### SPRAYER CALIBRATIONS AND CALCULATIONS<sup>1</sup>

TABLE K - 1. SPRAYER CALIBRATIONS AND CALCULATIONS

	PRATER CALIBRATIONS AND CALCULATI	
Calculation	Example 1	Formula 1
Determining the Gallon per Minute	Example 1 You want an output of 20 GPA. Your nozzles are 20 feet apart. Your	Formula 1
(GPM) required of nozzles to achieve a given Gallon per Acre	field speed is 5 MPH. How much do you need to collect from each nozzle to achieve 20 GPA?	<u>GPM = GPA x MPH x W</u> 5940
(GPA)	<u>20 GPA x 5 MPH</u> x 20 = <u>2000</u> 5940 5940	GPM = Gallons per minute from one nozzle
	= 0.336 GPM per nozzle	GPA = Gallons per acre
	Example 1a - Convert Gallons per Minute (GPM) to Ounces per Minute (OPM) From Example 1 you have collected 0.336 GPM from each nozzle.	W = nozzle spacing (inches) or; = spray width (inches) if using a broadjet or; = row spacing (inches) divided by the number or nozzles per row. MPH = Field speed in Miles Per Hour
	0.366 x 128 = 43 OPM per nozzle	5940 = a constant
	Example 1b - Convert OPM to GPM You have collected 43 OPM from each nozzle.	Formula 1a
	43 OPM / 128 = 0.336	OPM = GPM x 128
		Formula 1b
		GPM = OPM / 128
2. Determining GPA	Example 2	Formula 2
when given nozzle GPM, spacing between nozzles and field speed	Nozzle spacing = 20". Field speed = 5 MPH. You collected liquid from all of the nozzles for one minute and obtained an average of 51 ounces per nozzle. Convert 51 OPM to GPM	GPA = <u>GPM x 5940</u> MPH x W
neia speea	51 OPM / 128 = 0.398 or 40 GPM per nozzle.	
	0.398 GPM x 5940 = 2364.12 5 MPH x 20 100	
	= 23.64 or 24 GPA	
3. Determining required speed when you know GPA, GPM and spacing between nozzles or broadjet	Example 3a  Nozzle output = 10 GPM. Swath width = 35 feet (420 inches).  Desired GPA = 30 GPA. What speed do you need to be traveling to achieve 30 GPA?	Formula 3  GPM x 5940 30 GPA x 420
swath	10 GPM x 5940 = 59,400 30 GPA x 420 12,600	
	=4.7 or 5 MPH	
	*Broadjet Example: If you had nozzles that were 20 inches apart and GPM was 0.40 GPM, the answer would be 3.96 or 4 MPH.	
	Example 3b You want 30 GPA with a field speed of 7 MPH and nozzle spacing is 30 inches. Using formula #1, you determine that you need to collect 1 GPM from each nozzle. When you check the nozzles, the output is actually 1.5 GPM. You can either change the nozzles or adjust your field speed to achieve 30 GPA.	
	$\frac{1.5 \text{ GPM x } 5940}{30 \text{ GPA x } 30 \text{ inches}} = \frac{8,910}{900}$	
A Have more to a constant	= 9.9 or 10 MPH as the new field speed	Famula
4. How much area can my sprayer cover	Example 4 Your sprayer is calibrated at 30 GPA. You have a sprayer with a 500	Formula 4
(acres)?	gallon tank. How many acres can you treat with 500 gallons? How many can you treat with 250 gallons?	Volume in tank = Acres Treated GPA
	500 gallons         250 gallons           30 GPA         30 GPA	
<b>5.11</b>	= 16.6 acres treated = 8.3 acres treated	5 I. 5
5. How much total	Example 5  You want to spray 10 acres and your sprayer is calibrated to 25	Formula 5
solution do you need in order to spray a given acreage?	You want to spray 10 acres and your sprayer is calibrated to 25 GPA. How much total solution do you need in your sprayer tank?	Acres to spray x GPA = Gallons required
_	10 acres x 25 GPA = 250 gallons	
6. How much	Example 6a	Formula 6
pesticide, dry or	Your sprayer can treat 30 acres and the label calls for a rate of 1 pint	

<sup>&</sup>lt;sup>1</sup> Montana State University Extension Service, 2000. MontGuide MT 2000-14

Calculation	Example	Formula
liquid, do you add to	per acre. How much pesticide do you add to the tank?	Acres treated x labeled rate
the tank when rate is given on a per acre basis?	30 acres x 1 pint = 30 pints or 3 ¾ gallons (30 / 8 pints per gallon)	= Amount of pesticide to add to the tank
	Example 6b Using the information in Example 6a, you are using dry ingredients in ounces per acre. How much pesticide do you add to the tank to treat 30 acres?	
	30 acres x 10 ounces = 300 ounces or 18 ¾ pounds (300 / 16 oz. per pound)	
7. How much liquid pesticide do you add to the tank when the rate is given	Example 7a A rate of 3 lbs/acre of the active ingredient (a.i.) is recommended. This pesticide contains 8 lbs. of a.i. per gallon of formulation.	Formula 7  Labeled Rate Per Acre = Gallon amount to apply Amount of a.i. per gallon
according to pounds of active ingredient (a.i.) per acre?	3 lbs. per acre / 8 lbs. a.i. per gallon = 0.375 gallons per acre <b>or</b> 1 ½ quarts per acre (0.375 x 4) <b>or</b> 3 pints per acres (0.375 x 8)	Amount of a.i. per ganon
(a.i.) per acre:	Example 7b You have calibrated a 300 gallon sprayer. It can spray 7.5 acres per tank at 40 GPA. A recommendation indicates to apply ½ pound a.i. per acre. The label indicates that it contains 2 pounds of a.i. per gallon. How much pesticide will you add to the tank to spray 7.5 acres?	
	0.50 lb a.i./acre = 0.25 gallon (1 quart)/ac 2 lb a.i./gallon	
0.11	7.5 acres/tank x 1 quart per acre = 7.5 quarts	5
8. How much dry pesticide do you apply per acre when the rate	Example 8 A recommended rate of 0.2 lbs. a.i./acres of a 25% wettable powder (WP) is recommended (One pound of formulation contains 0.25 lbs.	Formula 8  Recommended rate = lbs. of formulation/acre
is given as a percentage of a.i.?	a.i.)  0.2 lbs. per acre = 0.80 lb formulation /ac 0.25 lbs. a.i.	% a.i. per lbs of formulation
	To convert to ounces: 0.80 lbs. x 16 ounces/lbs. (dry) = 12.8 ounces per acre	
9. Check the output of boom nozzles.	All nozzles across a boom need to be applying roughly the same amount of liquid within a certain error range (usually 5% on either side of the average). Clean and/or replace any nozzles that fall outside of your given error range.	Formula 9  Nozzle 1 output + nozzle 2 output + etc.  Number of nozzles on the boom  = Average Nozzle Output
	Example 9 You have a 10 nozzle boom and you have collected from under each nozzle for one minute. You noted the following nozzle outputs	Average Nozzle Output x 0.05 = amount to add and subtract from the Average Nozzle Output to make an error range of 5%.
	Nozzle = 1 2 3 4 5 6 7 8 9 10 Output (Oz)=43 44 47 42 46 44 50 41 42 42 = 441 oz. Total	<b>g</b>
	Average Nozzle Output = 441 oz. / 10 nozzles = 44.1 oz. For 5% error: 44.1 oz. x 0.05 = 2.2 oz. to add and subtract from the average.	
	Error range (5%) on either side of the average = 41.9 oz. to 46.3 oz. Nozzles 3, 7, & 8 needs to be cleaned or replaced. Note: If a nozzle's output is lower, it may be plugged and only need to be cleaned. Repeat this exercise until all nozzles fall with the error range.	
10. Adding Adjuvants to the Spray Tank	Pesticide labels often suggest adding adjuvants to the spray mix, listing the rate of the adjuvant in terms of percentage of the spray mix, volume per acre, or volume per quantity of spray mix	Formula 10a  % of spray mix x gallons of spray mix
	Example 10a – When the rate is expressed as a % of the spray	100 = Gallons adjuvant needed
	mix Total spray mix = 500 gallons. Adjuvant rate is 1% of the finished spray volume. 0.01 x 500 = 5 gallons of adjuvant added along with	Formula 10b
	pesticide to make a 500 gallon solution  Example 10b – When the rate is expressed as a volume per	Adjuvant needed =  Adjuvant rate x acres to be treated
	acre. Your sprayer is calibrated to 30 GPA and you plan on using 300	Formula 10c
	gallons of solution. An adjuvant calls for a rate of 1 pint per acre.	Adjuvant needed =
	300 gallons / 30 GPA = 10 acres x 1 pint per acre = 10 pints of adjuvant added along with pesticide to make a 300 gallon solution.	Rate per 100 gallons x gallons of spray mix

Calculation			E	xample				Formula
	Example 10c	– When			essed in c	uarts p	per 100	
	gallons.  Adjuvant rate = 2 quarts per 100 gallons. A total of 400 gallons of spray mix will be used.  2 quarts x 400 gallons total mix							
	100 gallons							
	= 8 quarts of a gallon solution		o add ald	ong with	pesticide	to make	e a 400	
11. Dilution Rule	Example 11 How much of a	50% 00	ncontrat	o is noo	dad ta ma	ko 100 (	gallone of a	Formula 11
	1.5% spray?	a 50 /6 CO	riceriliai	e is rice	ueu to ma	ve 100 í	yalloris or a	C1 x V1 = C2 x V2
	50 x Volume 1 V1 = 3 gallon		.5 x 100	;				C1= % of a.i. in concentrate V1 = quantity of concentrate needed C2 = % a.i. desired in final mixture
	The final mixtu (V1) plus the r							V1 = quantity of final mixture
	and the require	ed amour						It is important that the units used are all the same: i.e. percent x pounds = percent x pounds or percent x volume = percent x volume
Hints on Percentage Mixing	A pesticide label may tell you to mix up a concentration or percentage of the product in water. For example, mix 1 part of the pesticide concentrate and 99 parts water. This makes a 1 percent mixture. Since there are 128 fluid ounces in one gallon, 1.28 ounces of a concentrate mixed into 1 gallon of water will make approximately a 1 percent mixture (Hint: 1 tablespoon is about ½ ounce.)  The label may also instruct you to make a spray solution with a specific percentage of active ingredient (a.i., for example, a one percent a.i. solution for a particular pest. If the pesticide is formulated as an emulsifiable concentrate (EC) containing 57 percent active ingredient. To make a 1 percent a.i. spray solution from this formulation, you would add 1 part of the pesticide to 56 parts of water.							
Glyphosate product rates based on formulation, acid equivalent (ae) and	Pounds ae/gal or ai/gal are found on glyphosate product labels. The following table displays conversions.					abels. The		
active ingredient (ai).2								
				fl oz/A				
	3 4	16	24	32	48	64		
	4 5.4	12	18	24	36	48		
	4.7 5.1 4.5 5.5	12 11	18 16	24	36 32	48	-	
	5 6.1	10	15	20	30	40		
				•			•	
<u> </u>								1

<sup>&</sup>lt;sup>2</sup> NDSU 2005

### HAND-HELD / BACKPACK SPRAYER CALIBRATION

### **TABLE K - 2. BACKPACK SPRAYER CALIBRATION**

	No Math Version <sup>3</sup>							
Step 1	Establish a calibration plot that is exactly: 18.5 feet wide x 18.5 feet long							
Step 2	Spray the calibration plot uniformly with water, noting the number of seconds required:	Time Required to spray plot = seconds.						
Step 3	Spray into a bucket for same number of seconds.							
Step 4	Measure the number of ounces of water in the bucket:	Volume sprayed = ounces						
Step 5	The number of ounces collected from the bucket is equal to the number of gallons per acre the sprayer is delivering:	Gallons Per Acre (GPA) =						
	Adding the Correct Amount of Herbicide to Tank for	r Liquid Herbicide Formulations						
Step 6	Record sprayer output in gallons/acre (calculated from Step 5).	Output (volume) = GPA						
Step 7	Determine volume of full spray tank.	Tank volume = gallons						
Step 8	From the herbicide label determine amount of herbicide concentrate to apply per acre.	Herbicide per Acre (quarts or pints)						
Step 9	Determine the amount of herbicide to add to each gallon using the chart below.							
Step 10	Calculate the amount of herbicide to add to each tank.	Amount of herbicide/gallon x number of gallons in a tank = Total amount of herbicide to add to a tank.						

The following table can be used to determine the amount of pesticide, liquid or dry formulation, needed per unit area (i.e. gallons per acre or GPA) to give the rate recommended for effective control<sup>4</sup>.

TABLE K - 3. AMOUNT OF HERBICIDE TO ADD TO MEET RECOMMENDED HERBICIDE RATE/ACRE BASED UPON SPRAY AMOUNT (GPA) CALIBRATED<sup>5</sup>

Gallons / Acre (GPA)	1 pint	1 quart	2 quarts	3 quarts	4quarts
15	6 tsp	2 fl oz.	4 fl oz.	6.25 fl oz.	8.5 fl oz.
20	5 tsp	10 tsp	3.25 fl oz.	4.75 fl oz.	6.33 fl oz.
30	3 tsp	6 tsp	2 fl oz.	3.25 fl oz.	4.25 fl oz.
40	2.33 tsp	4.75 tsp	1.66 fl oz.	2.33 fl oz.	3.25 fl oz.
50	2 tsp	3.75 tsp	1.25 fl oz.	2 fl oz.	2.5 fl oz.
60	1.66 tsp	3.25 tsp	6.33 tsp	1.66 fl oz.	2 fl oz.
70	1.33 tsp	2.75 tsp	5.5 tsp	1.33 fl oz.	1.75 fl oz.
80	1.25 tsp	2.33 tsp	4.75 tsp	7.25 tsp	9.5 tsp
90	1 tsp	2 tsp	4.25 tsp	6.33 tsp	8.5 tsp
100	1 tsp	2 tsp	3.75 tsp	5.75 tsp	7.66 tsp
120	0.75 tsp	1.5 tsp	3.0 tsp	4.75 tsp	6 tsp

### **Liquid Conversions**

3 teaspoons = 1 tablespoon

8 fl ounces = 1 cup

2 tablespoons = 1 fluid ounce

1 cup = 16 tablespoons

TBS = tablespoons

fl oz. = fluid ounces

<sup>&</sup>lt;sup>3</sup> Montana State University Extension Service, 2000. MontGuide MT 2000-14

<sup>&</sup>lt;sup>4</sup> Source: Bussan, et al, 2001-2002

<sup>&</sup>lt;sup>5</sup> tsp = teaspoons

**Example:** Assume that the calibration of your sprayer (Steps 1 – 5) yields an output of 30 GPA and your sprayer holds 3 gallons. Your herbicide label for the target weed species indicates a herbicide application rate of 1 pint/acre. Go to the chart and read across from 30 Gal. / A to the 1-pint column – the amount of herbicide to add per gallon is 3 tsp in the chart. Since your sprayer holds 3 gallons of total solution, you would add 9 tsp of herbicide in addition to the water in each tank.

### HAND-HELD SPRAYERS<sup>6</sup>

Hand-held sprayers are often used for spot treating patches of weeds or for treating small areas such as lawns. Spray coverage should be uniform and the leaves of the target plants should be wet but the amount of spray solution applied should be limited so that run-off does not occur. Hand-held sprayers should be calibrated by 1) spraying a known area using water and a standard and reproducible procedure, 2) measuring the amount of water applied, and 3) calculating gallons per acre (gpa).

For example, 0.75 gallon on 500 sq ft is the same as 65 gallons per acre:

43,560 sg ft per acre / 500 sg ft x 0.75 gallon = 65 gpa.

The desired rate in lb/A or pt/A can be used to calculate the amount of herbicide to add to the spray solution. If 3 pt/A is desired:

3 pt/A / 65 gpa = 0.046 pt or 0.73 fl oz or 1.5 Tbsp/gal of spray solution (16 fl oz = 1 pt, 2 Tbsp = 1 fl oz).

When calibration of a hand-held sprayer is not possible and the herbicide being used is safe to the environment and non-target plants, a volume of 50 to 70 gpa can be assumed. However, the actual volume applied can vary considerably with the type of sprayer, spray pressure, and technique of the applicator so calibration is strongly encouraged.

Some herbicide labels specify a percent solution for use in hand-held sprayers. The following chart provides mixing instructions to obtain solutions of varying percent concentrations on a volume/volume basis:

TABLE K - 4. VOLUME / VOLUME (V/V) BASIS

		%Concentration of Herbicide			
Desired Solution Volume	0.5	1.0	1.5	2.0	5.0
gallons	Amount of	Amount of herbicide to add, fl oz			
1	0.6	1.3	1.9	2.6	6.4
2	1.3	2.6	3.8	5.2	12.8
5	3.2	6.4	9.6	12.8	32.0
10	6.4	12.8	19.2	25.6	64.0
100	64.0	128.0	192.0	256.0	640.0

#### **ACTIVE INGREDIENT (A.I.) VERSUS ACID EQUIVALENT (A.E.)**

Labels on herbicide containers and instructions for mixing herbicides sometimes use units of herbicide active ingredient (a.i.) or acid equivalent (a.e.). The herbicide may be sold in different concentrations, but units of a.i. or a.e. provide standard measures, so the mixing instructions can apply in all cases. In order to follow these instructions, you will need to determine how many a.i. or a.e. are in an ounce, or quart or liter, of the concentrate on hand.

16 Tbls = 1 cup

1 fl oz = 30 mls

1 fl oz = 2 Tbls

The "active ingredient" (a.i.) of an herbicide formulation is responsible for its herbicidal activity or ability to kill or suppress plants. The a.i. is always identified on the herbicide label by either its common name or chemical name, or both. Herbicide formulations available for sale commonly contain other so-called "inert" compounds too.

1 pt = 16 fl oz

1 Tbls = 3 tsp

1 Tbls = 15 ml

<sup>&</sup>lt;sup>6</sup> NDSU 2005.

The "acid equivalent" (a.e.) of an herbicide is just the acid portion of the a.i., and it is this acid portion that is responsible for herbicidal effects. The acid portion (or parent acid) is generally associated with other chemical compounds to form a salt or an ester, which is more stable and better able to move through a plant's waxy cuticle, and into the plant. The salt or ester is the a.i.

Weak acid herbicides are formulated as salts or esters through the addition of a salt or ester molecular group to the parent acid molecule. This allows the herbicide acid to mix properly with adjuvants and enhances the compound's ability to move into plant tissue. Once the herbicide enters the plant, the salt or ester group is cleaved off the parent molecule, allowing the acid to affect the plant.

Because the salt or ester molecular group can vary dramatically in size, a measure of the percent a.i., especially in the case of a weak acid herbicide, does not adequately reflect the percentage of acid in the formulation. Thus, the a.e. is used to determine the amount of the product to be applied.

Product labels for weak acid herbicides will list the product's percentage of active ingredient, as well as other inert ingredients, at the top of the label. The percentage of acid equivalent in the formulation is usually listed below these percentages in a separate table or paragraph.

TABLE K - 5. PINTS OF COMMERCIAL PRODUCT NEEDED PER ACRE

Pounds a.i./gallon of	Pounds of active ingredients per acre						
commercial product	1/4	1/2	1	2	3	10	
1.0	2	4	8	16	24	80	
2.0	1	2	4	8	12	40	
3.0	2/3	1 1/3	2 2/3	5 1/3	8	26 2/3	
3 .34	3/5	1 1/5	2 2/5	4 4/5	7 1/5	24	
4.6	1/2	1	2	4	6	20	
6.0	1/3	2/3	1 1/3	2 2/3	4	13 1/3	

#### **AQUATIC WEED CALCULATIONS**

Some herbicides, such as those for control of emergent plants, are applied on the basis of the area to be treated. Others, such as those used to control certain submerged weeds, are applied on the basis of the volume of water to be treated. For aquatic weed control, the volume of water and/or area to be treated must be determined accurately. Chemical application rates are provided on the label in either an amount to apply per surface acre or per acre-foot of water. One acre is a surface area measurement of 43,560 square feet. An acre-foot is one acre of water one foot deep. To determine acre-feet of water, multiply the surface area in acres by the average depth in feet.

TABLE K - 6. SURFACE AREA CALCULATIONS

TABLE IT 6: CONTACE AIREA CALCOLLATIONS				
AREA DESCRIPTION	EXAMPLES			
CIRCLE = 3.14 x radius <sup>2</sup>	EXAMPLE: a pond radius 85 feet x 85 x 3.14 = 22686.5 square feet total surface area (/ 43,560 = 1/2 acre surface area)			
RECTANGLE = length x width	EXAMPLE: a pond length 145 feet x width of 75 feet = 10,875 square feet total surface area (/ 43,560 = 1/4 acre surface area)			
TRIANGLE = (base x height) / 2	EXAMPLE: a pond base of 100 feet x height of 50 feet = 5,000 square feet / 2 = 2,500 square feet total surface area (/ 43,560 = 1/10 acre surface area)			
<b>OVAL</b> = length x width x 0.8	EXAMPLE: a pond length of 200 feet x width of 90 feet x 0.8 = 14,400 square feet total surface area (/ 43,560 = 1/3 acre surface area)			

#### **CONVERSION FACTORS**

#### **Liquid Conversion Factors**

1 gallon = 4 quarts or 8 pints or 3,785 cc or 128 fluid ounces 1 quart = 2 pints or 4 cups or 946 cc or 32 fluid ounces 1 pint = 2 cups or 473 cc or 16 fluid ounces 1 cup = 16 tablespoons or 236.5 cc or 8 fluid ounces 1 tablespoon = 3 teaspoons or 15 cc or 0.5 fluid ounces

2 tablespoons = 1 fluid ounce

#### **Weight Conversion Factors**

1 pound = 16 ounces or 454 grams 1 ounce = 28.4 grams or 30 cc

#### **Plot Size Factors**

1 rod = 16.5 feet

1 square rod = 16.5 X 16.5 feet or 272 square feet

1 acre = 160 square rods 1 acre = 43,560 square feet

#### **Application Factors**

1 cup per square rod = 10 gallons per acre 1 pint per square rod = 20 gallons per acre 1 quart per square rod = 40 gallons per acre 1 gallon per square rod = 160 gallons per acre

### TABLE K - 7. METRIC CONVERSIONS<sup>7</sup>

Symbol	When you know	Multiply by	To Find	Symbol
lb	pounds	0.45	kilograms	kg
pt	pints	0.47	liters	I
qt	quarts	0.95	liters	I
OZ	ounces	30.0	milliliters	ml
Α	acres	0.4	hectares	ha
ha	hectares	2.5	acres	Α

 $<sup>^{7}</sup>$  Conversions in this metric guide are pounds per acre to kilograms per hectare **Example:** 2 lb/A to kg/ha = 2 x 0.45 = 0.90 kg/A x 2.5 = 2.25 kg/ha

TABLE K - 8. COMMON UNIT CONVERSIONS AND ABBREVIATIONS

TABLE K - 8. COMMON UN		
Multiply	By	To Get
Acres	0.4047 4047	Hectares (ha)
Acres	4840	Square Meters (m2)
Acres	43,560	Square Yards Square Feet
Acres	1728	Cubic Inches
Cubic Feet	0.037	Cubic Yards
Cubic Feet	7.481	Gallons
Cubic Feet		Pints
Cubic Feet Cubic Feet	59.84 29.92	
Cups	8	Quarts Ounces
Cups	16	Tablespoons
Cups	48	
Gallons	3.785	Teaspoons Liters (L)
Gallons	128	Ounces
Gallons	8	Pints
Gallons	4	Quarts
Gallons per Acre (gal/acre)	9.34	Liters per Hectare (L/ha)
Grams (g)	0.001	Kilograms
Grams (g)	1000	Milligrams
Grams (g)	0.035	Ounces (oz)
Grams per Liter (g)	1000	Parts per Million
Hectares (ha)	2.47	Acres
Inches (in)	2.54	Centimeters (cm)
Kilograms (kg)	1000	Grams (g)
Kilograms (kg)	35.274	Ounces (oz)
Kilograms (kg)	2.2046	Pounds (lb)
Kilograms per hectare (kg/ha)	0.892	Pounds per Acre (lb/acre)
Kilometers (km)	0.6214	Miles (mi)
Liters (L)	1000	Cubic Centimeters (cm3)
Liters (L)	0.2642	Gallons (gal)
Liters (L)	33.814	Fluid Ounces (oz)
Meters (m)	100	Centimeters
Meters (m)	3.281	Feet
Meters (m)	0.001	Kilometers
Meters (m)	39.37	Inches
Meters (m)	1.094	Yards
Miles (mi)	1.609	Kilometers (km)
Miles (mi)	5280	Feet
Miles (mi)	1760	Yards
Miles per Hour (mi/hr)	44.70	Centimeters per Second (cm/sec)
Miles per Hour (mi/hr)	88	Feet per Minute
Miles per Hour (mi/hr)	1.467	Feet per Second
Miles per Minute	88	Feet per Second
Miles per Minute	60	Miles per Hour
Milligrams (mg)	0.000035	Ounces (oz)
Milliliters (ml)	0.0338	Ounces (oz)
Ounces (oz) - dry	0.063	Pounds
Ounces (oz) - liquid	0.063	Pints
Ounces (oz) - liquid	0.031	Quarts
Ounces (oz) - liquid	480	Drops
Ounces (oz) - liquid	29.573	Milliliters (ml)
Ounces (oz) - liquid	0.02957	Liters
Ounces (oz) - liquid	29.5735	cubic centimeters (cm3)
Ounces (oz)	2	Tablespoons
Ounces (oz)	6	Teaspoons
Ounces (oz)	28.3495	Grams (g)
Ounces per acre (oz/acre)	70.1	Grams per Hectare (g/ha)
Ounces per Acre (oz/acre)	0.0701	Kilograms per Hectare (kg/ha)
Parts per Million	0.001	Grams per Liter
Parts per Million	0.05842	Grains per Gallon
Parts per Million	1	Milligrams per Liter
Parts per Million	0.0001	Percent
Parts per Million	1	Milligram per Kilogram
Pints	0.125	Gallons
Pints	0.473	Liters
Pints	2	Cups
		1 2000

Multiply	Ву	To Get
Pints - liquid	16	Ounces - liquid
Pints - liquid	0.5	Quarts - liquid
Pounds (lb)	16	Ounces
Pounds (lb)	0.01	Hundredweight (CWT)
Pounds (lb)	453.6	Grams (g)
Pounds (lb)	0.4536	Kilograms (kg)
Pounds per acre (lb/acre)	1.121	Kilograms per hectare (kg/ha)
Pounds per acre (lb/acre)	112.1	mg/square meter (mg/m2)
Pounds per acre (lb/acre)	11.21	μg/square centimeter (μg/cm 2)
Pounds per gallon (lb/gal)	119.8	grams per liter (g/L)
Pounds per gallon (lb/gal)	7.48052	Pounds per Cu. Foot
Quarts	2	Pints
Quarts	0.25	Gallons
Quarts	0.946	Liters
Quarts – liquid	32	Ounces - liquid
Quarts – liquid	2	Pints - liquid
Square centimeters (cm2)	0.155	Square inches (in2)
Square centimeters (cm2)	0.0001	Square meters (m2)
Square meters (m2)	10,000	Square centimeters (cm2)
Tablespoons	3	Teaspoons
Tablespoons	0.5	Ounces - liquid
Teaspoons	60	Drops
Teaspoons	0.33	Tablespoons
Teaspoons	0.1666	Ounces - liquid
Tons	907.185	Kilograms
Yards	0.9144	Meters

Note: All references to pounds and ounces refer to English units of measurement unless otherwise specified.

TABLE K - 9. BAND WIDTH (FT) DISTANCE REQUIRED TO TREAT ONE ACRE

Band width (ft)	Feet	Miles
1	43,560	8.25
2	21,780	4.13
3	14,520	2.75
4	10,890	2.06
5	8,712	1.65
10	4,356	0.8

- End of Appendix K -