods

- Broadcast
  - Air, ground, boat
- Band
- Crack and crevice

Pre-Empt™

Professional Cockroach Gel Bait

ACTIVE INGREDIENT:

Imidacloprid, 1-[(6-Chloro-3-pyridinyl)methyl]-*N* nitro-2-imidazolidinimine.....2.15%

INERT INGREDIENTS.....97.85%

100.00%

EPA Reg. No. 3125 - 525 — Five 30-gram Tubes Per Box, 10 Boxes Per Case

STOP - Read the label before use.
Keep out of reach of children.

CAUTION

PRECAUTIONARY STATEMENTS
HAZARDS TO HUMANS
AND DOMESTIC ANIMALS

CAUTION: Causes moderate eye irritation. Avoid contact with eyes or clothing. Wash thoroughly with soap and water after handling.

FIRST AID

If Swallowed: Call a physician or Poison Control Center.

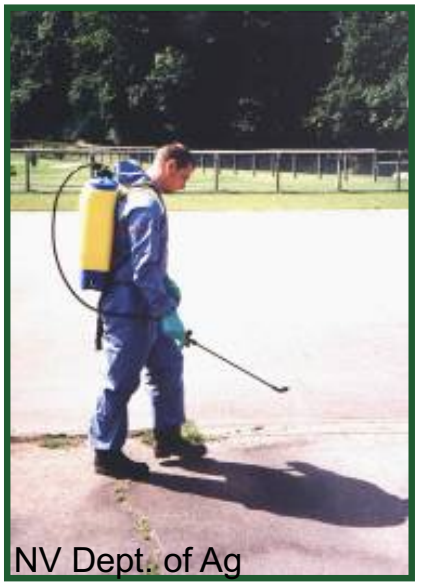
SPOT OR CRACK AND CREVICE APPLICATIONS

Spot treatments: PRE-EMPT should be applied as spots or droplets of approximately 4 to 6 mm in diameter. Approximately 10 droplets per 100 sq. ft. is recommended for use under conditions with low to moderate insect infestations. Approximately 20 droplets per 100 sq. ft. is recommended for more severe infestations or where the population occurs in inaccessible locations, such as in wall voids. Under most circumstances, more numerous, smaller bait placements will provide faster and more effective control than fewer large placements.

Crack and Crevice Treatments: PRE-EMPT may also be applied as a bead or thin film where appropriate. Bait should be applied into cracks and crevices in which insects hide or through which they may enter the building. Such openings commonly occur at expansion joints, between different elements of construction, between, behind or under various types of equipment such as cabinets, refrigerators, sinks, stoves, dishwashers, and through floors, doors, windows, walls and ceilings. These openings may lead to voids such as hollow walls, hollow equipment legs and bases, utility entrances, electrical conduit, junction and switch boxes, and wall and floor drain exits. Trapping techniques or spot flushings will aid in determining areas with insect activity.

Application Methods

- Spot
- Basal
- Space treatment
- Tree/stem injection
- Rope-wick or wiper treatment


NV Dept. of Ag

Application Placement

- Foliar
- Soil injection

- Soil incorporation
  - Tillage, rainfall, irrigation

Types of Safety Systems

- Closed mixing and loading systems
  - Mechanical systems
  - Water-soluble packets
- Enclosed cabs
- Pesticide Containment Pad

Lynn County, OR
Russ Glover

Closed Mixing and Loading Systems

- Prevent human contact with pesticides while mixing or loading
- Benefits
  - Increase human safety
  - Reduce need for PPE
  - Decrease likelihood of spilling
  - Accurately measure pesticide

Camlock System

Closed Mixing and Loading Systems: Mechanical Systems

All in one system

- Remove pesticide product from container
  - by gravity or suction
- Rinse pesticide container
- Transfer pesticide and rinse solution to tank without being exposed to pesticide!

Closed Mixing and Loading Systems: Mechanical Systems

- Product specific
- Mini-bulk containers
  - 40-600 gallons
  - Pump, drive and meter units deliver accurate amount from mini-bulk container to sprayer
  - Refill containers – eliminates waste

Closed Mixing and Loading Systems: Water-soluble packaging

- Easy system
- Unopened pesticide package is dropped into the mix tank
- Bag dissolves and pesticide is released into the tank

Enclosed Cabs

- May prevent exposure to pesticides if sealed correctly
- Supplement to PPE but not a replacement
- Consider cab contamination issues

Pesticide Containment System

Containment Pad

- Catch spills, leaks, overflows and wash water
- Prevent environmental contamination
- Impermeable material (sealed concrete, synthetic liners, glazed ceramic tile, etc.)
- System for recovering and removing material

Application Equipment

Hydraulic Sprayer

- Liquid
- Large power sprayers, small backpack and hand-held sprayers

Application Equipment

Air-blast sprayer

- Mist
- Uses air as the carrier

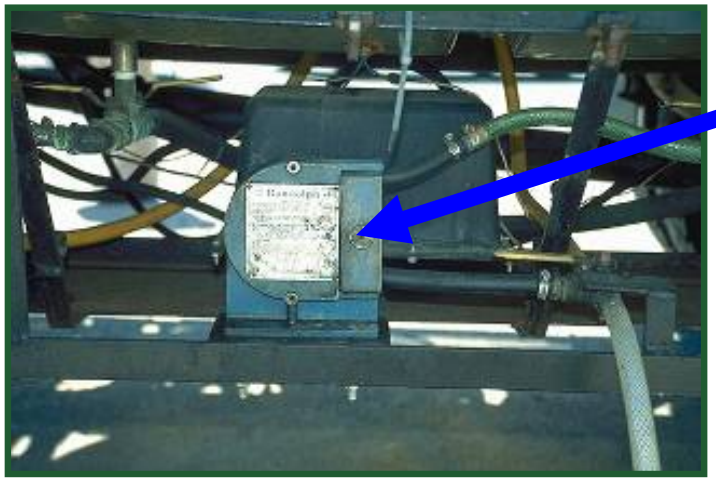
Sprayer Components

- Tank
  - Non-corrosive and easily cleaned
  - Opening top and bottom for ease in filling and cleaning

- Tank Agitator
  - Provides continuous mixing of pesticide and carrier

Sprayer Components

- Pump
  - Provide pressure and volume to nozzles
  - Corrosion and abrasion resistant
  - Read manufacturer instructions

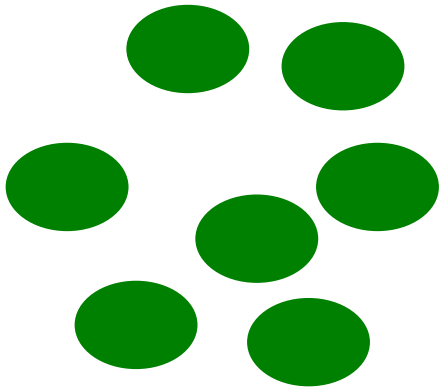


Sprayer Components

- Nozzle
  - Amount of material applied
  - Orifice size => droplet size
  - Distribution and droplet pattern

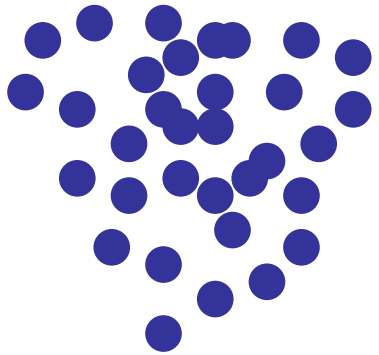
Coarse droplets

-minimize off-target drift



Fine droplets

-maximum surface coverage



Sprayer Components: Nozzles

- Material selection
  - Brass – don't use with abrasive material
  - Plastic
  - Hardened Stainless Steel
  - Ceramic

Best if used with wettable powders and dry flowables

Avoid application problems and replace all worn nozzles

Application Equipment

- Granular Applicators
  - Band or broadcast
  - Application rate affected by
    - Ground speed
    - Gate opening
    - Granule size, shape, and density
    - Terrain and weather conditions

Granular Applicators

Rotary Spreader

- Spinning disk or fan
- Heaviest granules thrown farther

Drop Spreader

- Gravity
- More precise application

Other Application Equipment


Maryland Dept. of Ag.

- Rubs, dipping vats
- Bait dispensers
- Foggers
- Dusters
- Chemigation

Equipment Calibration

What is meant by calibrating equipment?

Determine volume applied per area

13 ounces applied
per 1,000 sq. ft

18 gallons applied
per 1 acre

equivalent to:

0.18 gals applied
per 435.6 sq. ft

Equipment Calibration

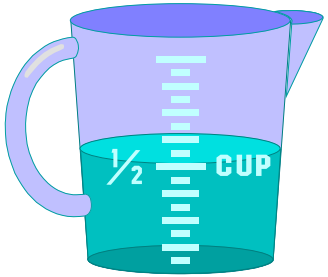
Determine Application Rate (volume/area)

- Output = nozzles and pressure
- Sprayer speed

Equipment Calibration

1.6 feet x 100 feet

Nozzle spacing and calibration course length

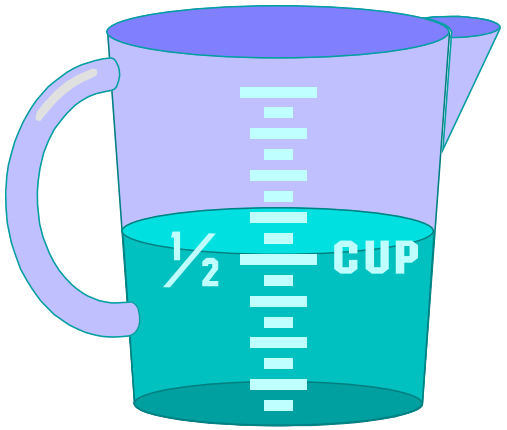


Calibration =
Volume applied per area

4 ounces per 160 ft^2

Equipment Calibration

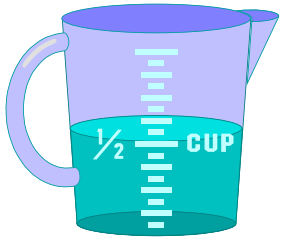
- Tools needs
  - Measuring tape, markers
  - Stopwatch
  - Scale or container with graduated volume
  - Tarp (granular)



Equipment Calibration

- Measure/mark a calibration area
- Apply using same technique when you will apply, time how long it takes
- Collect spray from one nozzle
- Multiply by number of nozzles
- Determine amount applied per area

45 seconds = 17 oz



15 feet x 200 feet *45 seconds*

17 oz/nozzle x 10 = ***170 oz per 3,000 square feet***

Calibration Formula

$$GPA = \frac{5940 \times \text{nozzle output in GPM}}{\text{MPH} \times \text{nozzle spacing in INCHES}}$$

GPA – gallons per acre
MPH – miles per hour
GPM – gallons per minute

If using formulas, make sure you measure appropriate units

Equipment Calibration

- Calibrate based on label rates
  - Acre
  - 1000 sq.ft.
  - 100 sq.ft.

Crop Use Recommendations

Alfalfa:

Insects Controlled	Rate of Application	Method of Application
For control of Grasshoppers	¼ to ½ pint per acre	Apply as a foliar spray when insect populations and/or damage reaches economic thresholds, refer to Cooperative Extension Pest Management Guidelines. Minimum gallonage requirements. Ten gallons of finished spray per acre with ground equipment, two gallons per acre with aircraft.
For control of Alfalfa Blotch Leafminer and Potato Leafhopper	1 to 2 pints per acre	

- For accuracy, use the area stated
- Can use smaller unit area and covert, but you loose some accuracy

Equipment Calibration

Why is calibration important?

- Adjust equipment to get desired rate
- Achieve label rate for product delivery
  - Meet application volume requirements
  - Effective pest control
  - Does not waste money
- Personal and environmental safety

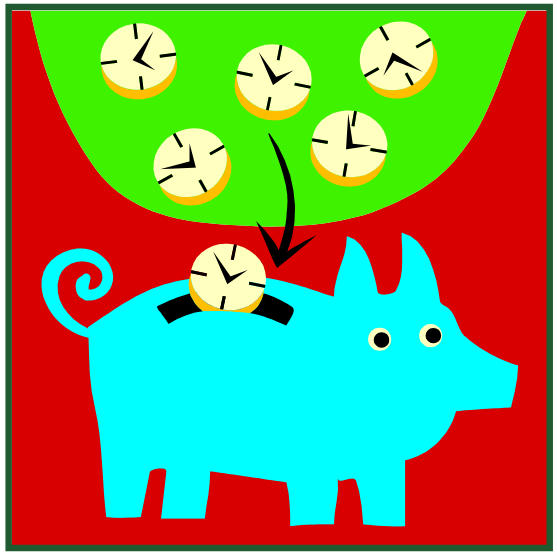
Equipment Calibration

How often should you calibrate?

- Periodically
  - Any change in equipment set up
  - Whenever change products

Calibration is important

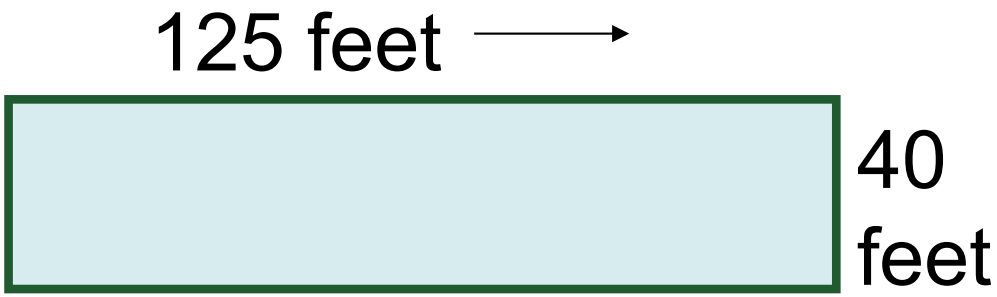
Take the time to do it right and often



Oh no, Math!

- Equipment calibration and application requires basic math skills
- Remember, you can always refer to manuals for formulas but you need to know how to use the formulas

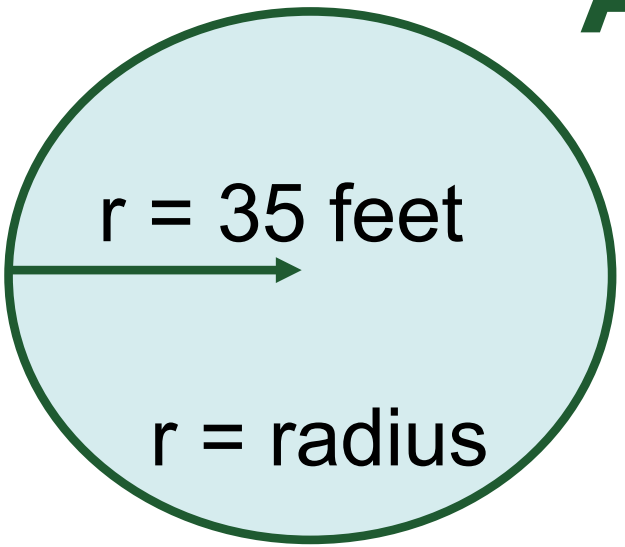
Area of Square/Rectangle



Area = Length x Width

125 x 40 = 5,000 sq.ft.

Area of Circle



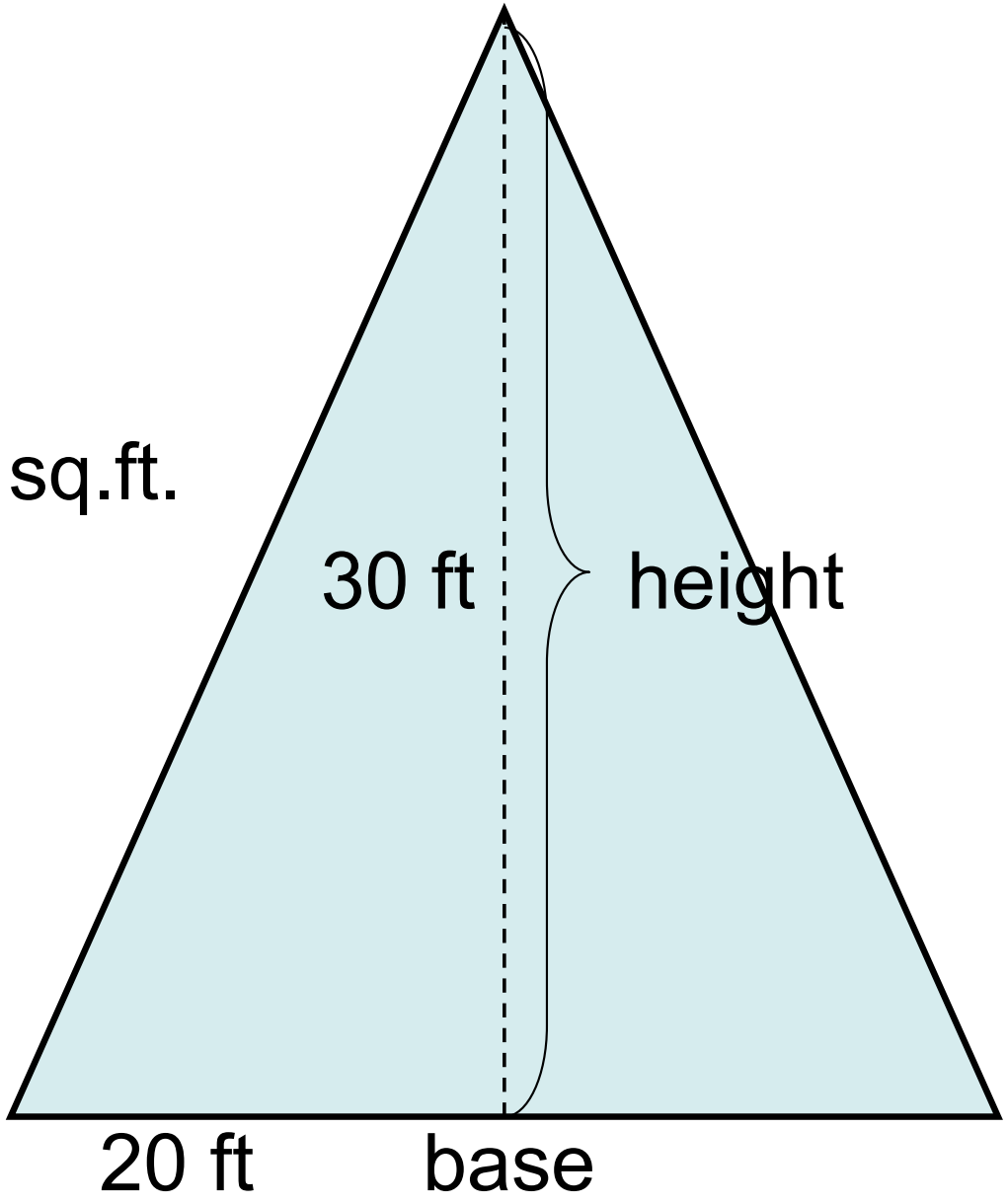
Area = 3.14 x r^2

3.14 x 35 x 35 = 3,846.5 sq.ft.

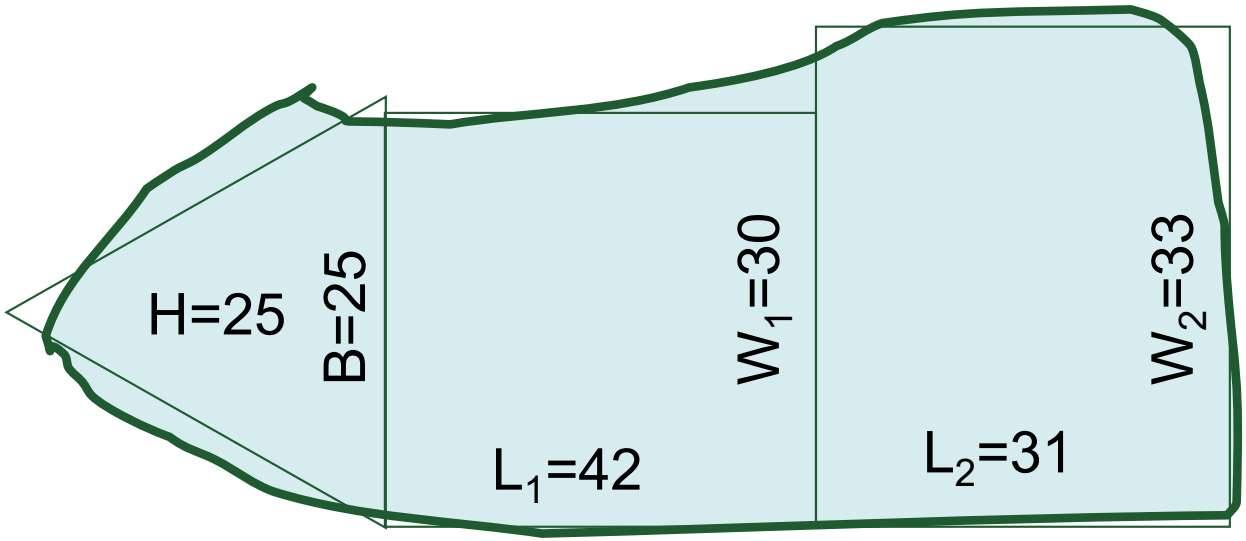
Triangular Areas

$$\text{Area} = \frac{\text{base} \times \text{height}}{2}$$

$$\text{Area} = \frac{20 \times 30}{2} = 300 \text{ sq.ft.}$$



Irregularly Shaped Sites (from Univ. of Missouri – Lincoln)



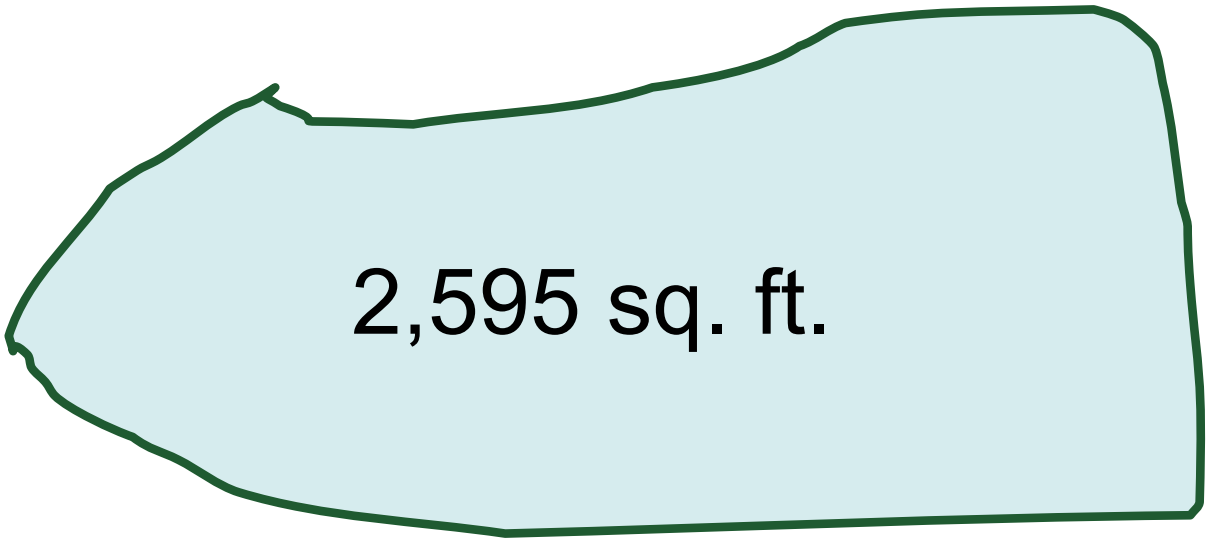
B - base
L - length
W - width

Use a combination of shapes and add their areas:

Area = $(B \times H \div 2) + (L_1 \times W_1) + (L_2 \times W_2)$

$(25 \times 25 \div 2) + (42 \times 30) + (31 \times 33) = 2{,}595$ sq.ft.

Irregularly Shaped Sites (from Univ. of Missouri – Lincoln)



How much of an acre is this area?

2,595 sq.ft. ÷ 43,560 sq.ft. = 0.06 Acres

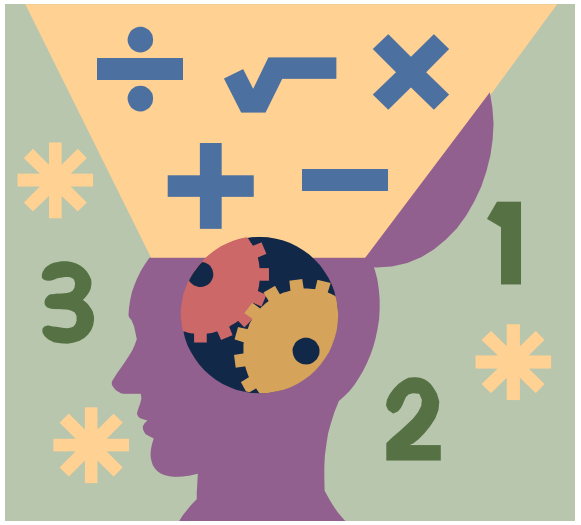
REMEMBER:
43,560 square feet in 1 acre

Determining Application Rate

- Calibrated delivery rate of the sprayer is used to determine amount of pesticide concentrate you need and the amount of total spray mix needed
- READ THE LABEL!!!
- Don’t be proud, ask for help and have someone double check your calculations

Determining Application Rate

- Follow your units
  - 1000 square feet, acres
  - Gallons, quarts, pints, ounces
  - Ounces, pounds
  - Pounds of active ingredient



Read the Label
and
Watch Math Units!

Pesticide Math

You have a weed problem in a 40 ft. x 300 ft. turf area. The herbicide label says to apply 4 ounces of product per 1000 square feet. How many ounces of product do you need to comply with the label directions?

Area = 40 ft x 300 ft = 12,000 sq.ft.

12,000 sq.ft. ÷ 1,000 sq.ft. = 12 units

4 ounces x 12 units = 48 ounces needed

Pesticide Math

You have a sprayer calibrated to deliver 20 gallons per acre. Your sprayer has a 300 gallon tank. The label states to apply 2 quarts per acre. How many gallons of product do you need to fill the tank?

300 **gallon tank** ÷ 20 **GPA** = 15 acres covered

15 acres x 2 quarts/acre = 30 quarts

30 quarts ÷ 4 qts/gal = 7.5 gallons

Pesticide Math: Cross multiplication

The label directs you to mix 1.5 quarts surfactant per 100 gallons of spray. How much surfactant do you need to make up 45 gallons of spray?

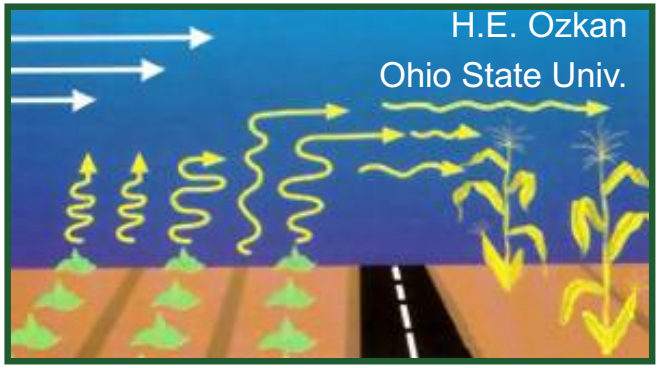
$$\frac{1.5 \text{ quarts}}{100 \text{ gallons}} = \frac{? \text{ quarts}}{45 \text{ gallons}}$$

$$\frac{1.5 \text{ quarts}}{100 \text{ gallons}} = \frac{? \text{ quarts}}{45 \text{ gallons}} \qquad \frac{1.5 \times 45 \text{ qts}}{100 \text{ gallons}} = ?$$

$$(1.5 \times 45) \div 100 = 0.675 \text{ quarts}$$

Minimizing Drift

- Read the Label
  - Volatility
  - Equipment restrictions
  - Droplet size restrictions
    - New technology
  - Buffers
  - Wind direction/speed
  - Temperature Inversions



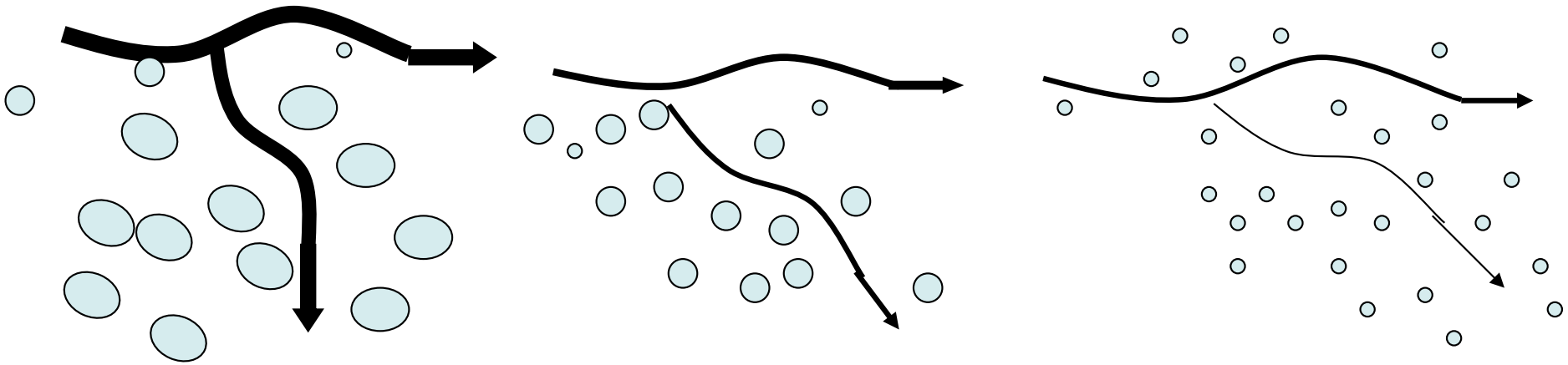
	PSI				
	29	36	44	51	58
DG95015E	M	M	F	F	F
DG9502E	C	M	M	M	M
DG9503E	C	C	M	M	M
DG9504E	C	C	C	M	M

Minimizing Drift

- Drift variables
  - Application equipment
    - Type of nozzle
    - Nozzle size and pressure
    - Sprayer speed – unstable boom
  - Distance from sprayer to target site
  - Drift adjuvants
  - Weather assessment

Minimizing Drift: Type of Nozzle

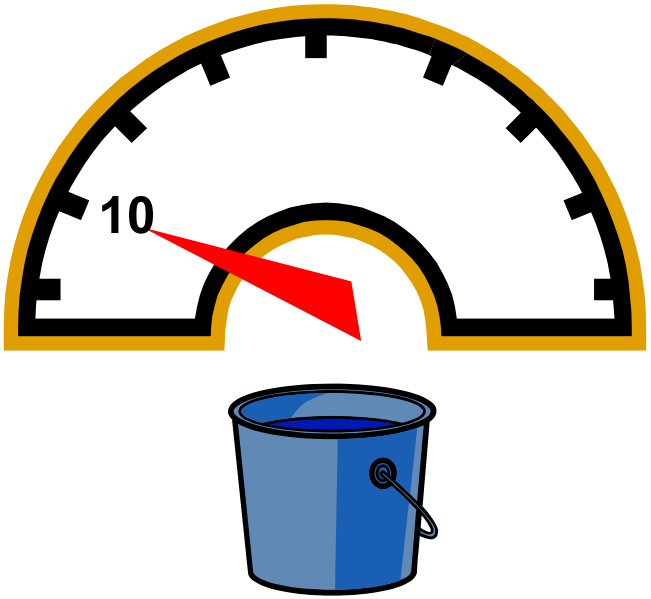
- Drift reduction nozzles
- Larger droplets are less likely to drift = larger orifice
- Read the label



Minimizing Drift: Spray Pressure

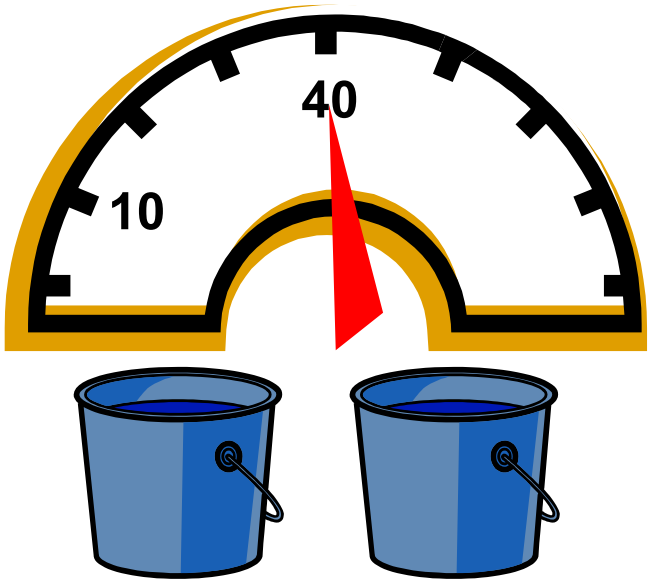
- Increase pressure 4 times to double the nozzle output – consider drift when changing pressure

Sprayer pressure at 10 psi



Sprayer output = 1 bucket

Sprayer pressure at 40 psi



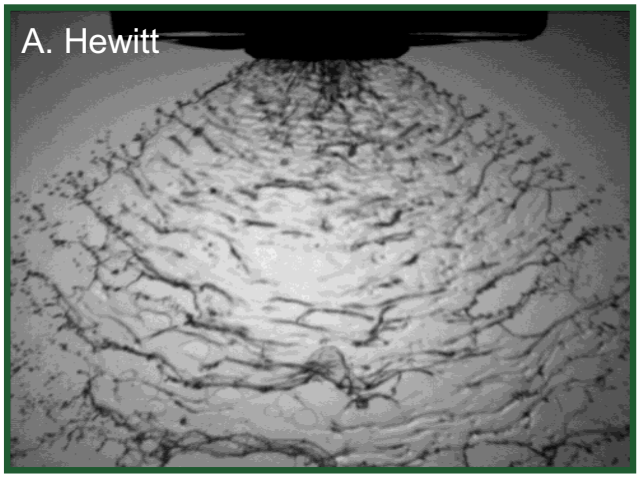
Sprayer output = 2 buckets

Minimizing Drift
Distance from target site

Reducing the distance a droplet must fall before hitting the target site, reduces drift potential

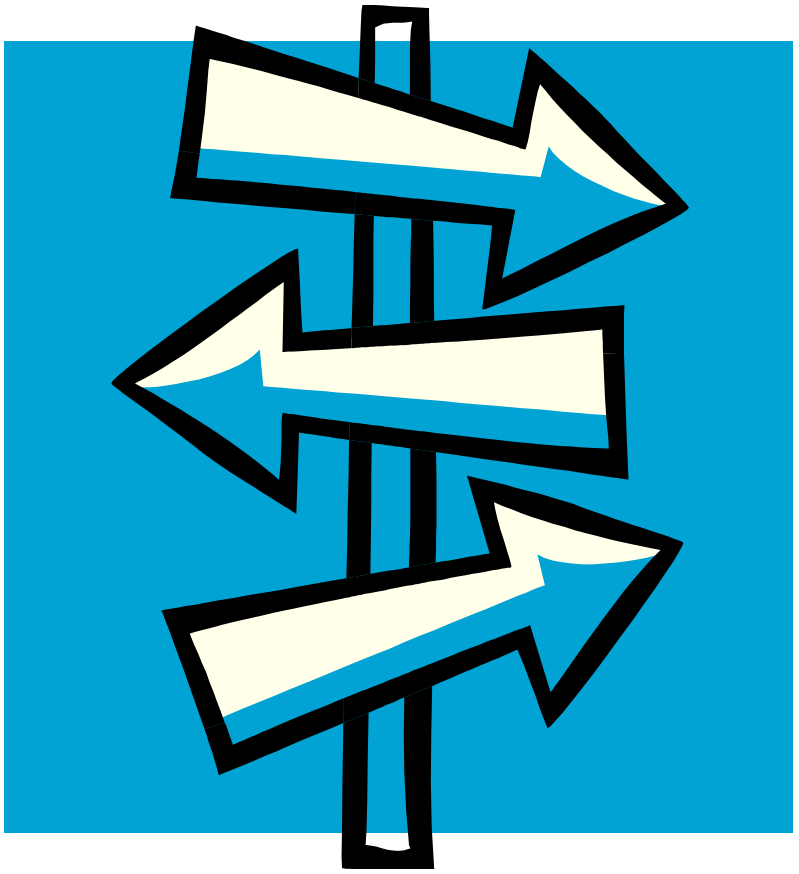
Minimizing Drift
Spray Adjuvants

- Several drift reduction adjuvants on the market
- Evaluate to ensure you get drift reduction



Lots of Decisions
Mistakes are Costly

- Target site and pest
- Pesticide choices and formulations
- PPE, closed systems
- Equipment selection set up, calibration
- Environment where application is to take place



Take the time to calibrate!

- Every sprayer needs to be calibrated
- Make sure applying correct amount of product
- Be a responsible pesticide applicator

CHAPTER 11

Q1. Which of the following would contribute to minimizing drift potential?

1. Small nozzle orifice
2. 4 mph wind speed
3. High spray pressure
4. 1 ½ foot boom height

A. 1 and 3 only
B. 2 and 4 only
C. 1 and 4 only
D. 3 and 2 only

CHAPTER 11

Q2. Which type of application would you perform to treat a basement where there is evidence of a cockroach infestation?

A. Broadcast application
B. Dip
C. Basal application
D. Crack and crevice application

CHAPTER 11

Q3. You need to treat a round golf green. The diameter of the golf green is 100 ft. The label rate is 3 oz. of product to 1,000 sq. ft. How much product do you need to treat the green? (area circle = 3.14 x r^2)

A. 23.5 ounces
B. 47 ounces
C. 94.2 ounces
D. 62.7 ounces

3.14 x 50 x 50 = 7,850

3 oz x 7.85 = 23.5

CHAPTER 11

Acknowledgements

- Washington State University Urban IPM and Pesticide Safety Education Program authored this presentation

- Illustrations were provided by Kansas State University, University of Missouri-Lincoln, Virginia Tech., Washington State Dept. of Agriculture, Washington State University

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CHAPTER 11

Acknowledgements

- Presentation was reviewed by Beth Long, University of Tennessee; Ed Crow, Maryland Dept. of Agriculture; Jeanne Kasai, US EPA; and Susan Whitney King, University of Delaware

- Narration was provided by Carol Ramsay, Washington State University Urban IPM & Pesticide Safety Education

CHAPTER 11

Support for this project was made possible through EPA Office of Pesticide Program cooperative agreements with the Council for Agricultural, Science and Technology, and the National Association of State Departments of Agriculture Research Foundation. The views expressed herein are those of the authors and do not necessarily represent the views and policies of the EPA.

CAST

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