

# ILLINOIS PESTICIDE APPLICATOR TRAINING

GENERAL STANDARDS

# CONTENTS

Chapter 1: Integrated Pest Management

Chapter 2: Understanding Pesticides

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Chapter 4: Human Pesticide Protection

Chapter 5: Pesticides in the Environment

Chapter 6: Application Equipment & Calibration

Chapter 7: Pesticide Laws & Regulations

*Relate these chapters to your everyday herbicide application*

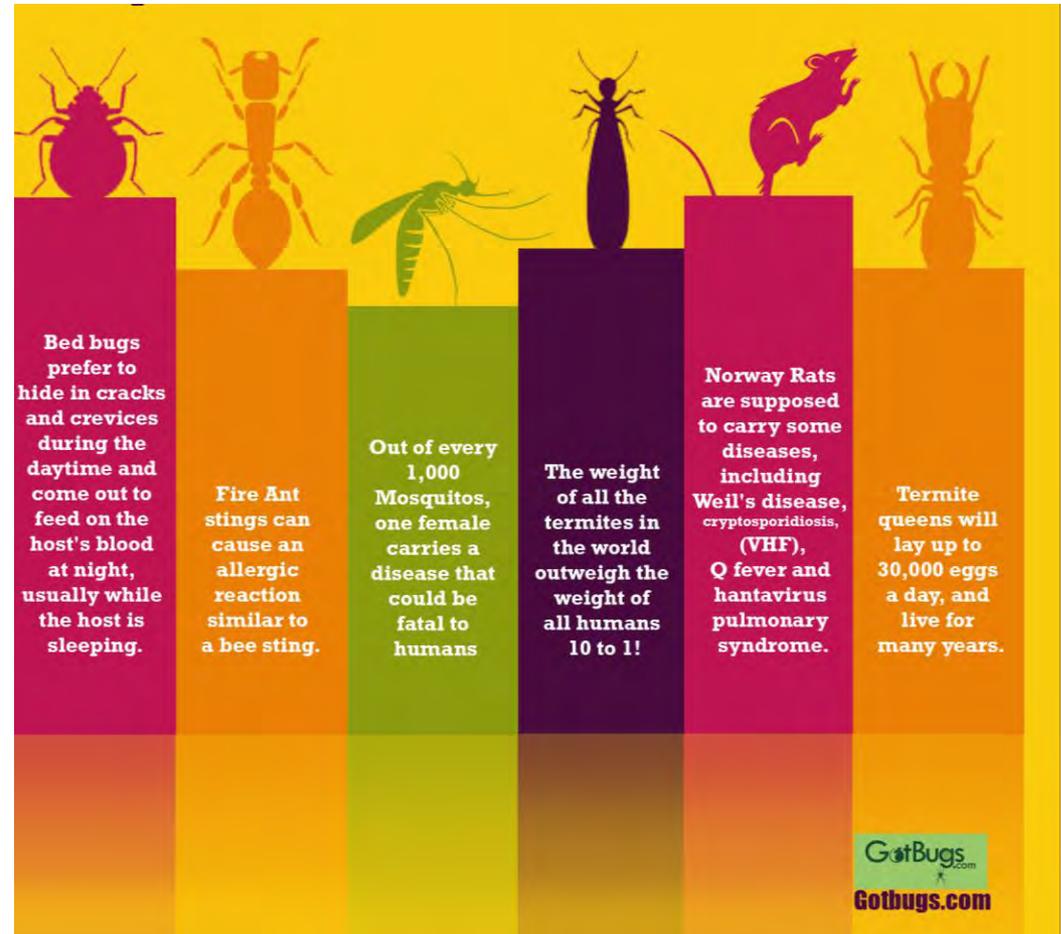
# CHAPTER 1: INTEGRATED PEST MANAGEMENT (IPM)



# What is a Pest?



- any insect, mite, rodent, weed, disease, etc.
- injurious to the health of humans, animals, plants or the environment



# Goal of Integrated Pest Management (IPM)

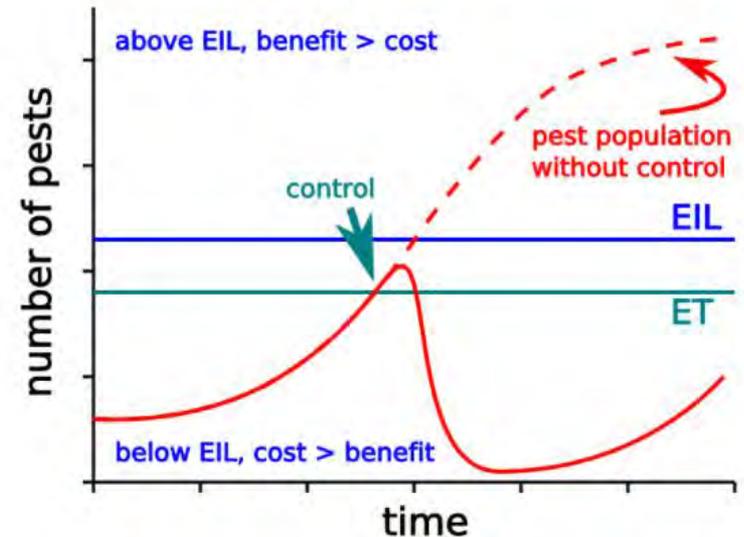
- ❑ Approach to plant protection that is recommended for efficient pest control with minimal environmental impact
- ❑ Goals to achieve:
  - ❑ keep pest below economic & aesthetic injury level
  - ❑ to avoid adverse effects on humans, wildlife & the environment
- ❑ Elimination of all pests is **not** the goal



# Economic Injury Level



- breakeven point at which
  - cost of pest control equals
  - revenue loss caused by pest
  - damage house your trying to sell

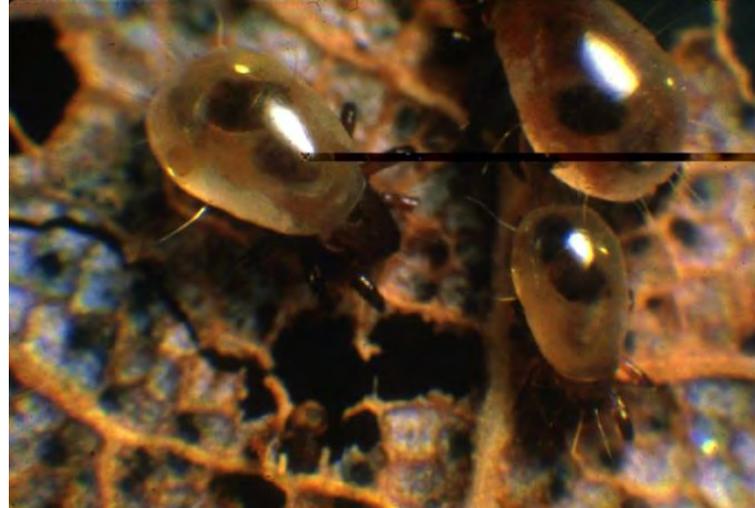


# Economic/Action threshold

- the number of pests per plant or amount of damage to plant at which control measures should begin

If control applied  
the pest population  
should not reach  
economic injury level

(aphids)



# Aesthetic injury level

- the number of pests that might cause enough damage to the appearance of a plant to warrant the cost of control
- based on Appearance

*What is acceptable at the FPCC might not be the same at the Chicago Botanic Garden*



# Pest Identification before treatment

- Key to successful IPM program is scouting
  - Regular monitoring of pest population & plant conditions
    - Properly identification of pest is essential *prior* to treatment
    - Properly diagnose disease symptoms in order to effectively treat



# 5 types of control methods (IPM)

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1. **Cultural**
2. **Mechanical**
3. **Biological**
4. **Chemical**
5. **Preventative**

In most cases an IPM approach is the most efficient & environmentally safe approach

# Cultural control

- Improves crop health, increases ability to compete better against pests
  - Crop rotation (corn/soybean)
  - Mulching
  - Smother crops (oats, grass or groundcover)
  - Host plant resistance
  - Manipulating planting/ harvest dates
  - Planting rates & row widths



Figure 28



# Mechanical control

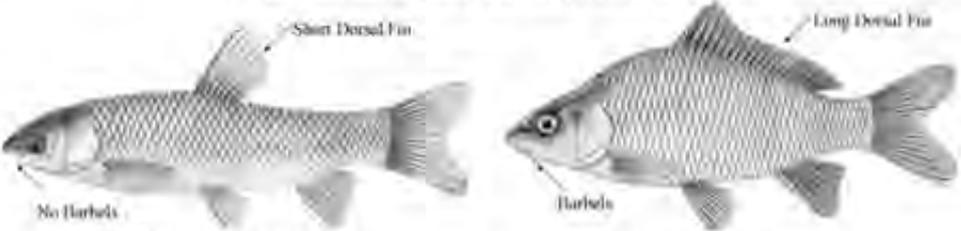
- physical elimination of pest (pulling, cutting, etc.)
  - ▣ Pruning
  - ▣ Weeding
  - ▣ Hoeing
  - ▣ Hand picking insects
  - ▣ Mowing
  - ▣ Bury or burning



# Biological control

- using living organisms to reduce pests to economically acceptable levels
- Beneficial organisms that are natural enemies of the pest
- Or diseases
- Weed eating fish
- Purple Loosestrife beetles

THIS WATERBODY IS STOCKED WITH  
**STERILE TRIPLOID GRASS CARP**  
FOR THE CONTROL OF AQUATIC WEEDS



The image shows two fish side-by-side. The fish on the left is a Triploid Grass Carp, characterized by a short dorsal fin and no barbels. The fish on the right is a Common Carp, characterized by a long dorsal fin and barbels.

**Triploid Grass Carp**      **Common Carp**

State Law Section 50-13-1630(D): It is unlawful to take grass carp from waters stocked as permitted by this section. Grass carp caught must be returned to the water immediately. Any bow hunting of grass carp will be classified as "take".

SCDNR  
Aquatic Nuisance Species Program



DNR

# Chemical control

- using chemical agents to reduce pests
- at proper time using scouting techniques

## **Before using pesticide consider:**

- Other effective nonchemical controls
- Has scouting indicated the pest population large enough to warrant control?
- Is this the correct time to apply for optimal control?



<https://www.thesca.org/connect/blog/behind-scenes>

# Preventative control



- To prevent entry & spread of pests
  - Prevents spread by seed or plant parts
    - Clean equipment for weed seeds before leaving infested site
  - Stopping spread of insects, larvae & eggs
    - Quarantines

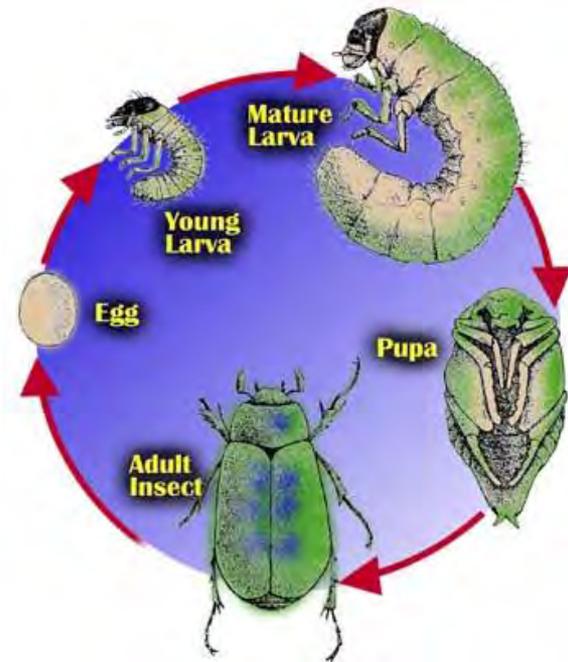


# Pesticide failure

- Can be caused from:
  - Applying wrong type of pesticide or wrong application rate
  - Applying when pest is not in susceptible stage
  - Not applying the pesticide to the part of the plant or animal where the pest is located
  - Applying a pesticide to a resistant pest population

# Important to identify pests & their life cycles

- Many people think that all insects are pests
- Most insects are a beneficial part of ecology
  - ▣ Predators or parasites of other insects
  - ▣ Very important for pollination
- Proper identification
  - ▣ understand if injurious or not to the plant
  - ▣ if the pest is susceptible or not susceptible to control
- Proper plant & insect ID is important
  - ▣ identify insect & lifecycle
  - ▣ identify plant found on



# Insects

- ❑ Have an outside exoskeleton
- ❑ Shape & number of body parts are used to properly identify
- ❑ As they grow they shed their exoskeleton & grow larger



# Adult insects

- 3 pairs of jointed legs
- 3 distinct body regions
  - Head
  - Thorax
  - Abdomen

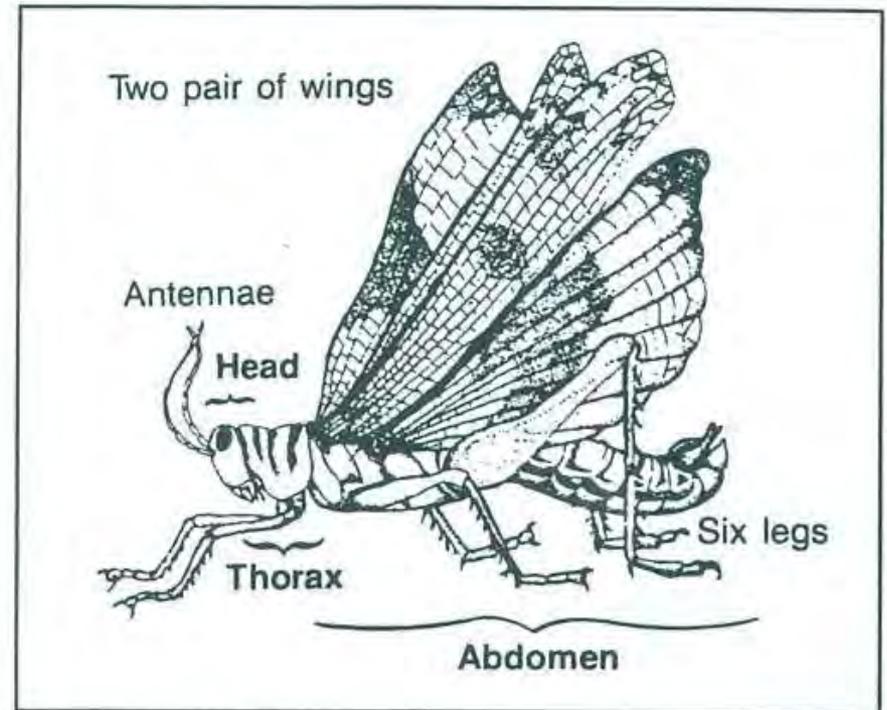


Figure 1.2 Adult insect.

# Incomplete development

- Some insects have simple metamorphosis
- 3 life stages- eggs, nymph, adult

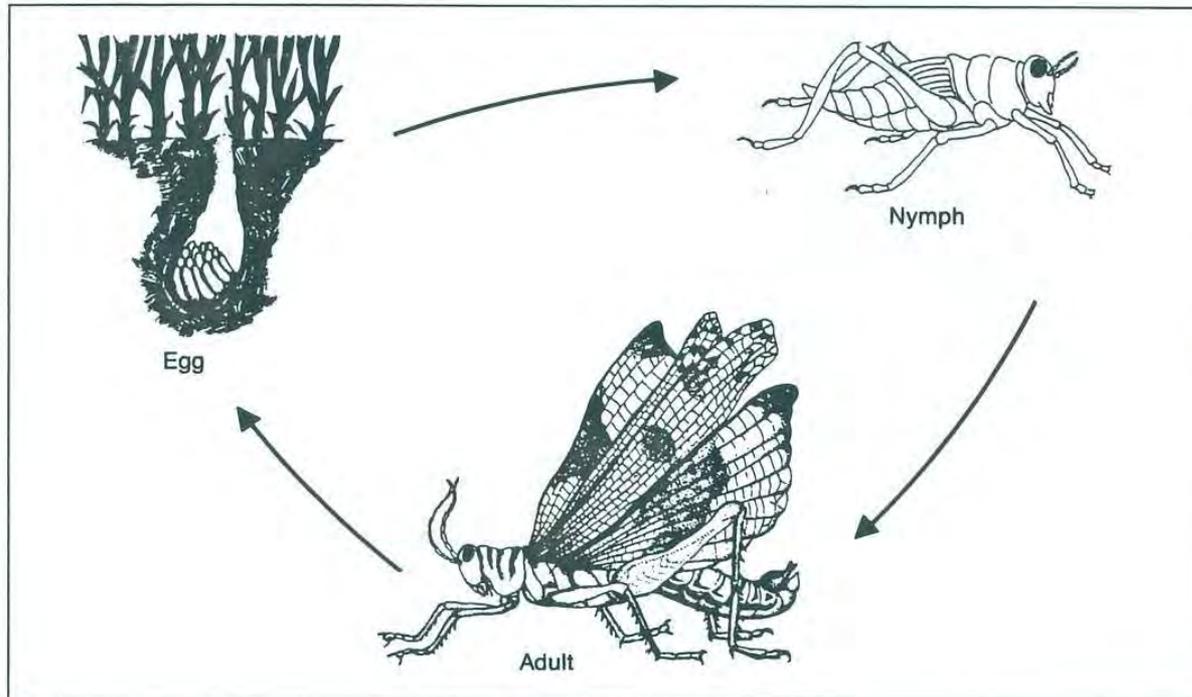


Figure 1.4 Incomplete development: three-stage life cycle.

# Complete development

- 4 life stages- eggs, larvae, pupae, adults
- Pupae- resting stage when it does not eat & not very active

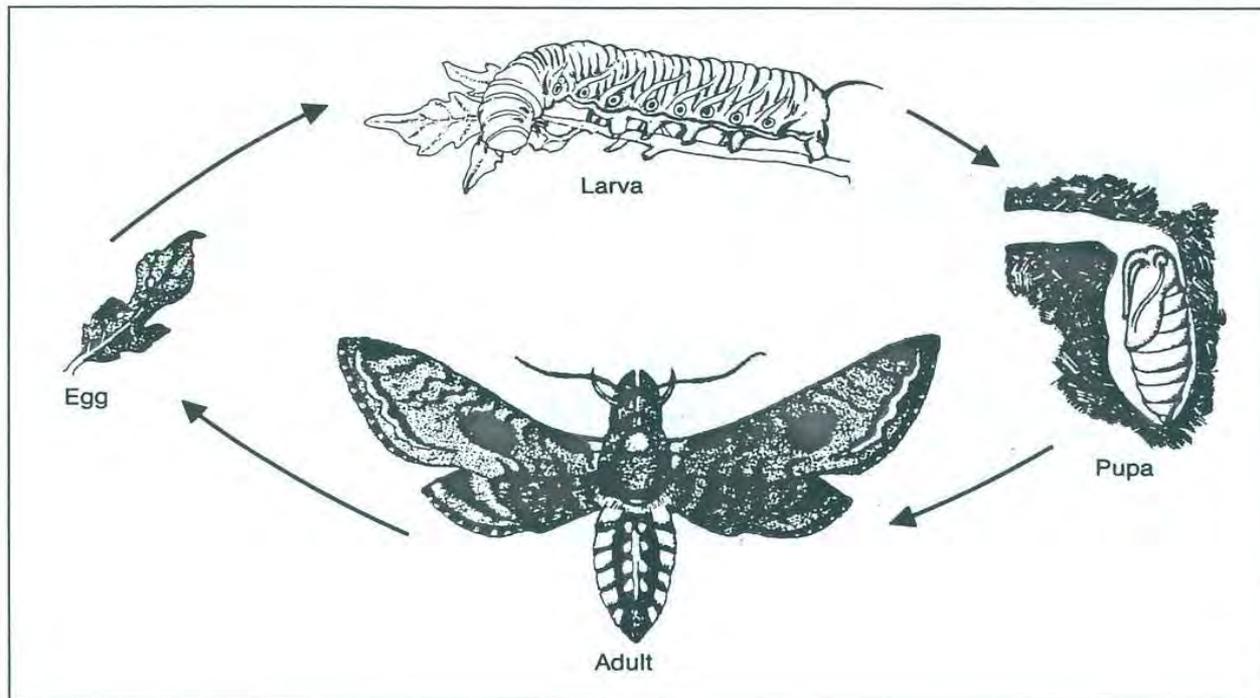
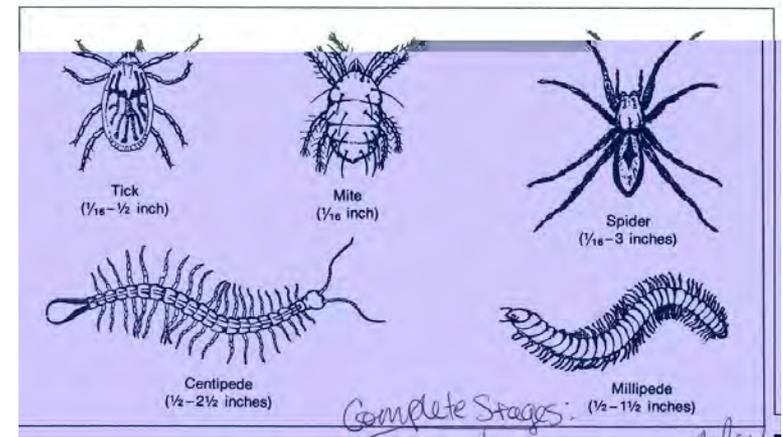


Figure 1.5 Complete development: four-stage life cycle.

# Insect Relatives

- Mites- are spiderlike and as adults have 4 pairs of jointed legs
- Spiders- have 4 pairs of legs and 2 distinct body regions
- Crustaceans- sowbugs & pillbugs with 7 pairs of legs (feed on decaying organic matter)



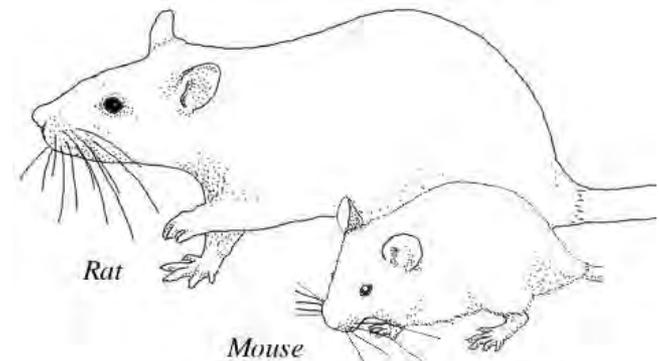
# Mammals & Bird Pests-

- All birds are protected under the law except non-native birds- starlings, feral pigeons, and house sparrows



<http://www.outdooralabama.com/watchable-wildlife/images/european%20starling.jpg>

- All mammals are protected by law except for rats, mice and ground squirrels.



# Plant Pathology-

- Is the study of plant diseases
- Plant considered diseased when:
  - ▣ differs from a normal plant in appearance, structure or function
- 2 types of plant diseases:
  - ▣ Non-infectious
  - ▣ Infectious



# Noninfectious diseases

- ❑ Cannot be transferred from pest to pest or plant to plant
- ❑ Often a result of unfavorable growing conditions
  - ❑ Temperature
  - ❑ Moisture
  - ❑ Compaction
  - ❑ Pesticide misapplication
  - ❑ Air pollution



# Infectious diseases

- ❑ Multiply within the host
- ❑ Can be transferred from plant to plant
- ❑ Caused by pathogens or living organisms
  - ❑ Fungi
  - ❑ Bacteria
  - ❑ Nematodes
  - ❑ Viruses
  - ❑ Phytoplasmas



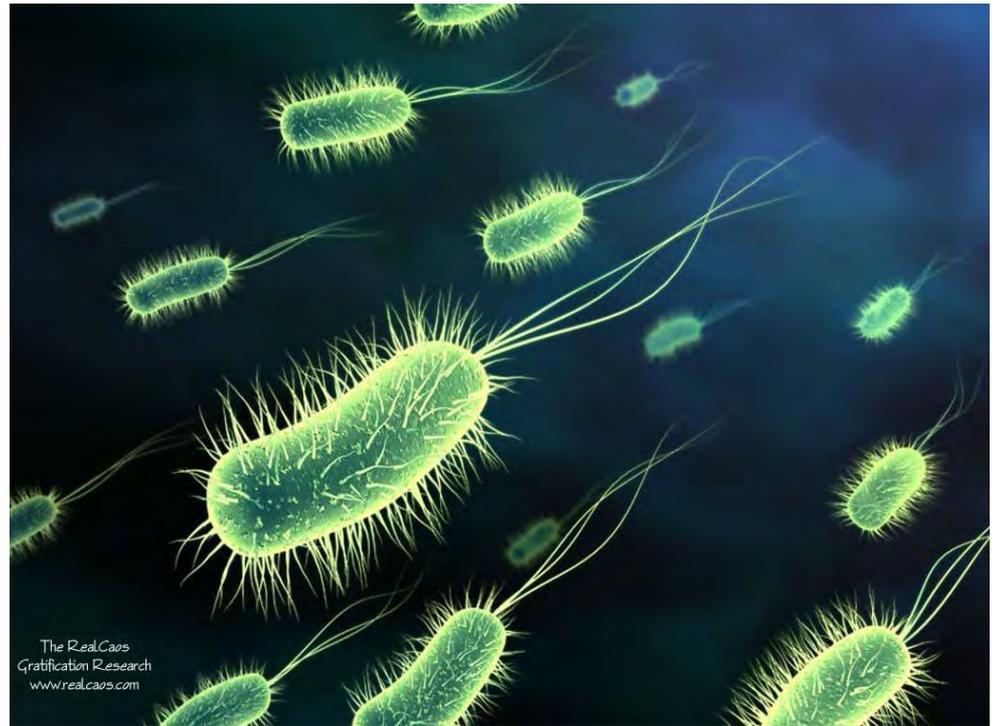
# Fungi

- Small multi-celled organisms that feed on waste materials
- Most are beneficial or harmless but some are pathogenic & leading culprits of plant diseases



# Bacteria

- Microscopic **single-celled** organisms
- Enter plants through wounds or natural openings



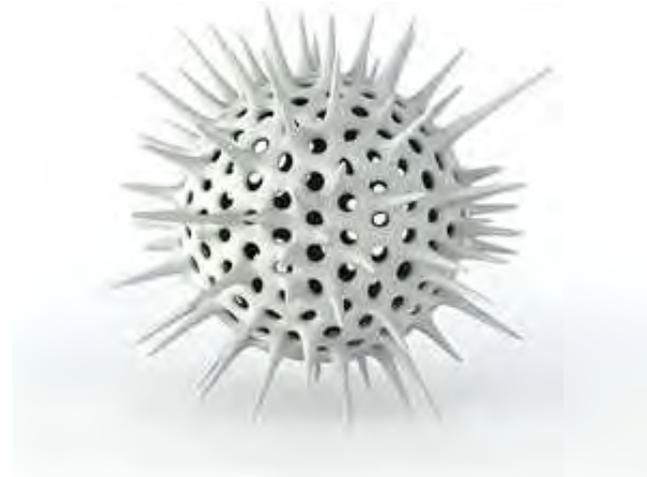
# Nematodes

- microscopic roundworms that live in or on soil
- feed in the roots of plants
- few are injurious



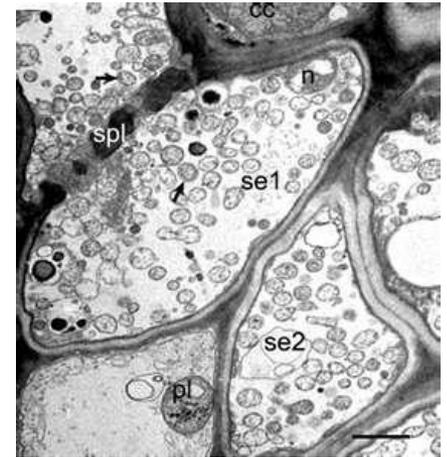
# Viruses

- submicroscopic pieces of DNA or RNA transmitted by sap-sucking insects
- **CANNOT** be controlled by pesticides



# Phytoplasma

- Bacteria-like organisms that lack cell walls
- transmitted by sap sucking insects or plant propagation
- CANNOT be controlled by pesticide



# Plant disease (common)

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- Condition when plant differs from normal healthy plant in appearance, structure or function
  
- Common signs of plant pathogens
  - wilting
  - yellowing
  - leaf spots
  - dropping leaves
  - necrosis

# 3 Common Plant Disease Examples

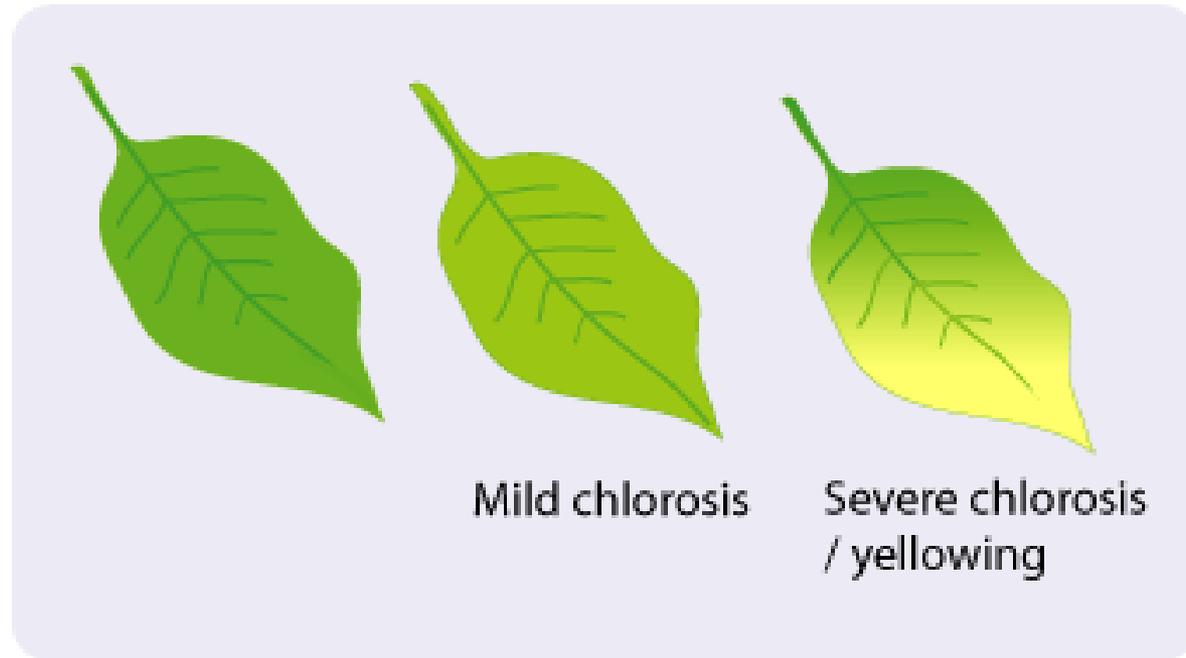
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- **Chlorosis**
- **Mosaic**
- **Gall**

*(see page 10 for additional examples)*

# Chlorosis

- is a yellowish-green coloration in normally green tissues such as leaves



# Mosaic

- an intermingling patch of green and yellow color on a leaf



# Gall

- An abnormal swelling in portion of a branch, leaf, root or bud- wasp

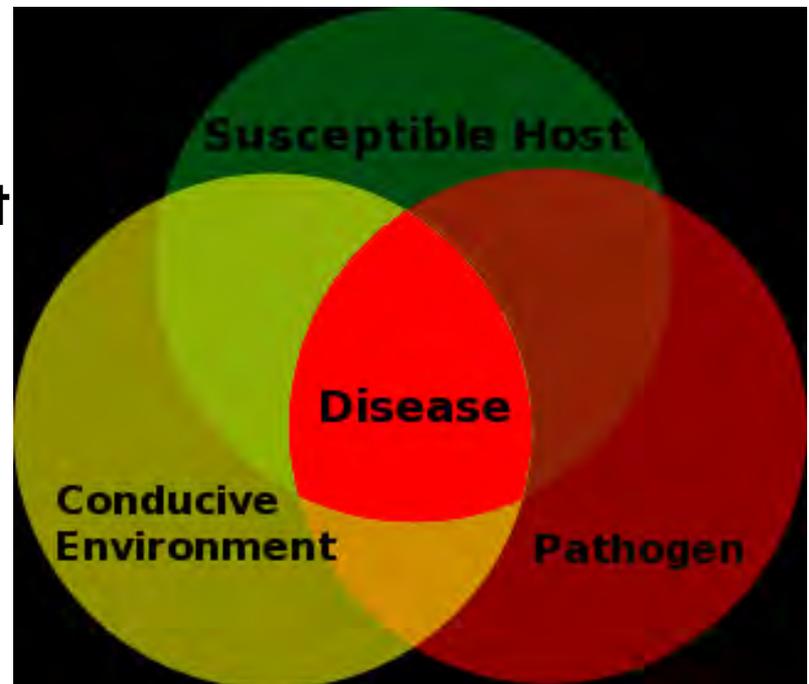


<http://www.hiltonpond.org/images/GallGoldenrodBall01.jpg>

# Development of Infectious Disease

4 elements necessary for the development of an infectious plant disease

- Susceptible host
- Plant Pathogen
- Favorable Environment
- Time



# Susceptible host

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- for a disease to occur a plant must be able to become infected by that type of pathogen
  
- Example Oak wilt, gall

# Plant Pathogen

- Microorganism capable of causing an infectious disease
- Often host-specific & can only infect a few species of plants



[http://nfrec.ifas.ufl.edu/paret/u-scout/Brassica/Pages/White\\_mold.html](http://nfrec.ifas.ufl.edu/paret/u-scout/Brassica/Pages/White_mold.html)



<http://shellyrush.blogspot.com/2013/09/why-should-i-care-about-germs.html>

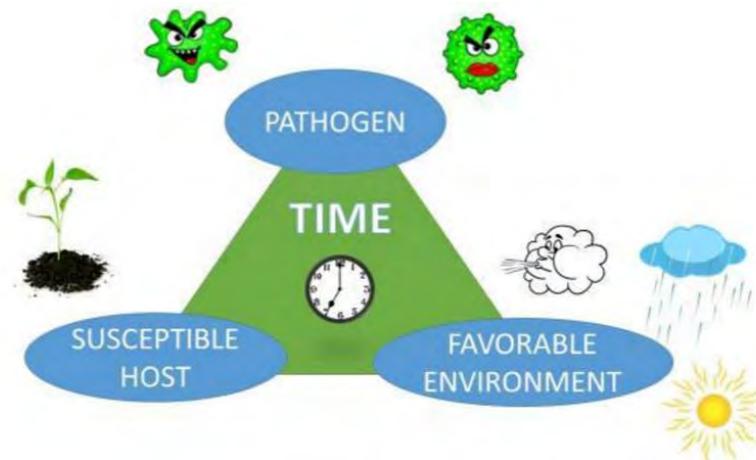
# Favorable Environment

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- Plant pathogens have certain temperature & moisture requirements
- In order to grow or enter plants
- Such as extra moisture susceptibility or drought

# Time

- Symptoms change over course of weeks or months
- Time for the disease to progress throughout the plant



# Weeds

- any plant growing where it is not wanted
- some are legally declared noxious
- first step in planning weed control is correct identification of the plant



[http://www.fcps.edu/islandcreekes/ecology/common\\_dandelion.htm](http://www.fcps.edu/islandcreekes/ecology/common_dandelion.htm)

# Weed classification

## □ Noxious

### ■ Declared so by Illinois law, must be controlled

- Common/ giant ragweed, marijuana, musk/ Canada thistle, johnsongrass, perennial sowthistle, sorghum-alum, & kudzu

## □ Exotic

### ■ Unlawful to buy, sell, offers for sale, distribute or plant

- Japanese honeysuckle, multiflora rose, purple loosestrife, common/ glossy buckthorn, japanese /dahurain buckthorn & kudzu

# 3 types of weeds

- Grasses
- Sedges
- Broadleaves



# Grasses and Grass-like weeds

- Parallel veins



# Broadleaf weeds

- Broadleaf plants- have **net-veined** leaves and are usually less elongated than grasses
- Broadleaf Weeds
- Trees and shrubs –  
*Drop leaves in fall w/  
persistent stems that  
overwinter*



# Life cycles of weeds

Plants are easiest to control when they are seedlings

- Annual weeds- complete life cycle in 1 year
- Biennial- complete life cycle in 2 years-
- Perennial- live longer than 2+ years
  - Most shed leaves in fall or above ground die back



# Life Cycles of Weeds- p. 14

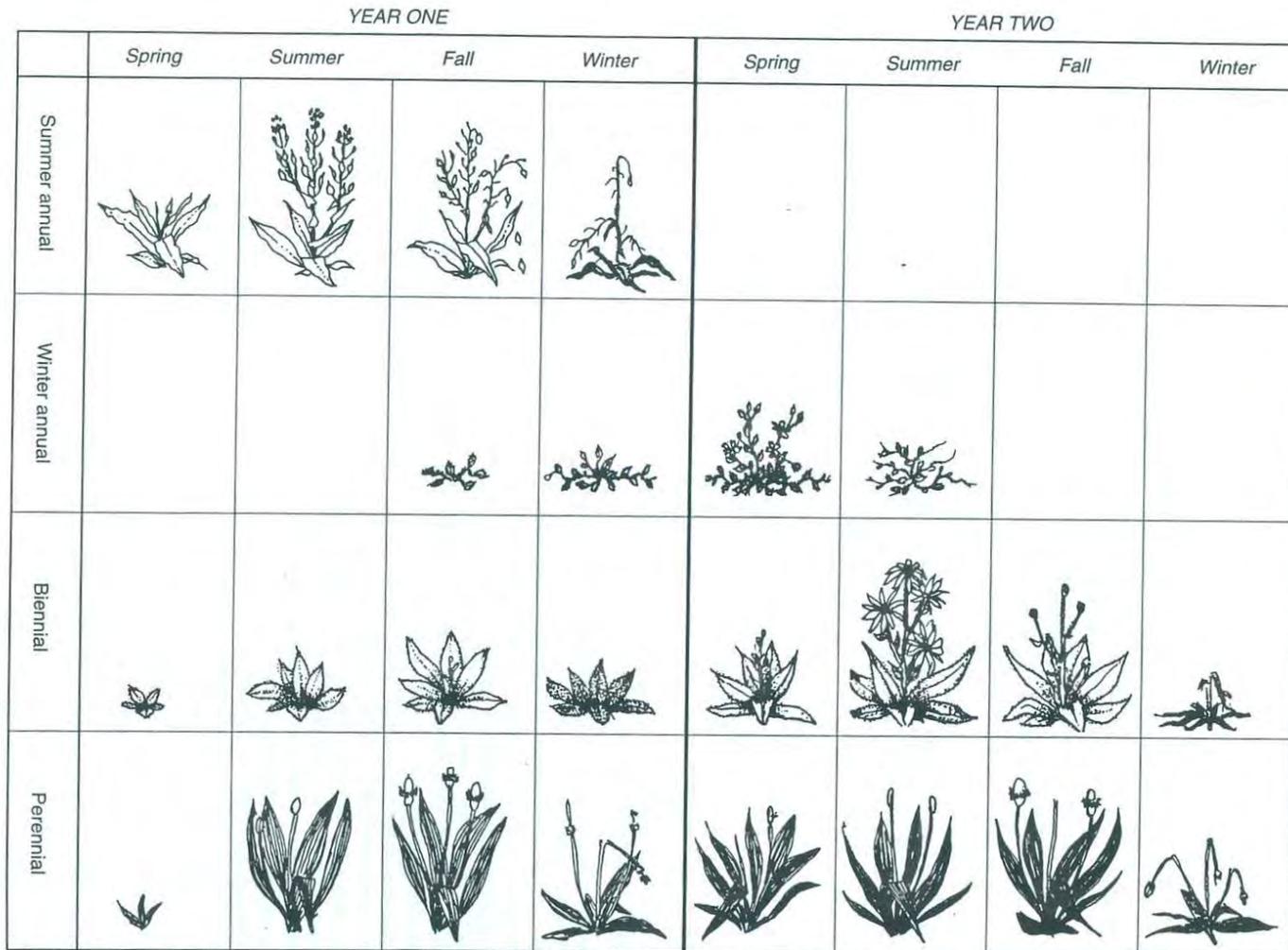


Figure 1.6. Weed life cycle.

Cycle repeats until plant dies.

# Sample Question

- What type of weed germinates in the spring, develops a root system and low growing cluster of leaves called a rosette?



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- What type of weed germinates in the spring, develops a root system and low growing cluster of leaves called a rosette?



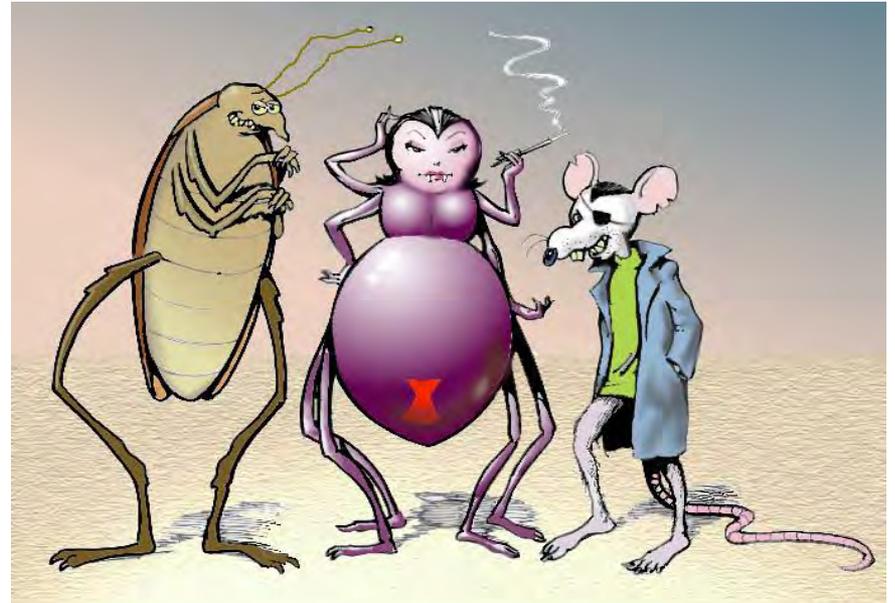
A Biennial weed

# CHAPTER 2: UNDERSTANDING PESTICIDES



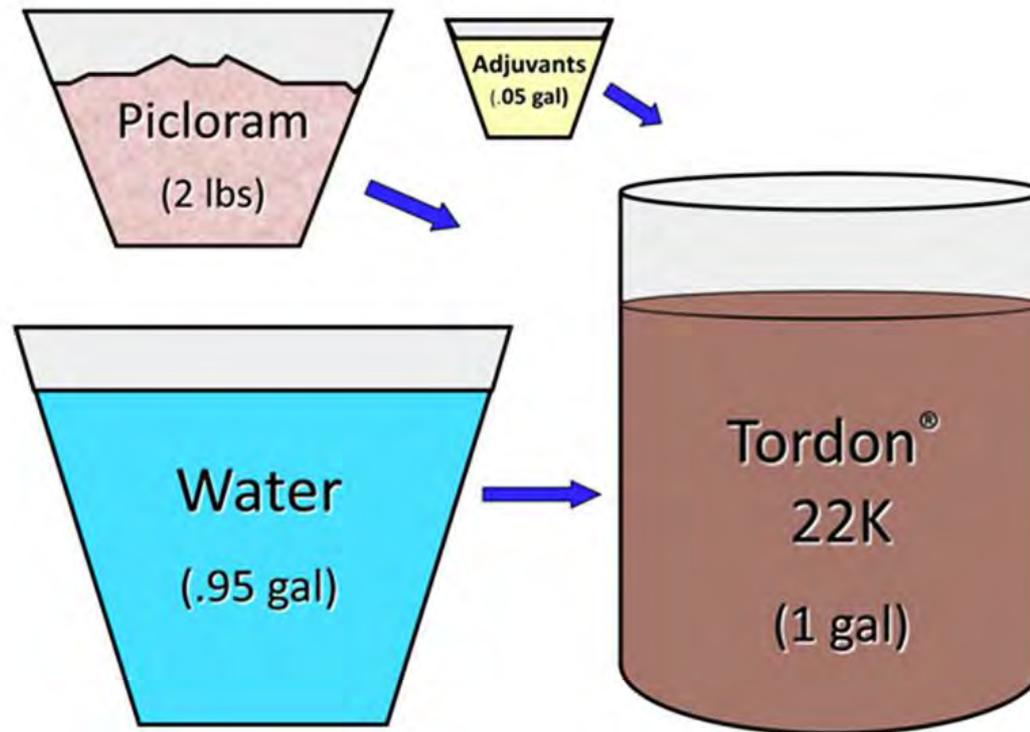
# What is a Pesticide?

- Any chemical used to destroy, prevent or control any form of life declared as a pest



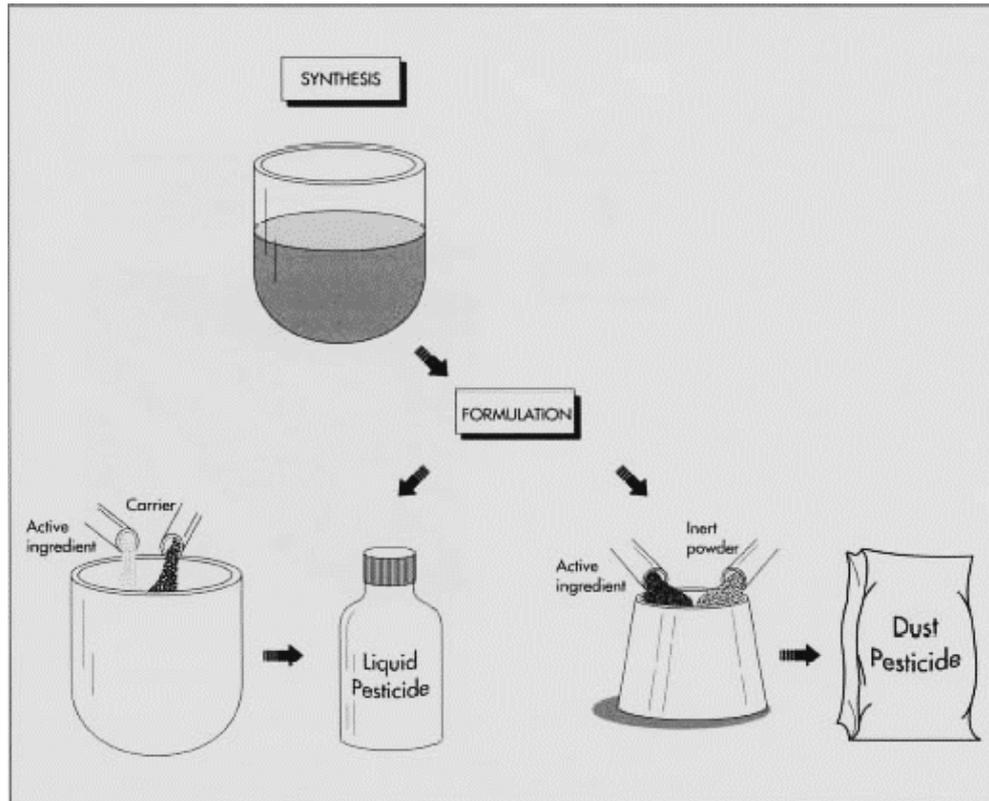
# Pesticide formulation

- Made up of **Active** and **Inert** ingredients



# Active ingredient (AI)

- The chemical effective against the pest
  - ▣ the part of the pesticide that kills



# Inert ingredients

- Don't directly harm pest but will make the Active ingredient more effective

**RESTRICTED USE PESTICIDE**  
FOR RETAIL SALE TO AND USE ONLY BY CERTIFIED APPLICATORS  
OR PERSONS UNDER THEIR DIRECT SUPERVISION AND ONLY  
FOR THOSE USES COVERED BY THE CERTIFIED APPLICATOR'S  
CERTIFICATION.

**ILLI-ON 1.5 EC**

FOR USE IN FIELD CORN AND SOYBEANS

**ACTIVE INGREDIENT:**

Illinate:Dimethyl zillate 0.0 dimethyl 2 (N-methyl ethyl propil, carbonyl).....	22.8%
<b>INERT INGREDIENTS .....</b>	<b>77.2%</b>
<b>Total.....</b>	<b>100.0%</b>

Contains 1 .5 pounds Illinate per gallon  
Net Contents 5 Gallons Liquid

EPA Reg. No. 123-4567-AA      Establishment No. 12345

For Emergency Assistance Call: 1-800-xxx-xxxx

**KEEP OUT OF REACH OF CHILDREN**

 **DANGER/¡PELIGRO!**   
**DANGER-POISON**

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

**SAMPLE PESTICIDE LABEL**

**Product Information**

Use classification [Restricted use]  
Trade or brand name [Illi-On]  
Formulation [1.5 EC]  
Common name [Illinate]

**Ingredients**

**Net contents of container**

**EPA registration number**

**Establishment number**

**Emergency phone number**

**Signal words:**

- Danger–Poison (high toxicity)
- Warning (moderate toxicity)
- Caution (low to very low toxicity)

# Herbicide Formulations

- may be ready to use as is or may require dilution with water or another carrier (oil or liquid)

## Dry formulations-

- 60WDG means 60% active ingredient water-dispersible granule (.6 pounds AI)

## Wet formulations

- 4EC means 4 lbs of active ingredient per gallon of emulsifiable concentrate

# Dry Formulations

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- Soluble powder (SP)
- Wettable powder (WP, P)
- Dry flowables or water-dispersible granules (DF, WDG)
- Granules (G)
- Pellets (P, PS)
- Dusts (D)

# Soluble powders (SP)- p.16

- are mixed with water and dissolve readily and form a true solution

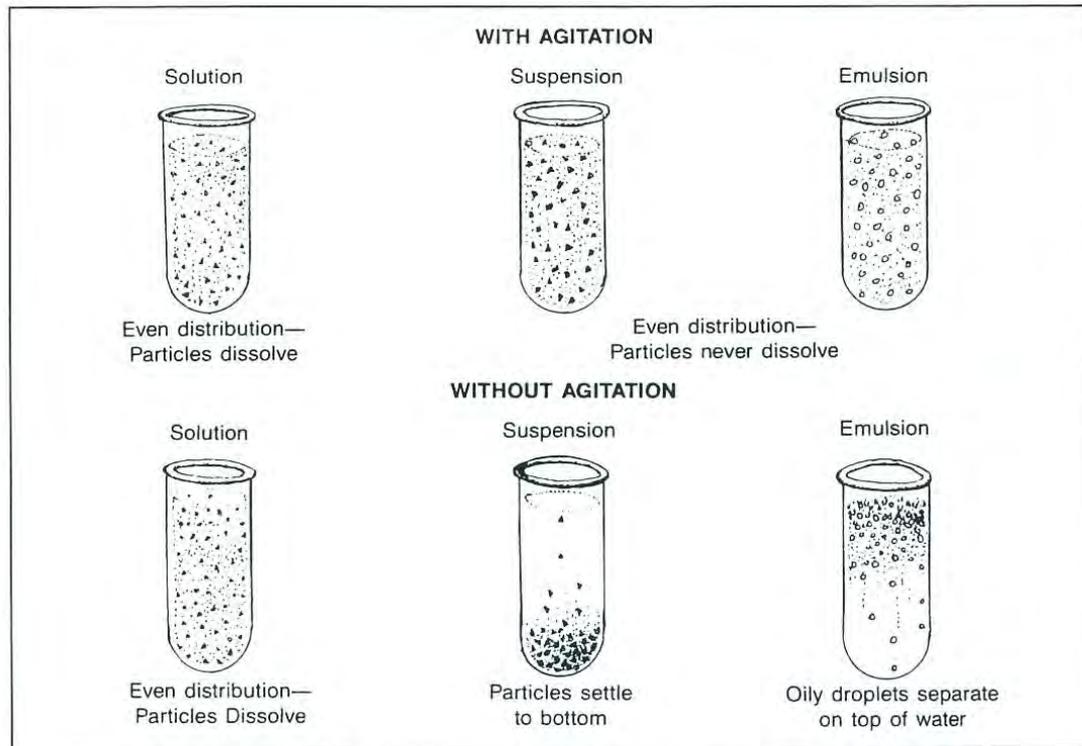


Figure 2.1 Differences among solutions, suspensions, and emulsions.

# Wettable powders (WP)

- Finely ground powder mixed with water to form a **suspension** and not a true solution
- are *ABRASIVE* to pumps and nozzles
- *Require agitation when mixed with water*
- *Also an inhalation hazard*



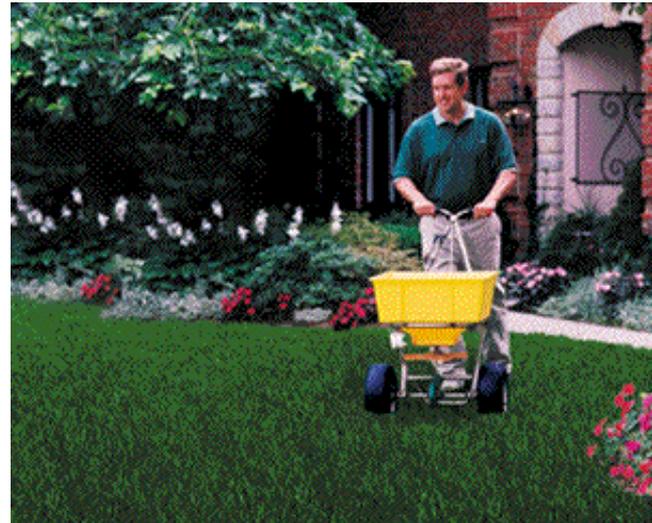
# Dry Flowables (DF) and Water-dispersible granules (WDG)

- Similar to wettable powders except the Active ingredient (AI) is formulated in a microgranule or granule instead of a powder
- Forms a suspension in liquid carrier – forms less dust than WPs



# Granules (G)

- Active ingredient is coated to make coarse particles such as clay, newspaper pellets.
- Granules are applied directly—no mixing with water
- Presents less hazard to handlers with little dust/no spray
- Sometimes called “Pellets (P)” but Ps are larger than Granules



# Dusts (D)

- Contain low percentage of AI on a very fine, dry inert carrier
  - Talc, chalk or clay
- Most ready to use as purchased
- Can present an inhalation hazard to handlers
- Likely to drift to non-target areas
  - Therefore use of these has decreased over the years

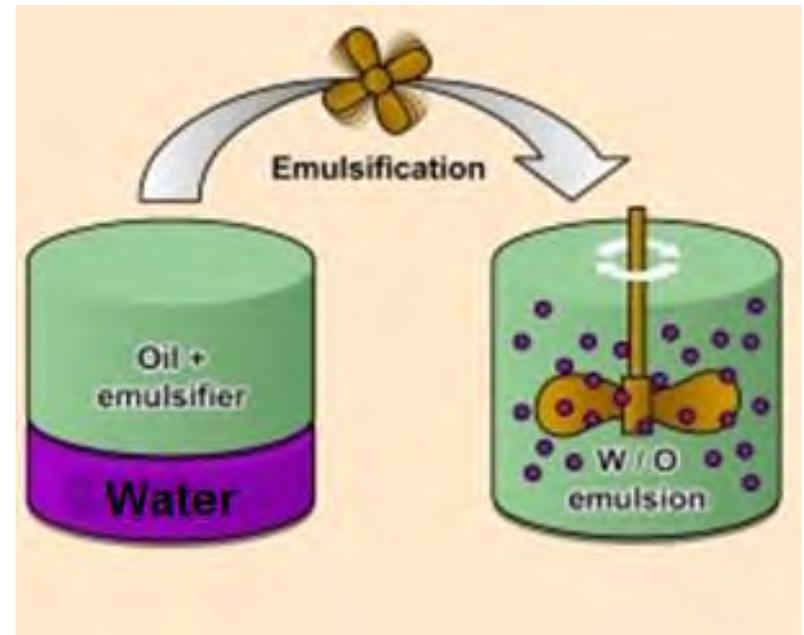
# Wet formulations

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- Emulsifiable concentrates
- Emulsions
- Microencapsulated
- Liquids or Flowables
- Solutions
- Ultra-low-volume concentrates (ULV)

# Emulsifiable concentrate (EC)

- Active ingredient is mixed with 1 or more solvents & emulsifier that allows mixing with water
- They are easily absorbed into the skin and create a dermal hazard

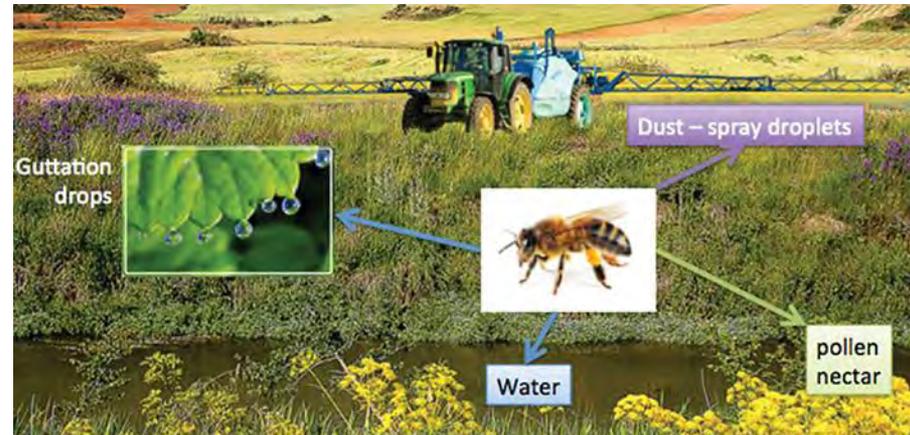


# Microencapsulated (ME)

- AI is surrounded by a capsule or coating that is suspended in a solvent or carrier- which results in time-released product
- *Require agitation when mixed with water*
  - *Use with special caution near bee hives, bees may carry it back to the hive & poison the entire colony*



<https://www.intechopen.com/books/beekeeping-and-bee-conservation-advances-in-research/impacts-of-pesticides-on-honey-bees>



# Solutions (S)

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- Form true solutions when mixed according to label
  - will not settle out or separate

# Ultra-low volume concentration (ULV)

- have high % of active ingredient in solution with a solvent- *usually oil*



# Fumigants

- substances or mixtures that produce
  - ▣ gas, vapor, fumes or smoke intended to control a pest
- Special Licensing is required to handle most fumigants
- highly toxic to humans & animals

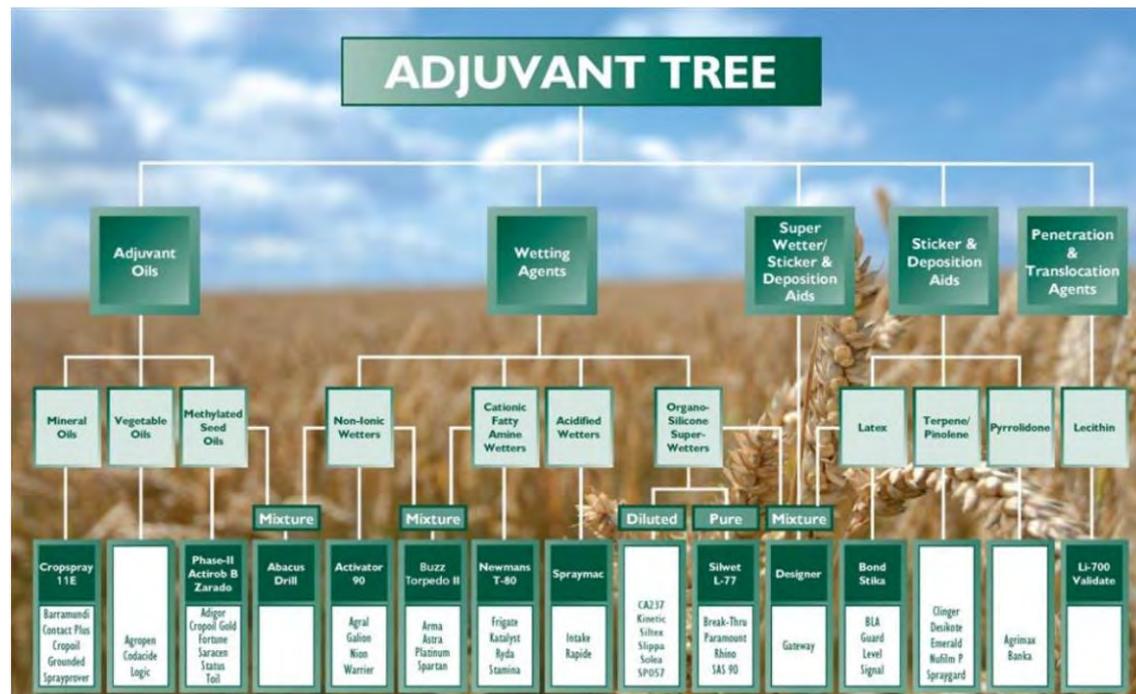


# Restricted Use Pesticides

- Can only be purchased by:
- **Certified Applicators or persons under their direct supervision**
- Records of restricted pesticide applications must be maintained for 2 years

# Adjuvant

- Chemical that modifies pesticide physical properties or enhances its performance or both
- Includes spray modifiers



# Drift reduction additives

- Thickening agents that increase droplet size & reduce the amount of spray drift
- To reduce drift droplets must be over 200 microns



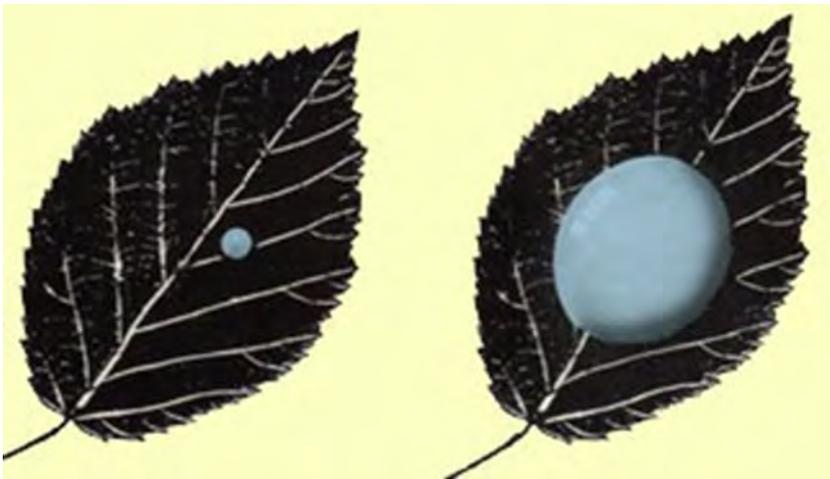
# Sticker

- used to increase the adherence of the chemical to the surface



# Surfactant or Spreader- p. 19

- added to spread the spray mixture more thoroughly over the target plant or insect
- decreases the surface tension of water
- allowing the water carrier to spread over the leaf surface



# Buffering Agent

- Adjuvants used to reduce pesticide inactivation due to the pH of the spray carrier



# Penetrants

- help pesticide pass through the outer surface of the plant—through the waxy coating on leaves



# Defoaming agents

- eliminate foam in the spray tanks, especially when agitation is necessary



<http://www.silicone.jp/e/products/type/defoaming/images/image1.jpg>

# Mixing of pesticides

- By Law it is your responsibility
  - Ensure that pesticides retain their properties if you mix them together
  - They do not change toxicity or other physical properties when combined.
- It is *illegal* to mix pesticides with other products that are prohibited on the label

# Chemical Incompatibility

- **Antagonism:** Decreased activity or effectiveness
- **Synergism:** Increased pesticide activity (can be good, can be bad)

*\*\*Cannot tell if pesticides are chemically incompatible by mixing alone\*\**

# Physical Incompatibility

- Some pesticides cannot be physically mixed together
- Can result from improper mixing or inadequate agitation
- Signs of incompatibility
  - Upon mixing 2 or more pesticides they may curdle, gel or become sludge-like
- Must perform a jar compatibility test to check prior to placing in tanks

# Proper mixing order: p. 20 2<sup>nd</sup> paragraph on right

*(from hardest to dissolve to easiest)*

- 1) fill tank  $\frac{1}{4}$  -  $\frac{1}{2}$  with carrier and agitate
- 2) add compatibility agent (if needed)
- 3) add suspension products
  - First dry: (WP, DF, WDG)
  - Second liquids: (F, L, ME)
- 4) add emulsion products (EC)
- 5) add solution products (S, SP)
- 6) add surfactants and penetrants (if needed)
- 7) Finish filling tank with carrier

# Mixing Order

oil on the surface, nor fine particles that precipitate to the bottom, nor thick (clabbered) texture. If the spray solution is not compatible, repeat the compatibility test with the addition of a suitable compatibility agent. If the solution is then compatible, use the compatibility agent as directed on its label. If the solution is still incompatible, **DO NOT** mix the ingredients in the same tank.

## Mixing Order

- 1) **Water.** Begin by agitating a thoroughly clean sprayer tank three-quarters full of clean water.
- 2) **Agitation.** Maintain constant agitation throughout mixing and application.
- 3) **Inductor.** If an inductor is used, rinse it thoroughly after each component has been added.
- 4) **Products in PVA bags.** Place any product contained in water-soluble PVA bags into the mixing tank. Wait until all water-soluble PVA bags have fully dissolved and the product is evenly mixed in the spray tank before continuing.
- 5) **Water-dispersible products** (such as **Marksman® herbicide**, dry flowables, wettable powders, suspension concentrates, or suspo-emulsions).
- 6) **Water-soluble products.**
- 7) **Emulsifiable concentrates** (such as oil concentrate when applicable).
- 8) **Water-soluble additives** (such as AMS or UAN when applicable).
- 9) **Remaining quantity of water.**

Maintain constant agitation during application.

- lachlor)
- **Dual Magnum®** (s-metolachlor)
- **Eradicane®** (EPTC)
- **Exceed®** (primisulfuron + prosulfuron)
- **Express®** (thifensulfuron + tribenuron-methyl)
- **Extrazine® II** (cyanazine + atrazine)
- **Fallow Master®** (glyphosate + dicamba)
- **Field Master®** (acetochlor + atrazine + glyphosate)
- **Frontier®** (dimethenamid)
- **Prowl™** (pendimethalin)
- **Python™** (flumetsulam)
- **Ramrod®** (propachlor)
- **Roundup Ultra®** (glyphosate)
- **Roundup Ultra RT** (glyphosate)
- **Spirit™** (primisulfuron + prosulfuron)
- **Stinger®** (clopyralid)
- **Surpass®** (acetochlor)
- **Sutan®** + (butylate)
- **TopNotch®** (acetochlor)
- **Touchdown®** (sulfosate)
- **Tough®** (pyridate)
- 2,4-D

See section **VI. Crop-specific Information** for more details. Read and follow the applicable **Restrictions and Limitations** and **Directions For Use** on all products involved in tank mixing. The most restrictive labeling applies to tank mixes.

**Marksman** may also be used in tank mixtures with foliar applied insecticides including synthetic pyrethroids such as **Ambush®, Asana®, Pounce®** and **Warrior®** insecticides or with the carbamate insecticide **Furadan®**. **DO NOT** apply **Marksman** in tank mixtures with **Lorsban®** insecticide.

Physical incompatibility, reduced weed control, or crop injury may result from mixing **Marksman** with other pesticides (fungicides, herbicides, insecticides, or miticides), additives, or fertilizers. BASF does not recommend using tank mixes other than those listed on BASF labeling. Local agricultural

Some labels have  
Mixing Order  
process stated on  
the label, i.e.  
Marksmen pg. 7

# Sample Question

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- Which of the following would you add to the tank first?

**Wettable Powder (WP )**

**Emulsifiable Concentrates (EC)**

**Solutions (S)**

# Answer

---

- Which of the following would you add to the tank first?

Wettable Powder (WP )

# Other info on pesticide labels

# Residual or persistent pesticides

---

- remain active in soil or area to kill pests for several days, weeks or years
  - Pre-emergence or Early Pre-plant
- Residue may also affect non target species

# Preharvest interval (PHI)

- The latest time a pesticide may be applied prior to harvest
- PHI is listed on the label to help stay under the tolerance

## What is “tolerance”?

The amount of chemical residue that may legally remain in or on food or feed crop when it is harvested.



# Selective pesticides

- control pest with little or no injury to related organisms

Garlon = broadleaf specific, selective herbicide



# Nonselective (broad-spectrum) pesticide

- control nearly all related organisms



Roundup

[http://www.extension.umn.edu/projects/yardandgarden/YGLNews/images2/Jul12009/art3-3\\_600.jpg](http://www.extension.umn.edu/projects/yardandgarden/YGLNews/images2/Jul12009/art3-3_600.jpg)

*In plants over time only plants that are resistant to the herbicide survive and live to produce seed*

- *making future generations more resistant*

# Nonselective pesticide resistance

- Occurs from overuse of broad spectrum insecticides since it can also kill natural predators for the pest
  - ▣ Predator & parasite populations rebound more slowly than the target pest- making it harder to control pest
  - ▣ Check label for calendar year spraying limits to prevent this (example) →



## RESISTANCE MANAGEMENT RECOMMENDATIONS

*Safari 20 SG Insecticide* contains a Group 4A insecticide. Insect biotypes with acquired resistance to Group 4A may eventually dominate the insect population if Group 4A insecticides are used repeatedly in the same crop or in successive years as the primary method of control for a targeted species. This may result in partial or total loss of control of those species by *Safari 20 SG Insecticide* or other Group 4A insecticides.

To delay the development of insecticide resistance in greenhouse, nursery and interiorscape use sites, strongly consider the following recommendations:

- Do not apply *Safari 20 SG Insecticide* or other Group 4A insecticides to consecutive generations of the same insect pest species.
- Do not drench soil media with *Safari 20 SG Insecticide* or other Group 4A insecticides more than one time per crop cycle or three months, whichever is shorter.
- Do not make more than two foliar or broadcast sprays of *Safari 20 SG Insecticide* or other Group 4A insecticides to a single crop during a two-month period.

# Systemic (or translocated) pesticide

- Move within the plant/animal from site of uptake to other parts
- Effective for plants with underground/ connecting reproductive structures

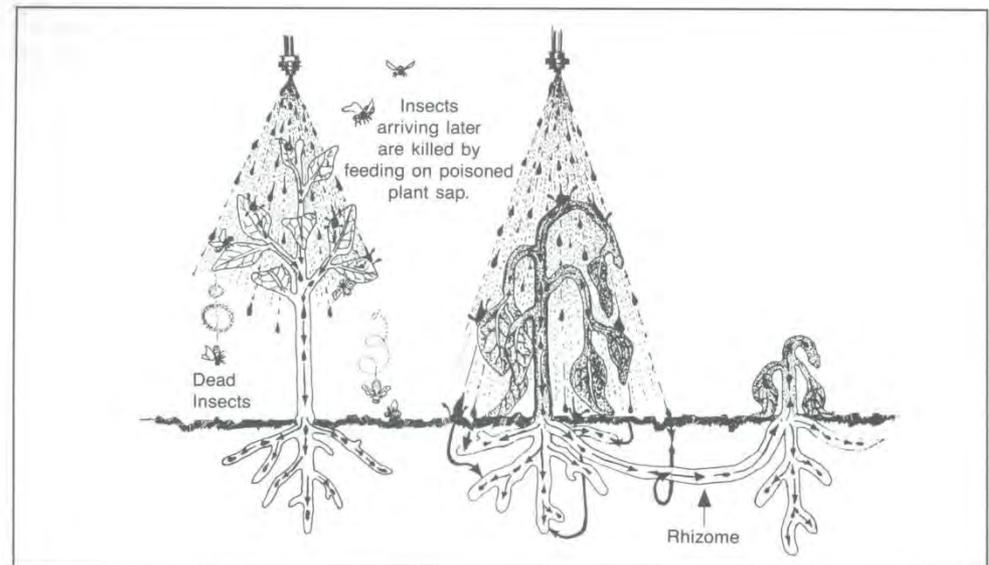


Figure 2.1. Systemic pesticides move in the circulatory system and can kill the pest at a site other than the point of pesticide contact.

# Contact pesticide

- control by **direct contact** with the pest only
- kill annuals if all the growing parts are above ground

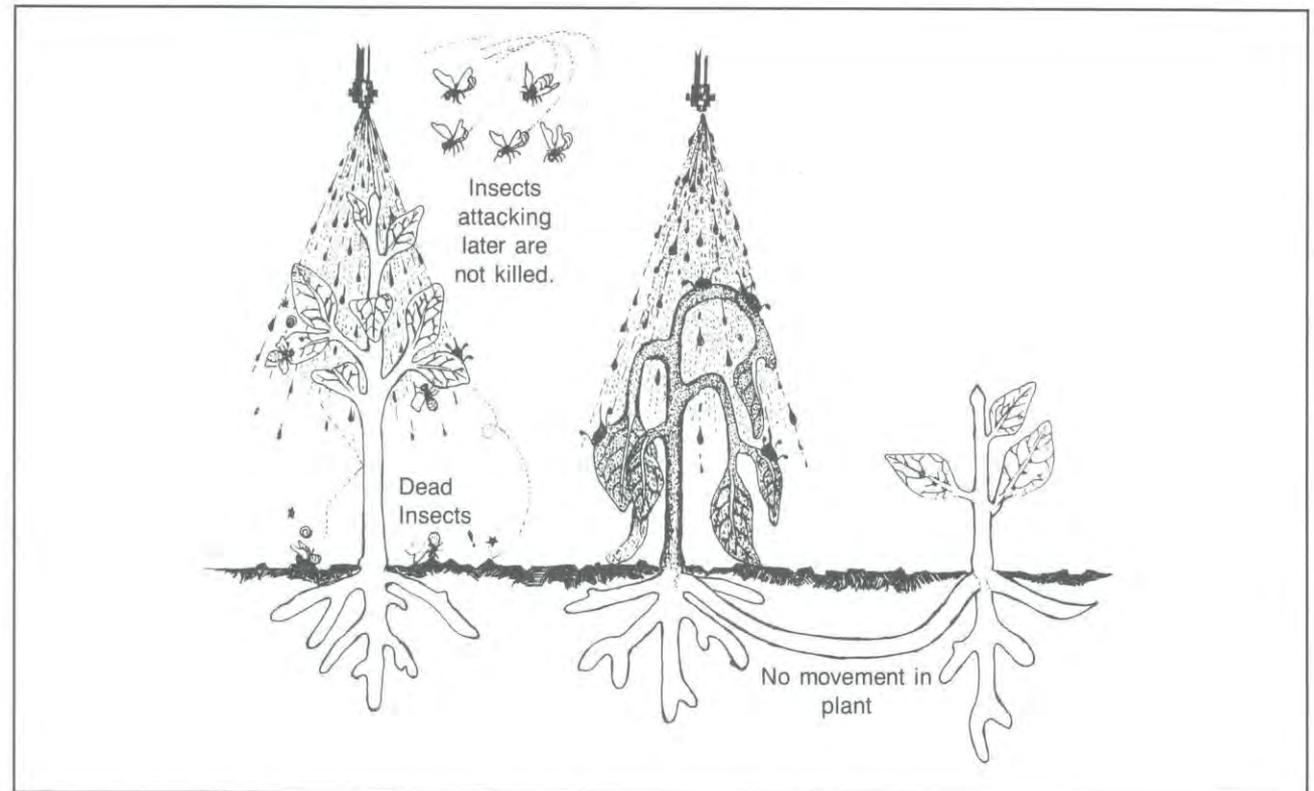


Figure 2.2. Contact pesticides kill pests only at the site of pesticide contact.

# Pest Resurgence

---

- Occurs from overuse of broad spectrum insecticides since they may also kill natural predators for the pest
- Predator and parasite populations rebound more slowly than the target pest- making it harder to control pest

# CHAPTER 3: LABELS AND LABELING



# Information on a Product Label:



Pesticide's impact on wildlife



Personal protective equipment required using pesticide



How long to wait before entering a treated area/ re-entry interval

# Read the Label

- Labels change very little typically but new formulations occur
- Recognize hazards to yourself and the world around you
- How much to use
- How often to spray
- Legal limit per acreage per year

## **When purchasing and applying a pesticide remember:**

- a) The label is a legal document
- b) Before you buy and apply a pesticide read the label
- c) A General Use pesticide is not given a classification on the label

# Specimen Label

Dow AgroSciences

# Rodeo®

## Herbicide

For control of annual and perennial weeds and woody plants in forests, non-crop sites, and in and around aquatic sites; also for use in wildlife habitat areas, for perennial grass release, and grass growth suppression and grazed areas on these sites.

Avoid contact of herbicide with foliage, green stems, exposed non-woody roots or fruit of crops, desirable plants and trees, because severe injury or destruction may result.

Active Ingredient(s):	
glyphosate <sup>1</sup> N-(phosphonmethyl)glycine, isopropylamine salt	53.6%
Inert Ingredients	46.2%
Total Ingredients	100.0%

<sup>1</sup>Contains 5.4 pounds per gallon glyphosate, isopropylamine salt (4 pounds per gallon glyphosate acid).

EPA Reg. No. 62719-324

### 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.)

### Precautionary Statements

#### Hazards to Humans and Domestic Animals

#### Harmful If Inhaled

Avoid breathing spray mist. Remove contaminated clothing and wash before reuse. Wash thoroughly with soap and water after handling.

### Personal Protective Equipment (PPE)

Applicators and other handlers must wear:

- Long-sleeved shirt and long pants
- Shoes plus socks.

Follow manufacturer's instructions for cleaning/maintaining PPE (Personal Protective Equipment). If no such instructions for washables, use detergent and hot water. Keep and wash PPE separately from other laundry.

### Engineering Controls

When handlers use closed systems, enclosed cabs, or aircraft in a manner that meets the requirements listed in Worker Protection Standard (WPS) for agricultural pesticides [40 CFR 170.240 (d) (4-6)], the handler PPE requirements may be reduced or modified as specified in the WPS.

### User Safety Recommendations

Users should:

- Wash hands before eating, drinking, chewing gum, using tobacco, or using the toilet.
- Remove clothing immediately if pesticide gets inside. Then wash thoroughly and put on clean clothing.

### First Aid

If inhaled: Move person to fresh air. If person is not breathing, call 911 or an ambulance, then give artificial respiration, preferably mouth-to-mouth if possible. Call a poison control center or doctor for further treatment advice.

Have the product container or label with you when calling a poison control center or doctor, or going for treatment. You may also contact 1-800-992-5994 for emergency medical treatment information.

### Environmental Hazards

Do not contaminate water when cleaning equipment or disposing of equipment washwaters. Treatment of aquatic weeds can result in oxygen depletion or loss due to decomposition of dead plants. This oxygen loss can cause fish suffocation.

In case of leak or spill, soak up and remove to a landfill.

### Physical or Chemical Hazards

Spray solutions of this product should be mixed, stored and applied using only stainless steel, aluminum, fiberglass, plastic or plastic-lined steel containers.

**Do not mix, store or apply this product or spray solutions of this product in galvanized steel or unlined steel (except stainless steel) containers or spray tanks.** This product or spray solutions of this product react with such containers and tanks to produce hydrogen gas, which may form a highly combustible gas mixture. This gas mixture could flash or explode, causing serious personal injury, if ignited by open flame, spark, welder's torch, lighted cigarette or other ignition source.

**Notice:** Read the entire label. Use only according to label directions. Before using this product, read Terms and Conditions of Use, Warranty Disclaimer, Inherent Risks of Use, and Limitation of Remedies elsewhere on this label. If terms are unacceptable, return at once unopened.

## Trade Name

(Refers to this specific formulation of herbicide)

## Chemical Name

(Shows what active ingredients are in the formulation)

## Active Ingredient Concentration

(Important to know this to determine rates and solutions for application)

## EPA Registration Number

(kind of like a social security number for herbicides. Each specific formulation must be registered with the EPA)

# Specimen Label



# Rodeo®

## Herbicide

For control of annual and perennial weeds and woody plants in forests, non-crop sites, and in and around aquatic sites; also for use in wildlife habitat areas, for perennial grass release, and grass growth suppression and grazed areas on these sites.

Avoid contact of herbicide with foliage, green stems, exposed non-woody roots or fruit of crops, desirable plants and trees, because severe injury or destruction may result.

### Active Ingredient(s):

glyphosate <sup>1</sup> N-(phosphonmethyl)glycine, isopropylamine salt .....	53.8%
Inert Ingredients .....	46.2%
Total Ingredients .....	100.0%

<sup>1</sup>Contains 5.4 pounds per gallon glyphosate, isopropylamine salt (4 pounds per gallon glyphosate acid).

EPA Reg. No. 62719-324

### Keep Out of Reach of Children

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### Precautionary Statements

#### Hazards to Humans and Domestic Animals

#### Harmful If Inhaled

Avoid breathing spray mist. Remove contaminated clothing and wash before reuse. Wash thoroughly with soap and water after handling.

### Personal Protective Equipment (PPE)

Applicators and other handlers must wear:

- Long-sleeved shirt and long pants
- Shoes plus socks.

Follow manufacturer's instructions for cleaning/maintaining PPE (Personal Protective Equipment). If no such instructions for washables, use detergent and hot water. Keep and wash PPE separately from other laundry.

### Engineering Controls

When handlers use closed systems, enclosed cabs, or aircraft in a manner that meets the requirements listed in Worker Protection Standard (WPS) for agricultural pesticides [40 CFR 170.240 (d) (4-6)], the handler PPE requirements may be reduced or modified as specified in the WPS.

### User Safety Recommendations

Users should:

- Wash hands before eating, drinking, chewing gum, using tobacco, or using the toilet.
- Remove clothing immediately if pesticide gets inside. Then wash thoroughly and put on clean clothing.

### First Aid

**If inhaled:** Move person to fresh air. If person is not breathing, call 911 or an ambulance, then give artificial respiration, preferably mouth-to-mouth if possible. Call a poison control center or doctor for further treatment advice.

Have the product container or label with you when calling a poison control center or doctor, or going for treatment. You may also contact 1-800-992-5994 for emergency medical treatment information.

### Environmental Hazards

Do not contaminate water when cleaning equipment or disposing of equipment washwaters. Treatment of aquatic weeds can result in oxygen depletion or loss due to decomposition of dead plants. This oxygen loss can cause fish suffocation.

In case of leak or spill, soak up and remove to a landfill.

### Physical or Chemical Hazards

Spray solutions of this product should be mixed, stored and applied using only stainless steel, aluminum, fiberglass, plastic or plastic-lined steel containers.

**Do not mix, store or apply this product or spray solutions of this product in galvanized steel or unlined steel (except stainless steel) containers or spray tanks.** This product or spray solutions of this product react with such containers and tanks to produce hydrogen gas, which may form a highly combustible gas mixture. This gas mixture could flash or explode, causing serious personal injury, if ignited by open flame, spark, welder's torch, lighted cigarette or other ignition source.

**Notice:** Read the entire label. Use only according to label directions. Before using this product, read Terms and Conditions of Use, Warranty Disclaimer, Inherent Risks of Use, and Limitation of Remedies elsewhere on this label. If terms are unacceptable, return at once unopened.

**PPE Requirements**  
(You must follow these requirements when applying this particular herbicide)

**Description of Herbicide Use**  
(Tells you what type of species and what locations it is legal to apply this herbicide)

**Hazard Statement**  
(Volunteers can only apply herbicides labeled as 'Caution')

**Contact information for Manufacturer**  
(In case of health of environment emergency)

**General information**  
(Basic information on how the herbicide works, how long it takes to see visible signs of effects, and conditions to treat)

### **General Information** (How this product works)

This product is a water-soluble liquid, which mixes readily with water and nonionic surfactant to be applied as a foliar spray for the control or destruction of many herbaceous and woody plants. This product is intended for control of annual and perennial weeds and woody plants in forests, pine straw plantations, non-crop sites such as utility rights-of-way and in and around aquatic sites; also for use in wildlife habitat areas, for perennial grass release, and grass growth suppression and grazed areas on these sites.

The active ingredient in this product moves through the plant from the point of foliage contact to and into the root system. Visible effects on most annual weeds occur within 2 to 4 days, 7 days or more on most perennial weeds, and 30 days or more on most woody plants. Extremely cool or cloudy weather following treatment may slow the activity of this product and delay visual effects of control. Visible effects include gradual wilting and yellowing of the plant which advances to complete browning of above-ground growth and deterioration of underground plant parts.

Unless otherwise directed on this label, delay application until vegetation has emerged and reached the stages described for control of such vegetation under the "Weeds Controlled" section of this label.

Unemerged plants arising from unattached underground rhizomes or root stocks of perennials or brush will not be affected by the spray and will continue to grow. For this reason best control of most perennial weeds or brush is obtained when treatment is made at late growth stages approaching maturity.

Always use the higher rate of this product and surfactant within the recommended range when vegetation is heavy or dense, when treating dense multi-canopied sites or woody vegetation or difficult-to-control herbaceous or woody plants.

Do not treat weeds, brush or trees under poor growing conditions such as drought stress, disease or insect damage, as reduced control may result. Reduced control of target vegetation may also occur if foliage is heavily covered with dust at the time of treatment.

Reduced control may result when applications are made to woody plants or weeds following site disturbance or plant top growth removal from grazing, mowing, logging or mechanical brush control. For best results, delay treatment of such areas until resprouting and foliar growth has restored the target vegetation to the recommended stage of growth for optimum herbicide exposure and control.

Rainfall or irrigation occurring within 6 hours after application may reduce effectiveness. Heavy rainfall or irrigation within 2 hours after application

In case of emergency endangering health or the environment involving this product, call 1-800-992-5994. If you wish to obtain additional product information, visit our web site at [www.dowagro.com](http://www.dowagro.com).

Agricultural Chemical: Do not ship or store with food, feeds, drugs or clothing.

### **Directions for Use**

It is a violation of Federal law to use this product in a manner inconsistent with its labeling.

Read all Directions for Use carefully before applying.

**This is an end-use product. Dow AgroSciences does not intend and has not registered it for reformulation. See individual container label for repackaging limitations.**

Do not apply this product in a way that will contact workers or other persons, either directly or through drift. Only protected handlers may be in the area during application. For any requirements specific to your state or tribe, consult the agency responsible for pesticide regulation.

### **Agricultural Use Requirements**

Use this product only in accordance with its labeling and with the Worker Protection Standard, 40 CFR part 170. This Standard contains requirements for the protection of agricultural workers on farms, forests, nurseries, and greenhouses, and handlers of agricultural pesticides. It contains requirements for training, decontamination, notification, and emergency assistance. It also contains specific instructions and exceptions pertaining to the statements on this label about personal protective equipment (PPE), and restricted entry interval. The requirements in this box only apply to uses of this product that are covered by the Worker Protection Standard.

Do not enter or allow worker entry into treated areas during the restricted entry interval (REI) of 4 hours.

PPE required for early entry to treated areas that is permitted under the Worker Protection Standard and that involves contact with anything that has been treated, such as plants, soil, or water, is:

- Coveralls
- Chemical-resistant gloves made of any waterproof material
- Shoes plus socks

### **Storage and Disposal**

Do not contaminate water, food, feed or seed by storage or disposal.

**Pesticide Storage: Store above 10°F (-12°C) to keep product from crystallizing.** Crystals will settle to the bottom. If allowed to crystallize, place in a warm room 68°F (20°C) for several days to redissolve and roll or shake container or recirculate in mini-bulk containers to mix well before using.

**Note:** The maximum rates stated throughout this product's labeling apply to this product combined with the use of all other herbicides containing glyphosate or sulfosate as the active ingredient, whether applied as mixtures or separately. Calculate the application rates and ensure that the total use of this and other glyphosate or sulfosate containing products does not exceed the maximum use rates.

**Grazing Restrictions:** This product may be used to treat undesirable vegetation in utility rights-of-way that pass through pastures, rangeland, and forestry sites that are being grazed. For tank mix applications, comply with all restrictions appearing on the tank mix product label.

Except for lactating dairy animals there are no grazing restrictions following the labeled applications of this product.

- For lactating dairy animals there are no grazing restrictions for the following labeled applications of this product:
  - ▶ Where the spray can be directed onto undesirable woody brush and trees, such as in handgun spray-to-wet or low volume directed spray treatments.
  - ▶ For tree injection of frill applications and for cut stump treatments
- For broadcast applications, observe the following restrictions for lactating dairy animals:
  - ▶ For application rates of greater than 4.5 but not to exceed 7.5 quarts per acre, no more than 15 percent of the available grazing area may be treated.
  - ▶ For application rates that do not exceed 4.5 quarts per acre, no more than 25 percent of the available grazing area may be treated.
- These restrictions do not apply to pastures, rangeland or forestry sites outside of utility rights-of-way.

**NOTE:** Use of this product in any manner not consistent with this label may result in injury to persons, animals or crops, or other unintended consequences. When not in use, keep container closed to prevent spills and contamination.

Buyer and all users are responsible for all loss or damage in connection with the use or handling of mixtures of this product or other materials that are not expressly recommended in this label. Mixing this product with herbicides or other materials not recommended in this label may result in reduced performance.

**ATTENTION: Avoid drift. Extreme care must be used when applying this product to prevent injury to desirable plants and crops.**

Do not allow the herbicide solution to mist, drip, drift or splash onto desirable vegetation since minute quantities of this product can cause severe damage or destruction to the crop plants in areas on which treatment was not intended. The likelihood of plant or crop injury occurring from the use of this product is greatest when winds are gusty or in excess of 5 miles per hour or when other conditions, including lesser wind velocities, will allow spray drift to occur. When spraying, avoid combinations of pressure and nozzle type that will result in splatter or fine particles (mist) which are likely to drift. **Avoid applying at excessive speed or pressure.**

## Spray Drift Management

Avoiding spray drift at the application site is the responsibility of the applicator. 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 drift movement from aerial applications to agricultural field crops. These requirements do not apply to forestry applications, public health uses or to applications using dry formulations.

1. The distance of the outer most nozzles on the boom must not exceed 3/4 the length of the wingspan or rotor.
2. Nozzles must always point backward parallel with the air stream and never be pointed downwards more than 45 degrees. Where states have more stringent regulations, they should be observed.

The applicator should be familiar with and take into account the information covered in the following **Aerial Drift Reduction Advisory Information:**

**Importance of Droplet Size:** The most effective way to reduce drift potential is to apply large droplets. The best 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 if applications are made improperly, or under unfavorable environmental conditions (see Wind, Temperature and Humidity, and Temperature Inversion section of this label).

**Controlling Droplet Size:** Volume-Use high flow rate nozzles to apply the highest practical spray volume. Nozzles with higher rated flows produce larger droplets.

Pressure-Use the lower spray pressures recommended for the nozzle. Higher pressure reduces droplet size and does not improve canopy penetration. When higher flow rates are needed, use higher flow rate nozzles instead of increasing pressure.

Number of nozzles-Use the minimum number of nozzles that provide uniform coverage.

Nozzle Orientation-Orienting nozzles so that the spray is released backwards, parallel to the airstream will produce larger droplets than other orientations. Significant deflection from the horizontal will reduce droplet size and increase drift potential.

Nozzle Type-Use a nozzle type that is designed for the intended application. With most nozzle types, narrower spray angles produce larger droplets. Consider using low-drift nozzles. Solid stream nozzles oriented straight back produce larger droplets than other nozzle types.

Boom Length-For some use patterns, reducing the effective boom length to less than 3/4 of the wingspan or rotor length may further reduce drift without reducing swath width.

Application-Applications should not be made at a height greater than 10 feet above the top of the largest plants unless a greater height is required for aircraft safety. Making applications at the lowest height that is safe reduces exposure of droplets to evaporation and wind.

**Cautionary statements**  
(To avoid unintended injury to desirable plants)

**Spray Solution:**

Desired Volume	Amount of this product							
	3/4%	1%	1 1/4%	1 1/2%	2%	5%	8%	10%
1 gal	1 fl oz	1 1/3 fl oz	1 2/3 fl oz	2 fl oz	2 2/3 fl oz	6 1/2 fl oz	10 1/4 fl oz	12 3/4 fl oz
25 gal	1 1/2 pt	1 qt	1 1/4 qt	1 1/2 qt	2 qt	5 qt	2 gal	2.5 gal
100 gal	3 qt	1 gal	1 1/4 gal	1 1/2 gal	2 gal	5 gal	8 gal	10 gal

2 tablespoons = 1 fluid ounce

For use in knapsack sprayers, it is suggested that the recommended amount of this product be mixed with water in a larger container. Fill the knapsack sprayer with the mixed solution and add the correct amount of surfactant.

When applied as directed, this product plus a surfactant such as a non-ionic surfactant containing 80% or greater active ingredient will control the following annual weeds:

**Selective Equipment**

This product may be applied through shielded sprayers or wiper application equipment. This equipment may be used to selectively control undesirable vegetation without harming desirable vegetation.

Shielded sprayers direct the herbicide solution onto weeds while shielding desirable vegetation from the spray solution. Any recommended rate or tank mixture of this product may be used employing this equipment.

Wiper applicators physically wipe product directly onto undesirable vegetation. Care should be taken to avoid wiping desirable vegetation. Use a 33 to 100 percent solution of this product, diluted in water for wiper applications. Use a 33 percent solution for wick or gravity feed systems. Higher concentrations may be used in pressurized systems that are capable of handling thicker solutions. Addition of a nonionic surfactant at a rate of 10 percent by volume of total herbicide solution is recommended.

**Weeds Controlled**

**Annual Weeds**

Apply to actively growing annual grasses and broadleaf weeds.

Allow at least 3 days after application before disturbing treated vegetation. After this period the weeds may be mowed, tilled or burned. See "Directions for Use," "General Information" and "Mixing and Application Instructions" for labeled uses and specific application instructions.

**Broadcast Application Rates:** For weeds less than 6 inches tall, use 1 1/2 pints of this product per acre plus a surfactant such as a non-ionic surfactant containing 80% or greater active ingredient. If weeds are greater than 6 inches tall, use 2 1/2 pints of this product per acre plus a non-ionic surfactant containing 80% or greater active ingredient..

**Hand-Held, High-Volume Application Rates:** Use a 3/4 percent solution of this product in water plus a surfactant such as a non-ionic surfactant containing 80% or greater active ingredient. Apply to foliage of vegetation to be controlled.

Common Name	Scientific Name
Balsamapple †	<i>Momordica charantia</i>
Barley	<i>Hordeum vulgare</i>
Barnyardgrass	<i>Echinochloa crus-galli</i>
Bassia, fivehock	<i>Bassia hyssopifolia</i>
Bluegrass, annual	<i>Poa annua</i>
Bluegrass, bulbous	<i>Poa bulbosa</i>
Brome	<i>Bromus spp.</i>
Buttercup	<i>Ranunculus spp.</i>
Cheat	<i>Bromus secalinus</i>
Chickweed, mouseear	<i>Cerastium vulgatum</i>
Cocklebur	<i>Xanthium strumarium</i>
Corn, volunteer	<i>Zea mays</i>
Crabgrass	<i>Digitaria spp.</i>
Dwarfdandelion	<i>Krigia cespitosa</i>
Falseflax, smallseed	<i>Camelina microcarpa</i>
Fiddleneck	<i>Amsinckia spp.</i>
Flaxleaf fleabane	<i>Coryza donariensis</i>
Fleabane	<i>Erigeron spp.</i>
Foxtail	<i>Setaria spp.</i>
Foxtail, Carolina	<i>Alopecurus carolinianus</i>
Groundsel, common	<i>Senecio vulgaris</i>
Horseweed/Marestail	<i>Coryza canadensis</i>
Kochia	<i>Kochia scoparia</i>
Lambsquarters, common	<i>Chenopodium album</i>
Lettuce, prickly	<i>Lactuca scariola</i>
Morningglory	<i>Ipomoea spp.</i>
Mustard, blue	<i>Chorispora tenella</i>
Mustard, tansy	<i>Descurainia pinnata</i>
Mustard, tumble	<i>Sisymbrium altissimum</i>
Mustard, wild	<i>Sinapis arvensis</i>
Oats, wild	<i>Avena fatua</i>
Panicum	<i>Panicum spp.</i>
Pennycress, field	<i>Thlaspi arvense</i>
Pigweed, redroot	<i>Amaranthus retroflexus</i>
Pigweed, smooth	<i>Amaranthus hybridus</i>
Ragweed, common	<i>Ambrosia artemisiifolia</i>
Ragweed, giant	<i>Ambrosia trifida</i>
Rocket, London	<i>Sisymbrium irio</i>
Rye	<i>Secale cereale</i>
Ryegrass, Italian ††	<i>Lolium multiflorum</i>
Sandbur, field	<i>Cenchrus spp.</i>
Shattercane	<i>Sorghum bicolor</i>
Shepherd's-purse	<i>Capsella bursa-pastoris</i>
Signalgrass, broadleaf	<i>Bracharia platyphylla</i>
Smartweed, Pennsylvania	<i>Polygonum pensylvanicum</i>

**Spray solution chart**

(Used by mixer to determine amount needed for different solution strengths)

**Control recommendations**

(Specific recommendations for control of different categories of weeds)

# Species specific control recommendations chart

(Label gives specific control recommendations for certain species)

Common Name	Scientific Name
Sowthistle, annual	<i>Sonchus oleraceus</i>
Spanishneedles <sup>††</sup>	<i>Bidens bipinnata</i>
Stinkgrass	<i>Eragrostis ciliaris</i>
Sunflower	<i>Helianthus annuus</i>
Thistle, Russian	<i>Salsola kali</i>
Spurry, umbrella	<i>Holosteum umbellatum</i>
Velvetleaf	<i>Abrus theophrasti</i>
Wheat	<i>Triticum aestivum</i>
Witchgrass	<i>Panicum capillare</i>

<sup>†</sup> Apply with hand-held equipment only.  
<sup>††</sup> Apply 3 pints of this product per acre.

Annual weeds will generally continue to germinate from seed throughout the growing season. Repeat treatments will be necessary to control later germinating weeds.

## Perennial Weeds

Apply this product to control most vigorously growing perennial weeds. Unless otherwise directed, apply when target plants are actively growing and most have reached early head or early bud stage of growth. Unless otherwise directed, allow at least 7 days after application before disturbing vegetation.

**NOTE:** If weeds have been mowed or tilled, do not treat until regrowth has reached the recommended stages. Fall treatments must be applied before a killing frost.

Repeat treatments may be necessary to control weeds regenerating from underground parts or seed.

**Specific Weed Control Recommendations:** For perennial weeds, apply the recommended rate plus a surfactant such as a non-ionic surfactant containing 80% or greater active ingredient. Use of this product without surfactant will result in reduced herbicide performance. Refer to the "Mixing and Application Instructions" section of this label and the surfactant manufacturer label for more information.

**When applied as directed, this product plus a surfactant such as a non-ionic surfactant containing 80% or greater active ingredient will control the following perennial weeds:** (Numbers in parentheses "-" following common name of a listed weed species refer to "Specific Perennial Weed Control Recommendations" for that weed which follow the species listing.)

Common Name	Scientific Name
Alfalfa (31)	<i>Medicago sativa</i>
Alligatorweed <sup>†</sup> (4)	<i>Alternanthera philoxeroides</i>
Anise/Fennel (31)	<i>Foeniculum vulgare</i>
Artichoke, Jerusalem (31)	<i>Helianthus tuberosus</i>
Bahiagrass (31)	<i>Paspalum notatum</i>
Bermudagrass (2)	<i>Cynodon dactylon</i>
Bindweed, field (3)	<i>Convolvulus arvensis</i>
Bluegrass, Kentucky (12)	<i>Poa pratensis</i>
Blueweed, Texas (3)	<i>Helianthus ciliaris</i>
Brackenfern (4)	<i>Pteridium spp.</i>
Bromegrass, smooth (12)	<i>Bromus inermis</i>
Canarygrass, reed (12)	<i>Phalaris arundinacea</i>
Cattail (5)	<i>Typha spp.</i>
Clover, red (31)	<i>Trifolium pratense</i>
Clover, white (31)	<i>Trifolium repens</i>
Cogongrass (6)	<i>Imperata cylindrica</i>

Cordgrass (7)
Cutgrass, giant <sup>†</sup> (8)
Dallisgrass (31)
Dandelion (31)
Dock, curly (31)
Dogbane, hemp (9)
Fescue (31)
Fescue, tall (10)
Guineagrass (11)
Hemlock, poison (31)
Horsenettle (31)
Horseradish (9)
Ice Plant (22)
Johnsongrass (12)
Kikuyugrass (21)
Knapweed (9)
Lantana (13)
Lespedeza, common (31)
Lespedeza, sericea (31)
Loosestrife, purple (14)
Lotus, American (15)
Maidencane (16)
Milkweed (17)
Muhly, wirestem (21)
Mullein, common (31)
Napiergrass (31)
Nightshade, silverleaf (3)
Nutsedge, purple (18)
Nutsedge, yellow (18)
Orchardgrass (12)
Pampasgrass (19)
Paragrass (16)
Phragmites <sup>††</sup> (20)
Quackgrass (21)
Reed, giant (22)
Ryegrass, perennial (12)
Smartweed, swamp (31)
Spargelock (23)
Starthistle, yellow (31)
Sweet potato, wild <sup>†</sup> (24)
Thistle, artichoke (25)
Thistle, Canada (25)
Timothy (12)
Trorpedograss <sup>†</sup> (26)
Tules, common (27)
Vaseygrass (31)
Velvetgrass (31)
Waterhyacinth (28)
Waterlettuce (29)
Waterprimrose (30)
Wheatgrass, western (12)

<sup>†</sup> Partial control.  
<sup>††</sup> Partial control in southeastern states. See "Specific Weed Control Recommendations" below.

## Specific Perennial Weed Control Recommendations:

- Alligatorweed:** Apply 6 pints of this product per acre as a broadcast spray or as a 1 1/4 percent solution with hand-held equipment to provide partial control of alligatorweed. Apply when most of the target plants are in bloom. Repeat applications will be required to maintain such control.

<i>Spartina spp.</i>
<i>Zizaniopsis miliacea</i>
<i>Paspalum dilatatum</i>
<i>Taraxacum officinale</i>
<i>Rumex crispus</i>
<i>Apocynum cannabinum</i>
<i>Festuca spp.</i>
<i>Festuca arundinacea</i>
<i>Panicum maximum</i>
<i>Conium maculatum</i>
<i>Solanum carolinense</i>
<i>Armoracia rusticana</i>
<i>Mesembryanthemum crystallinum</i>
<i>Sorghum halepense</i>
<i>Pennisetum clandestinum</i>
<i>Centaurea repens</i>
<i>Lantana camara</i>
<i>Lespedeza striata</i>
<i>Lespedeza cuneata</i>
<i>Lythrum salicaria</i>
<i>Nelumbo lutea</i>
<i>Panicum hepatomon</i>
<i>Asclepias spp.</i>
<i>Muhlenbergia frondosa</i>
<i>Verbascum thapsus</i>
<i>Pennisetum purpureum</i>
<i>Solanum elaeagnifolium</i>
<i>Cyperus rotundus</i>
<i>Cyperus esculentus</i>
<i>Dactylis glomerata</i>
<i>Cortaderia jubata</i>
<i>Brachiaria mutica</i>
<i>Phragmites spp.</i>
<i>Agropyron repens</i>
<i>Arundo donax</i>
<i>Lolium perenne</i>
<i>Polygonum occidentale</i>
<i>Nuphar luteum</i>
<i>Centaurea solstitialis</i>
<i>Ipomoea pandurata</i>
<i>Cynara cardunculus</i>
<i>Cirsium arvense</i>
<i>Phleum pratense</i>
<i>Panicum repens</i>
<i>Scirpus acutus</i>
<i>Paspalum urvillei</i>
<i>Holcus spp.</i>
<i>Eichornia crassipes</i>
<i>Pistia stratiotes</i>
<i>Ludwigia spp.</i>
<i>Agropyron smithii</i>

## Noncrop Sites

This product may be used to control the listed weeds in and around aquatic sites and on noncrop sites such as:

Airports  
Golf Courses  
Habitat Restoration & Management Areas  
Highways & Roadsides  
Industrial Plant Sites  
Lumberyards  
Parking Areas  
Parks  
Petroleum Tank Farms  
Pipeline, Power, Telephone & Utility Rights-of-Way  
Pumping Installations  
Railroads  
Schools  
Storage Areas  
Similar Sites

## Aquatic Sites

This product may be applied to emerged weeds in all bodies of fresh and brackish water which may be flowing, nonflowing or transient. This includes lakes, rivers, streams, ponds, estuaries, rice levees, seeps, irrigation and drainage ditches, canals, reservoirs, wastewater treatment facilities, wildlife habitat restoration and management areas and similar sites.

If aquatic sites are present in the noncrop area and are part of the intended treatment, read and observe the following directions:

- This product does not control plants which are completely submerged or have a majority of their foliage under water.
- There is no restriction on the use of treated water for irrigation, recreation or domestic purposes.
- Consult local state fish and game agency and water control authorities before applying this product to public water. Permits may be required to treat such water.
- **NOTE:** Do not apply this product directly to water within 1/2 mile up-stream of an active potable water intake in flowing water (i.e., river, stream, etc.) or within 1/2 mile of an active potable water intake in a standing body of water such as lake, pond or reservoir. To make aquatic applications around and within 1/2 mile of active potable water intakes, the water intake must be turned off for a minimum period of 48 hours after the application. The water intake may be turned on prior to 48 hours if the glyphosate level in the intake water is below 0.7 parts per million as determined by laboratory analysis. These aquatic applications may be made **only** in those cases where there are alternative water sources or holding ponds which would permit the turning off of an active potable water intake for a minimum period of 48 hours after the applications. This restriction does not apply to intermittent inadvertent overspray of water in terrestrial use sites.
- For treatments after drawdown of water or in dry ditches, allow 7 or more days after treatment before reintroduction of water to achieve maximum weed control. Apply this product within 1 day after drawdown to ensure application to actively growing weeds.

- Floating mats of vegetation may require retreatment. Avoid wash-off of sprayed foliage by spray boat or recreational boat backwash or by rainfall within 6 hours of application. Do not re-treat within 24 hours following the initial treatment.
- Applications made to moving bodies of water must be made while traveling upstream to prevent concentration of this herbicide in water. When making any bankside applications, do not overlap more than 1 foot into open water. Do not spray in bodies of water where weeds do not exist. The maximum application rate of 7 1/2 pints per acre must not be exceeded in any single broadcast application that is being made over water.
- When emerged infestations require treatment of the total surface area of impounded water, treating the area in strips may avoid oxygen depletion due to decaying vegetation. Oxygen depletion may result in fish kills.

## Forestry Sites and Utility Rights-of-Way

In forest and utility sites, this product is recommended for the control or partial control of woody brush, trees, and annual and perennial herbaceous weeds. This product is also recommended for use in preparing or establishing wildlife openings within these sites, in pine straw plantations for maintaining logging roads, and for side trimming along utility rights-of-way.

In forestry sites, this product is recommended for use in site preparation prior to planting any tree species, including Christmas trees and silvicultural nursery sites.

In utility sites, this product is recommended for use along electrical power, pipeline, and telephone rights-of-way, and in other utility sites associated with these rights-of-way, such as substations.

### Application Rates <sup>1</sup>:

Method of Application	Application Rate	Spray Volume (gal/acre)
<b>Broadcast</b>		
Aerial	1.5 to 7.5 qt/acre	5 to 30
Ground	1.5 to 7.5 qt/acre	10 to 60
<b>Spray-to-Wet</b>		
Handgun, Backpack Mistblower	0.75 to 2% by volume	spray-to-wet
<b>Low Volume Directed Spray <sup>2</sup></b>		
Handgun, Backpack Mistblower	5% to 10% by volume	partial coverage

<sup>1</sup> Where repeat applications are necessary, do not exceed 8.0 quarts per acre per year.

<sup>2</sup> For low volume directed spray applications, coverage should be uniform with at least 50 percent of the foliage contacted. For best results, coverage of the top one-half of the plant is important.

In forestry site preparation and utility rights-of-way applications, this product requires use with a surfactant such as a non-ionic surfactant containing greater than 80 percent active ingredient. Use of this product without surfactant will result in reduced herbicide performance. Refer to the "Mixing and Application Instructions" section of this label and the surfactant manufacturer label for more information.

## Wetland/aquatic information

(If you herbicides in or near water, it is crucial that you use a product labeled for use in aquatic areas. This section gives specific information about this type of application)

## Sites specific control recommendations chart

(Label gives specific control recommendations for certain sites)

Use higher rates of this product within the recommended rate ranges for control or partial control of woody brush, trees and hard-to-control perennial herbaceous weeds. For best results, apply to actively growing woody brush and trees after full leaf expansion and before fall color and leaf drop. Use increased rates within the recommended rate range to control of perennial herbaceous weeds from emergence up to the appearance of seedheads, flowers or berries appear. Use lower rates within the recommended rate range to control annual herbaceous weeds and actively growing perennial herbaceous weeds after seedheads, flowers or berries appear. Apply to foliage of actively growing annual herbaceous weeds anytime after emergence.

## Tank Mixtures

This product may be used in tank mix combination with other herbicide products to broaden the spectrum of vegetation controlled. When tank mixing, read and observe applicable use directions, precautions and limitations on the respective product labels. Use according to the most restrictive precautionary statements for each product on the mixture. Any recommended rate of this product may be used in a tank mix.

**Note:** For forestry site preparation, make sure the tank mix product is approved for use prior to planting the desired species. Observe planting interval restrictions. For side trimming treatments in utility rights-of-way, tank mixtures with Arsenal 2WSL herbicide are not recommended. For side trimming treatments, it is recommended that this product be used alone as recommended, or as a tank mix with Garlon.

Product	Broadcast Rate	Use Sites
Arsenal Applicators Concentrate	2 to 16 fl oz/acre	Forestry site preparation
Oust	1 to 4 oz/acre	Forestry site preparation, utility sites
Garlon 3A <sup>†</sup>	1 to 4 qt/acre	Forestry site preparation, utility sites
Garlon 4	1 to 4 qt/acre	Forestry site preparation, utility sites
Arsenal 2WSL	2 to 32 fl oz/acre	Utility sites
<b>Spray-to-Wet Rates</b>		
Arsenal Applicators Concentrate	1/32% to 1/2% by volume	Forestry site preparation
Arsenal 2WSL	1/32% to 1/2% by volume	Utility sites
<b>Low Volume Directed Spray Rates</b>		
Arsenal Applicators Concentrate	1/8% to 1/2% by volume	Forestry site preparation
Arsenal 2WSL	1/8% to 1/2% by volume	Utility sites

<sup>†</sup> Ensure that Garlon 3A is thoroughly mixed with water before adding this product. Agitation is required while mixing this product with Garlon 3A to avoid compatibility problems.

For control of herbaceous weeds, use the lower recommended tank mixture rates. For control of dense stands or difficult-to-control woody brush and trees, use the higher recommended rates.

## Forestry Conifer and Hardwood Release

### Directed Sprays and Selective Equipment

This product may be applied as a directed spray or by using selective equipment in forestry conifer and hardwood sites, including Christmas tree plantations and silvicultural nurseries. This product requires use with a surfactant. Use only surfactants that are approved for conifer release and specified on the surfactant label as safe for use in conifer release (pine release). Use of this product without surfactant will result in reduced herbicide performance. Refer to the "Mixing and Application Instructions" section of this label and the surfactant manufacturer label for more information.

**Tank Mixing:** In hardwood plantations, tank mixtures with Oust may be used. In pine plantations, tank mixtures with Garlon 4 or Arsenal AC may be used. Comply with all site restrictions, forestry species limitations, and precautions on the tank mix product labels.

Avoid contact of spray drift, mist or drips with foliage, green bark or non-woody surface roots of desirable plant species. See "Application Equipment and Techniques" section of this label for specific recommendations and precautions.

**Spray-to-Wet Applications:** Use a 2 percent spray solution to control undesirable woody brush and trees. To control herbaceous weeds, use a 1 to 2 percent spray solution.

**Low Volume Directed Spray Applications:** Use a 5 to 10 percent spray solution. Coverage should be uniform with at least 50 percent of the foliage contacted. Coverage of the top one-half of the unwanted vegetation is important.

**Broadcast Applications:** For equipment calibrated for broadcast applications, use 1 1/2 to 7 1/2 quarts of this product per acre. Apply in 10 to 60 gallons of clean water per acre. ~~Shielded application equipment may be used to avoid contact of the spray solution with desirable plants. Conifers should be adjusted to prevent spray contact with the foliage of green bark of desirable vegetation.~~

**Wiper Application Equipment:** See the "Selective Equipment" section of this label for equipment and application rate recommendations.

### Broadcast Application

**Note:** Except where specifically recommended below, make broadcast applications of this product only where conifers have been established for more than one year.

**Broadcast application must be made after formation of final conifer resting buds in the fall or prior to initial bud swelling in the spring.**

Injury may occur to conifers treated for release, especially where spray patterns overlap or the higher rates are applied. Damage can be accentuated if applications are made when conifers are actively growing, or are under stress from drought, flood water, improper planting, insects, animal damage or diseases.

Accord Concentrate requires use with a surfactant. Use a surfactant that is labeled/recommended for use in over-the-top release applications. Use of this product without a surfactant will result in reduced herbicide performance. Refer to the "Mixing and Application Instructions" section of this label and the surfactant manufacturer label for more information.

**Mixing Information**  
(Important information on which other herbicides are compatible with this specific herbicide and what rates to use and how to mix them correctly)

**Tank Mixture with Atrazine:** To release Douglas fir, apply 3/4 quart of this product with 4 pounds a.i. of atrazine per acre. Apply only over Douglas fir that has been established for at least one full growing season. Apply in the early spring, usually mid-March through early April. Injury will occur if applications are made after bud swell in the spring. For this use, do not add surfactant to the tank mixture.

Always read and follow the manufacturer's label for all herbicides and surfactants used.

### Wetland Sites

This product may be used in and around water (aquatic areas) and wetlands found in forestry and in power, telephone and pipeline rights-of-way sites, including where these sites are adjacent to or surrounding domestic water supply reservoirs, supply streams, lakes and ponds. Read and observe the following before making applications in and around water.

Consult local public water control authorities before applying this product in and around public water. Permits may be required to treat in such areas.

There is no restriction on the use of treated water for irrigation, recreation or domestic purposes.

**Note:** Do not apply this product directly to water within 1/2 mile up-stream of an active potable water intake in flowing water (i.e., river, stream, etc.) or within 1/2 mile of an active potable water intake in a standing body of water such as a lake, pond or reservoir. To make aquatic applications around and within 1/2 mile of active potable water intakes, the water intake must be turned off for a minimum period of 48 hours after application. These aquatic applications may be made ONLY in those cases where there are alternative water sources or holding ponds which would permit the turning off of an active potable water intake for a minimum period of 48 hours after the application. This restriction does not apply to intermittent inadvertent overspray of water in terrestrial use sites.

Do not spray open bodies of water where woody brush, trees and herbaceous weeds do not exist. The maximum application rate of 3 3/4 quarts per acre must not be exceeded in a single over-water broadcast application except as follows, where any recommended rate may be applied:

- Stream crossings in utility right-of-way.
- Where applications will result in less than 20 percent of the total water area being treated.

### Wildlife Habitat Restoration and Management Areas

This product is recommended for the restoration and/or maintenance of native habitat and in wildlife management areas.

**Habitat Restoration and Maintenance:** When applied as directed, exotic and other undesirable vegetation may be controlled in habitat management areas. Applications may be made to allow recovery of native plant species, to open up water to attract waterfowl, and for similar broad-spectrum vegetation control requirements in habitat management areas. Spot treatments may be made to selectively remove unwanted plants for habitat enhancement. For spot treatments, care should be exercised to keep spray off of desirable plants.

**Wildlife Food Plots:** This product may be used as a site preparation treatment prior to planting wildlife food plots. Apply as directed to control vegetation in the plot area. Any wildlife food species may be planted after applying this product, or native species may be allowed to reinfest the area. If tillage is needed to prepare a seedbed, wait 7 days after applying this product before tilling to allow for maximum effectiveness.

### Wiper Applications

For wick or wiper applications, mix 1 gallon of this product with 2 gallons of clean water to make a 33 percent solution. Addition of a nonionic surfactant at a rate of 10 percent by volume of total herbicide solution is recommended.

Wiper applications can be used to control or suppress annual and perennial weeds listed on this label. In heavy weed stands, a double application in opposite directions may improve results. See the "Weed Controlled" section in this label for recommended timing, growth stage and other instructions for achieving optimum results.

### Cut Stump Application

Woody vegetation may be controlled by treating freshly cut stumps of trees and resprouts with this product. Apply this product using suitable equipment to ensure coverage of the entire cambium. Cut vegetation close to the soil surface. **Apply a 50 to 100 percent solution of this product to freshly cut surface immediately after cutting.** Delay in applying this product may result in reduced performance. For best results, trees should be cut during periods of active growth and full leaf expansion.

When used according to directions for cut stump application, this product will **control, partially control or suppress** most woody brush and tree species, some of which are listed below:

Common Name	Scientific Name
Alder	<i>Alnus spp.</i>
Coyote brush <sup>1</sup>	<i>Baccharis consanguinea</i>
Dogwood <sup>1</sup>	<i>Cornus spp.</i>
Eucalyptus	<i>Eucalyptus spp.</i>
Hickory <sup>1</sup>	<i>Carya spp.</i>
Madrone	<i>Arbutus menziesii</i>
Maple <sup>1</sup>	<i>Acer spp.</i>
Oak	<i>Quercus spp.</i>
Poplar <sup>1</sup>	<i>Populus spp.</i>
Reed, giant	<i>Arundo donax</i>

## Wetland/aquatic information

(If you herbicides in or near water, it is crucial that you use a product labeled for use in aquatic areas. This section gives specific information about this type of application)

## Information on cut stump treatments

(Specific information on the rates and methods used for this application type)

# Exam contains 20 questions on label

1. What is the EPA Registration number of this herbicide? p1
2. What company makes this herbicide? p1
3. Are there any animals to which it is particularly toxic to? p1
4. What is the restricted entry interval (REI)? p2
5. What losses or damages are the product limited to? p5
6. Where can I find the tank mixing instructions?

1. What is the EPA Registration number of this herbicide? 62719-308
2. What company makes this herbicide? P1 DowAgroSciences
3. Are there any animals to which it is particularly toxic to? P1 Fish
4. What is the restricted entry interval (REI)? P2 12 hours
5. What losses or damages are the product limited to?  
P5 A refund of purchase price or replacement of the amount of product used
6. Where can I find the tank mixing instructions? Page 3  
bottom right

- 7) What should you do if your clothing is drenched with this products concentrate? p2
- 8) Can you use this product on cat grass inside private residences? p1
- 9) What is the product rate when spraying common dandelion in fluid ounces per 1000 sq. feet? p3
- 10) What is the A.I.? p1
- 11) What is the hazardous category of Safari? Hint: This is listed below the item on every single herbicide label? p1
- 12) What PPE is required for early entry into treated areas? p2

- 7) What should you do if your clothing is drenched with this products concentrate? P2 Discard
- 8) Can you use this product on cat grass inside private residences? P1 no
- 9) What is the product rate when spraying common dandelion in fluid ounces per 1000 sq. feet? P3 0.9
- 10) What is the A.I.? P1 Fluroxypyr 1- methylheptyl ester
- 11) What is the hazardous category of Safari? Hint: This is listed below the item on every single herbicide label? P1 WARNING
- 12) What PPE is required for early entry into treated areas? P2 Coveralls chemical resistant gloves shoes socks eyewear

- 13) What is first aid for eye product gets in eyes? p1
- 14) When can children and pets enter to the treated areas? p2
- 15) What is the intended use of this herbicide? p1
- 16) Where can this be appropriately applied? p1
- 17) True or false? You can use this product to control creeping red fescue? p2

- 13) What is first aid for eye product gets in eyes? <sub>P1</sub> rinse  
15-20 minutes remove contact lenses after the first 5 minutes call poison control or doctor
- 14) When can children and pets enter to the treated areas? <sub>P2</sub> 12 hours
- 15) What is the intended use of this herbicide? <sub>P1</sub> annual and perennial broadleaf weeds and woody brush in established turf
- 16) Where can this be appropriately applied? <sub>P1</sub> residential lawns golf courses sports field sod farms commercial turf areas
- 17) True or false? You can use this product to control creeping red fescue? <sub>P2</sub> True

18) True or false? You cannot apply more than 2 ½ pints per acres of this herbicide per annual growing season? p3

19) True or False? For Low Volume Application use 5-20 gallons of total spray mix per acres and high pressure and application equipment? p4

20) How much to do you add to 1 Gallon of water and apply to 1,000 square feet if you are supposed to use 2 pints per acre? p4

18) True or false? You cannot apply more than 2 ½ pints per acres of this herbicide per annual growing season? p3 True

19) True or False? For Low Volume Application use 5-20 gallons of total spray mix per acres and high pressure and application equipment? p4 False low pressure

20) How much to do you add to 1 Gallon of water and apply to 1,000 square feet if your supposed to use 2 pints per acre? p4

0.74 fluid ounces or 22 ml

# Sample Question

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- What warning is on every herbicide label?

# Answer

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- What warning is on every herbicide label?

Keep out of the reach of children

# Sample Question

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- If you have herbicide that you bought in 2015 and a new formulation comes out in 2016. The new label says that the herbicide can be used on corn. Can you use the old herbicide on corn?

# Sample Question

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- If you have herbicide that you bought in 2015 and a new formulation comes out in 2016. The new label says that the herbicide can be used on corn. Can you use the old herbicide on corn?

No, you cannot apply the old product to sites that are not on the old label but appear on the new one.

# CHAPTER 4: HUMAN PESTICIDE PROTECTION



# Toxicity

- The pesticide's ability to cause damage/ death
  - ▣ Pesticide label gives a quick indication of how poisonous it is by the signal word.



**CAUTION**

**WARNING**

**DANGER**

# LD<sub>50</sub>

- Dose that kills half of the test animals, stands for lethal dose (LD) for 50%- p32

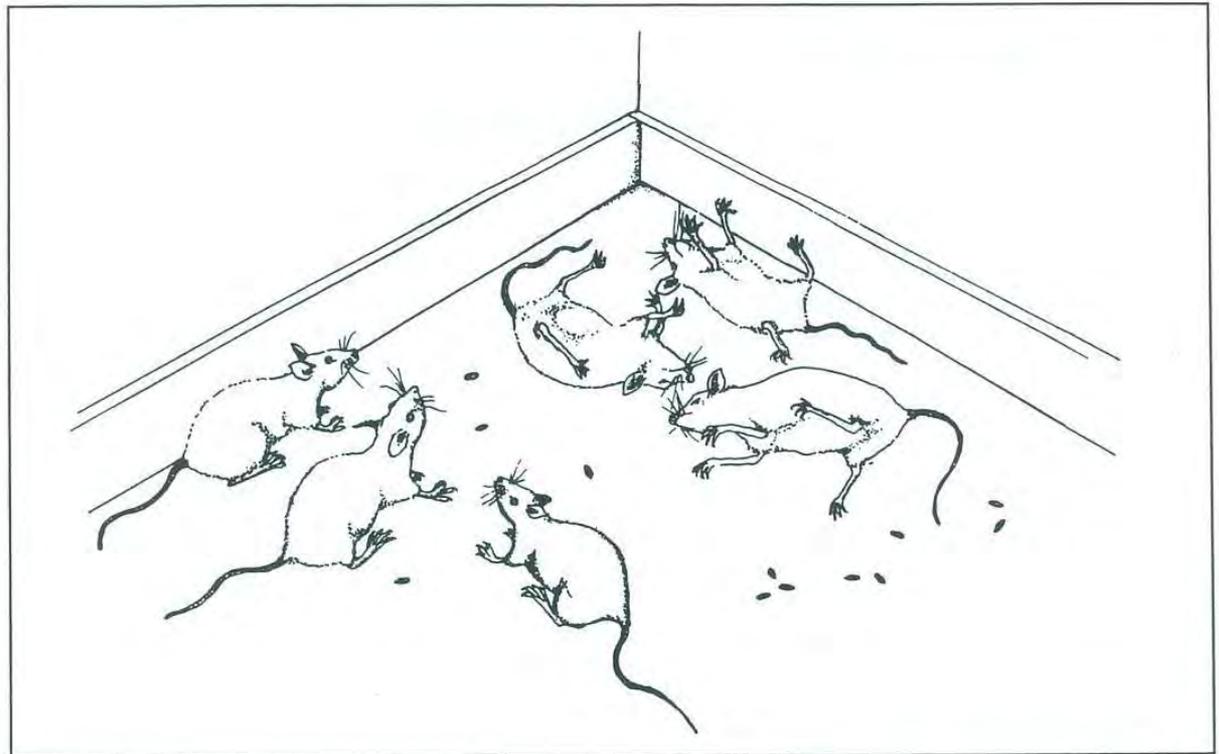


Figure 4.2 LD<sub>50</sub>: The amount that kills half of the tested animals.

# Exposure

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- how pesticides enter the body
- reason to wear proper protective equipment

# Routes of Exposure

- Oral- by mouth
- Dermal- by skin
- Eye- by eye
- Inhalation- by lungs



# Acute exposure

- One- time hazardous contact with pesticide
  - ▣ Spilling chemical on clothes & skin
  - ▣ Ingesting a pesticide accidentally
- Working with highly toxic chemicals you should never work alone in case you are exposed

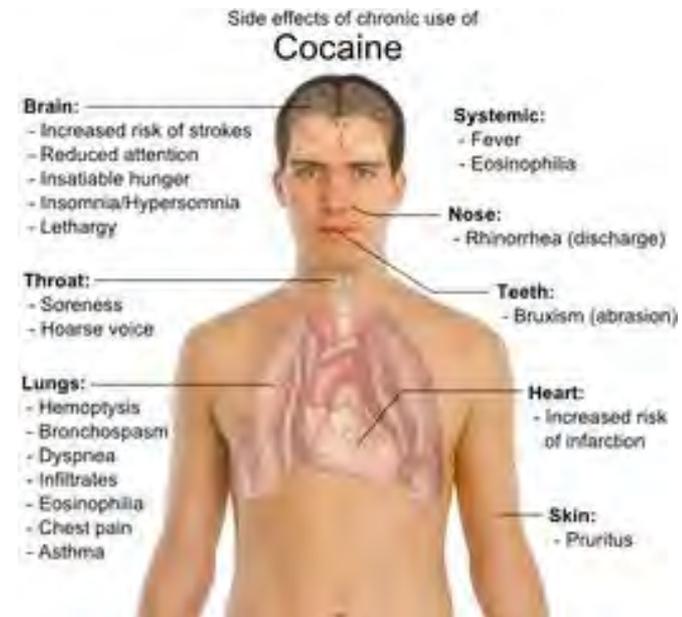
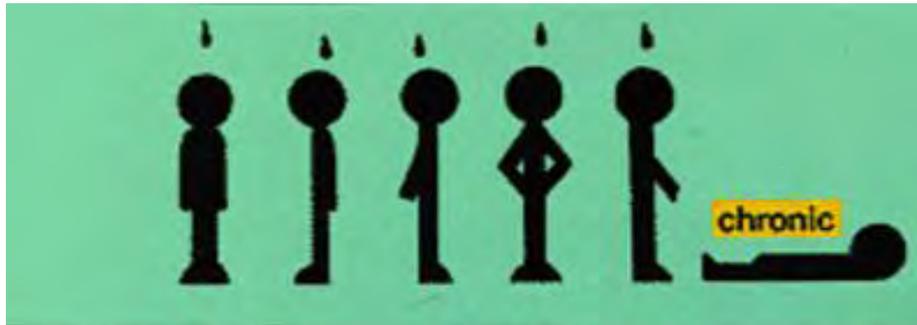


# Detecting poisoning

- Many insecticides used today are organophosphates or carbamate
- Organophosphates are involved in more cases of poisoning & deaths than other insecticides
- Levels can be measured doing a blood cholinesterase test
  - Reduction in cholinesterase indicates possible poisoning
  - Stop exposure immediately

# Chronic Effects

- Risks associated with long term use of a pesticide
- example chronic effects-not a pesticide



# Routes of Exposure

Why protective equipment is needed

# Dermal absorption rates - p 35

- Parts of the body absorb pesticides at different rates
- Forehead is 4 times more absorbent than the hand
- Genital area is 11 times more absorbent

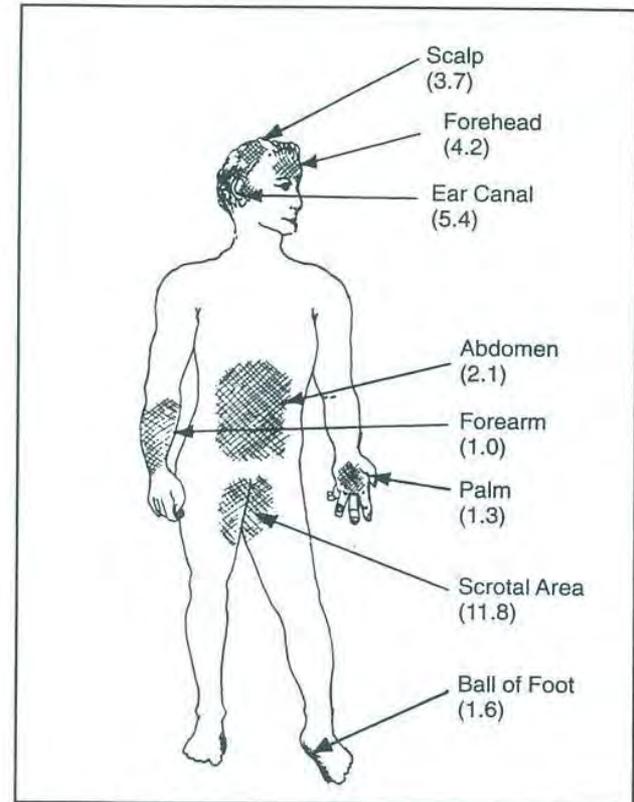


Figure 4.4 Dermal absorption rates as compared with the forearm.

# Treatment for Exposure



## □ Oral

- ▣ Check label or contact poison control

*Do not use food containers to hold herbicide*

## □ Skin

- ▣ rinse with water
- ▣ remove contaminated clothing
- ▣ wash with plenty of soap and water

*Most serious dermal exposures is when a pesticide mixed with oil crosses the skin barrier and into the bloodstream, the results can be fatal.*

# Treatment for Exposure



## □ Eye

- Rinse eye with water or eyewash bottle at least 15 min
- get medical attention if there is pain or reddening of the eye (best to be safe than sorry)

## □ Inhalation

- Move to better ventilated area
- keep air passages clear
- perform artificial respiration if necessary

# Personal Protective Equipment (PPE)

- **When using any pesticide at minimum wear:** p. 38
  - Hat, long sleeves, trousers/ coverall, socks and shoes
- **During mixing:** boots, glove, apron, and goggles
  - Unlined: chemical resistant gloves
  - Rubber, Nitrile or Neoprene
- Label states minimum PPE in the precautionary statement



# PPE Care

- Wash PPE separately from other clothing at home p.41
  - ▣ As soon as possible, do not have contaminated clothing sit around
  - ▣ Wash daily
- If you spill highly concentrated toxic chemicals on your clothes **do not wash** -- dispose of them properly



# Respirators

p. 41

- Protect from inhaling toxic chemicals
- Label indicate if respirator is need for application
- whether a prefilter is needed
- Designated with the following letters
  - N- not to be used with oil
  - R- oil resistant
  - P- oil proof
  - HE- high-efficiency

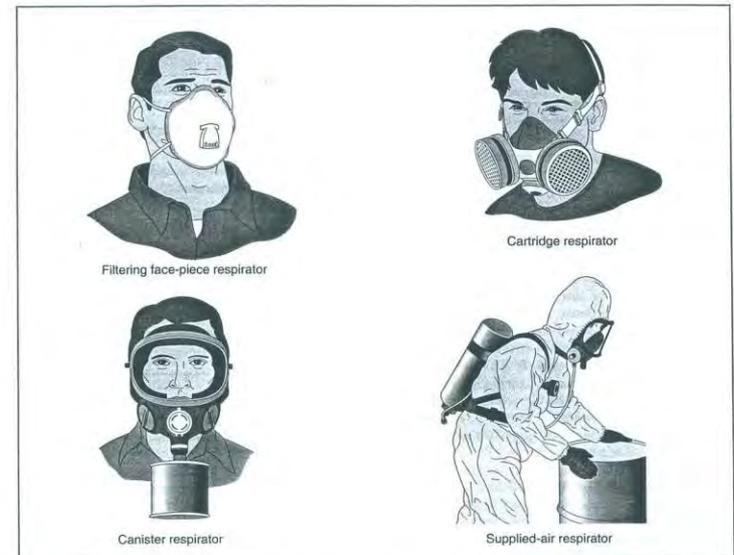


Figure 4.10 Respirators used for pesticide protection.

# Safe Handling & Storage

To protect others

# Transporting Pesticides p.44

- Check to make sure all containers are not leaking
- Do not transport with:
  - Food
  - Animal feed
  - Animal supplies
- Tie down & secure containers



# Pesticide Storage

- Store downwind & downhill from houses, play areas and ponds
- Away from human & livestock areas to avoid contamination in case of fire
- If possible in a separate building – first floor, in cool dry area away from direct sunlight
- Signs posted with a locked door



# Large Quantity Containment Area

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- Soap
- Pesticide absorptive material
- Fire extinguisher
- Broom & dustpan
- Trash can
- Keep Labels on containers

# Pesticide mixing & loading - p 47

- When filling, rinsing and draining equipment you should have a wash pad, wash rack or concrete apron with well designed sump to catch contaminated water

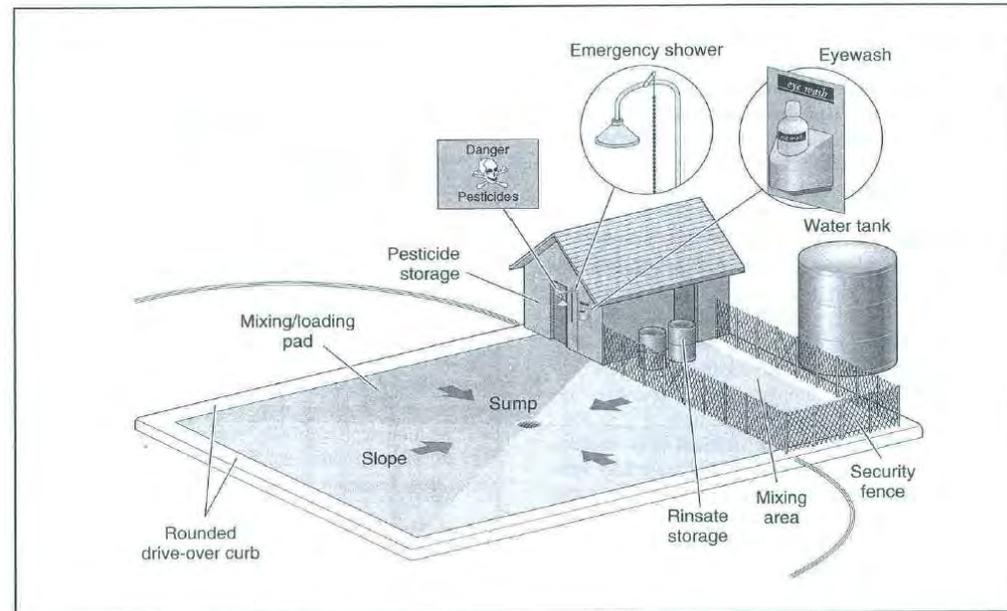


Figure 4.14 Pesticide mixing and loading area.

# What if you do not have this? P. 49

- Small amounts of surplus mixtures or rinsates can be diluted and reapplied to the treated area
- Do not exceed label rates for area listed on the label

Crop	Maximum Rate Per Acre Per Application	Maximum Rate Per Acre Per Season
Corn	3.5 pints	5.25 pints
Fallow Ground	8.6 pints	8.6 pints
Sorghum	2 pints	3.5 pints

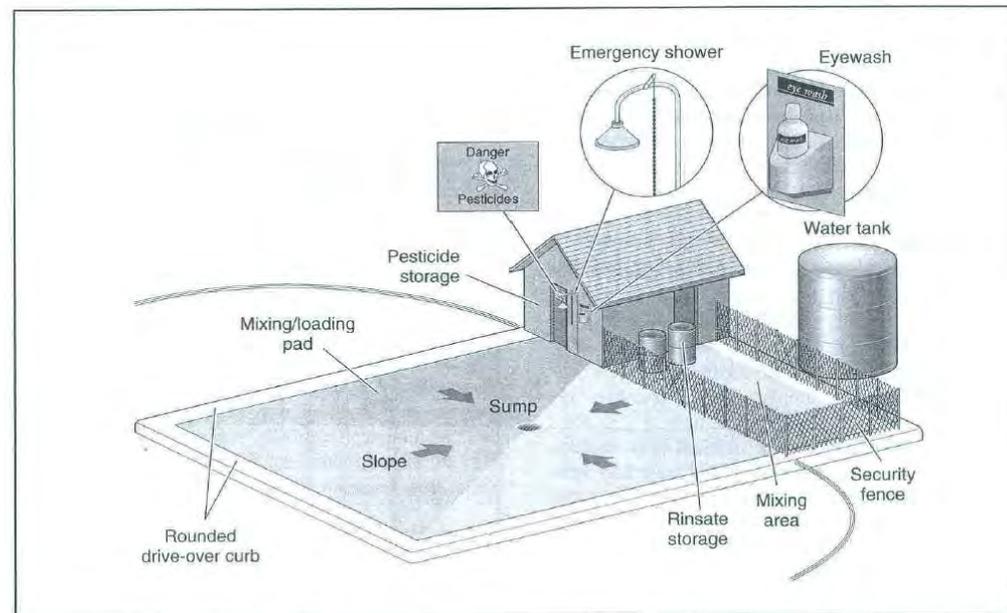
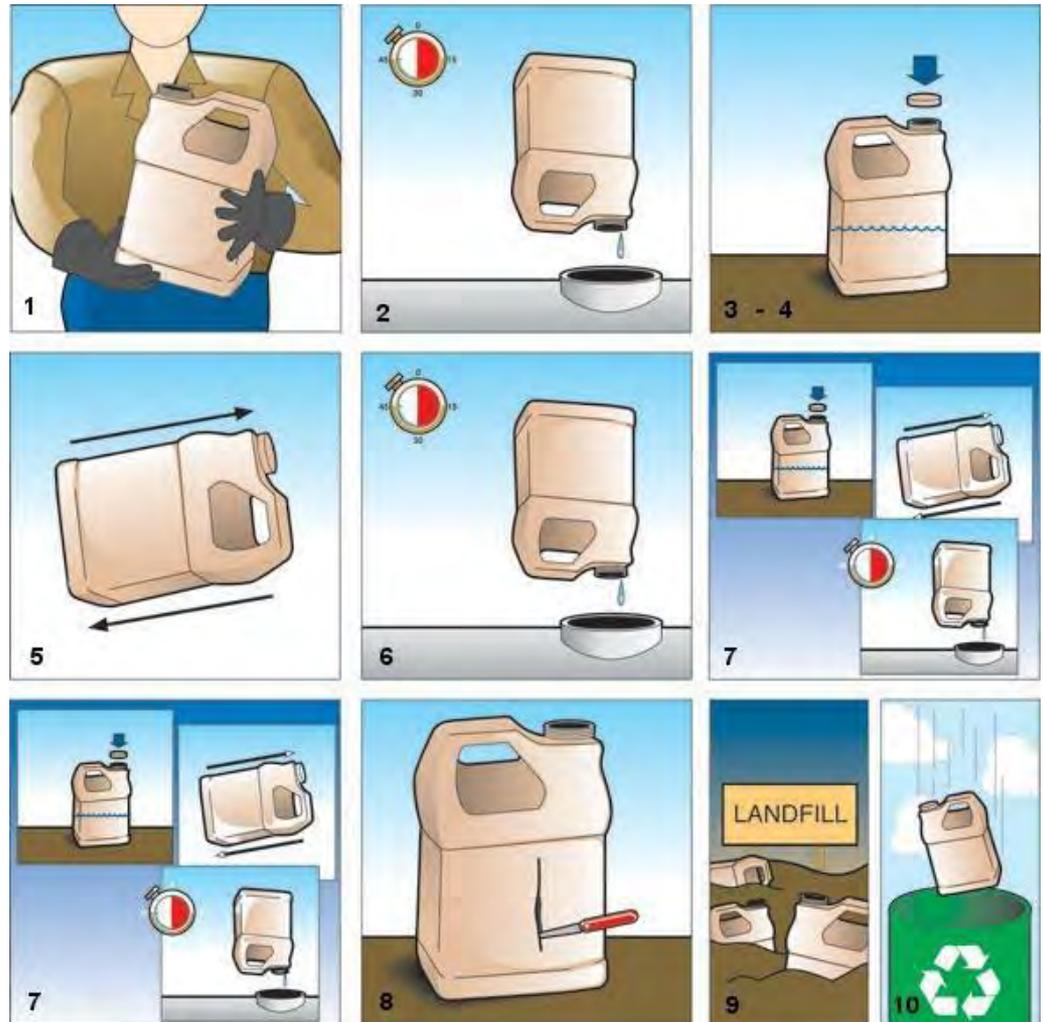


Figure 4.14 Pesticide mixing and loading area.

# Pesticide Container Rinsing p 51

- At end of day  
From backpack-  
Spray remaining  
herbicide on target  
plants to empty

- Triple Rinsing
- Still have residue



# Tank/Backpack Rinsing

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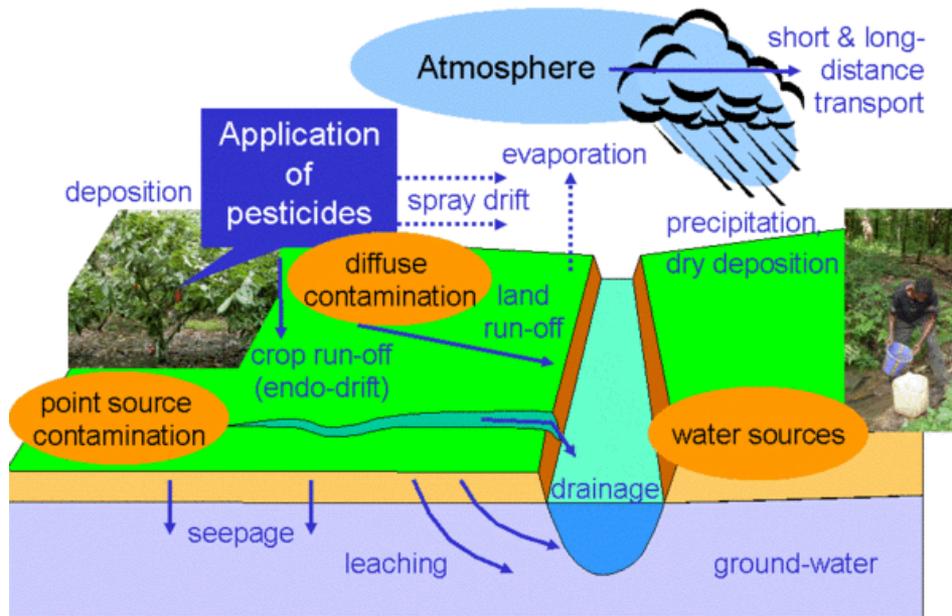
- Some oil formulations such as 2,4D may leave residues that can stay in tank & cause harm to plants if not thoroughly cleaned out
- To remove oily residue household ammonia is used

# CHAPTER 5: PESTICIDES IN THE ENVIRONMENT



# Particle Drift

- Movement of spray particles, usually by the wind resulting in misapplication



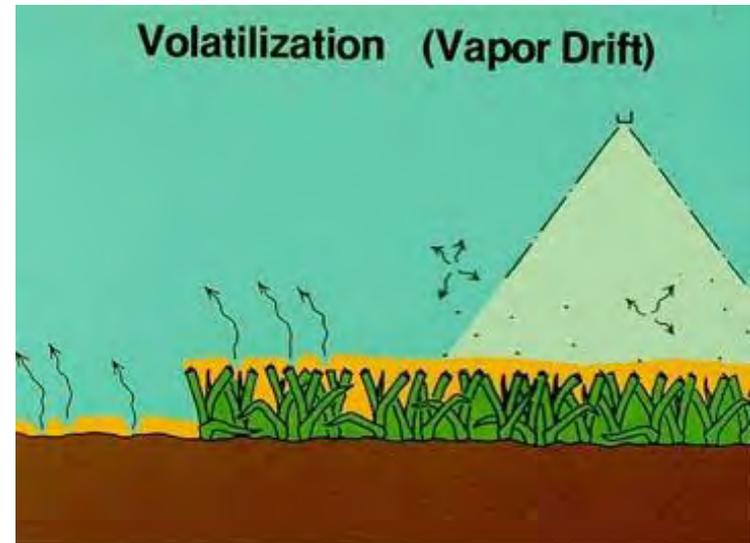
Prevent drift by NOT spraying when:

- Winds are over 10mph
- Winds are shifty
- Winds are blowing towards sensitive areas
- During periods of calm/inversions

# Vapor Drift

- Vapors formed after application
- carried out of target area, *volatilization*
- can occur up to several days after application- can result in damage
- If some products used in hot weather (Garlon 4)

*\*Labels list if herbicide is prone to volatilization, so switch to another formula (Garlon 3a) on those days*



**Both vapor & particle drift can result in off-target damage to vegetation and people**

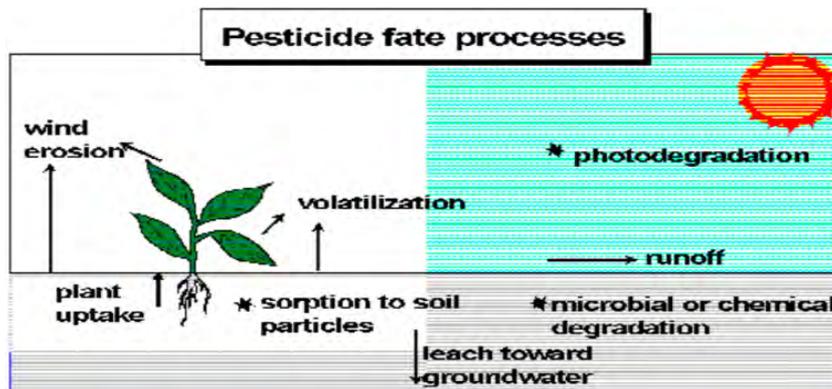
# Factors likely to increase drift



- small droplet size (under 200 microns)
- wind or air currents
- sprayer a large distance from the target plant
- high temperatures with increased evaporation rates

# Movement of Pesticides by Water p. 54

- Movement of pesticides out of the target area and into groundwater or surface water



Leaching, Seepage

Application prior to rainfall

Runoff into surface water

Reduce this by

- Nozzle pressure
- Droplet size
- Spray height

# Run-In and Leaching

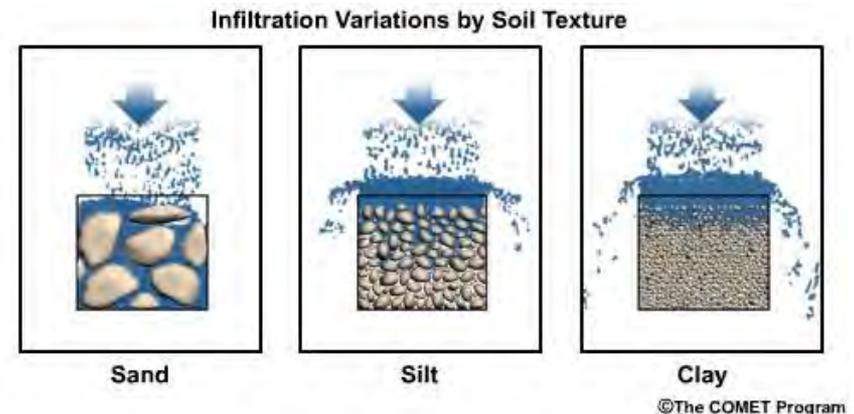
p. 55

- Run-In
  - when pesticide moves directly from soil surface to groundwater below
- Leaching
  - movement of pesticides downward in the soil profile with percolating water
  - can contaminate groundwater
- Pesticides degradation (breakdown)
  - is much slower in ground water because of the low oxygen and light conditions



# Leaching more likely if

- Pesticide over-applied
- Applied to sandy soil
- Pesticide properties
- Applied before heavy rain or irrigation
- Spills not cleaned up



# 4 factors determine if Pesticides Reach the Groundwater

p. 56

- Pesticide properties
  - persistence, adsorption and solubility
- Soil properties
  - soil texture and organic matter
- Site conditions
  - depth of groundwater, slope & climate
- Management practices
  - mishandling, not following directions or label

Example- Leaching occurs more on sandy soil or runoff on sloped areas

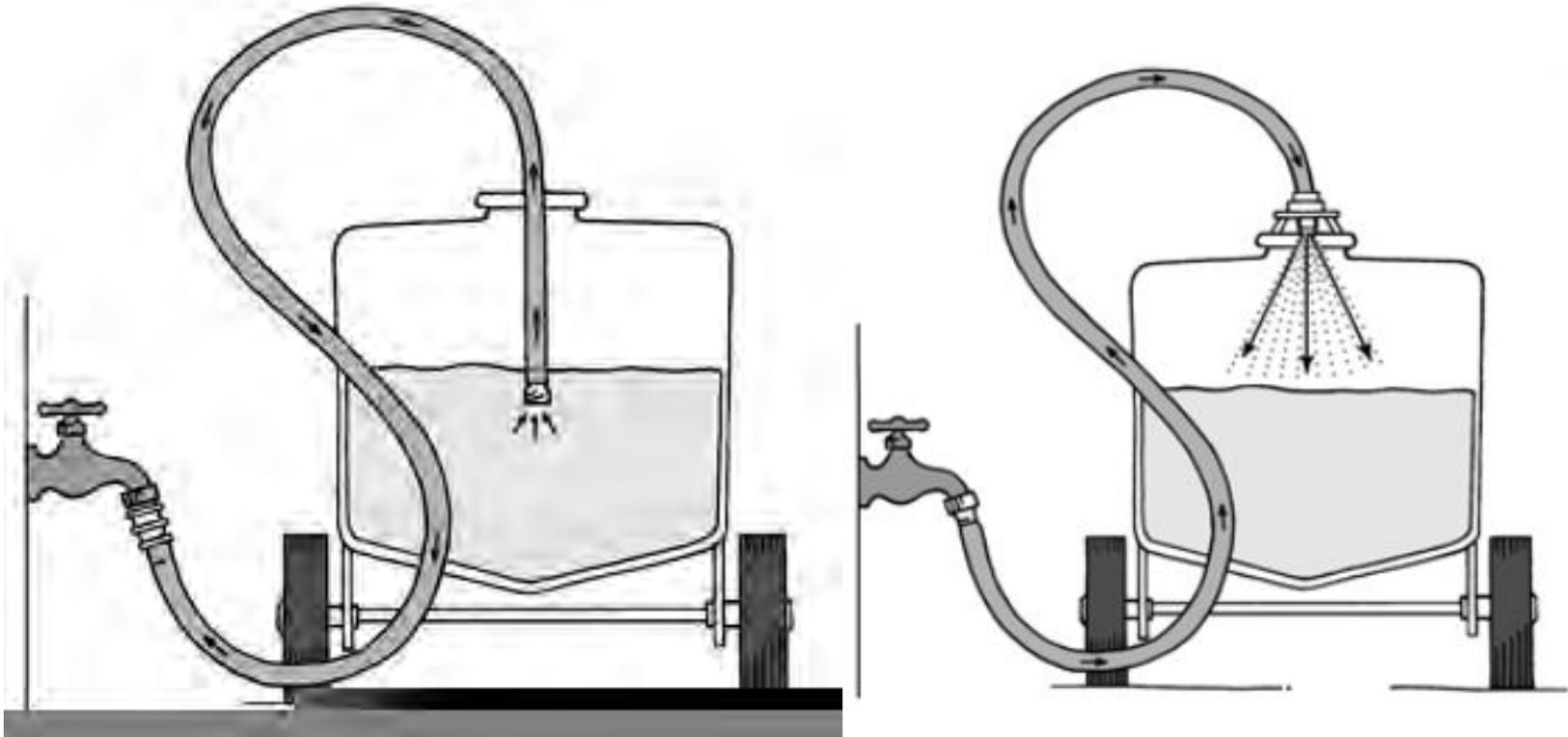
# Protect Water Resources

- Check weather forecasts & delay application if rain is predicted
  - Always have back up plans



# Backsiphoning

- To prevent back-siphoning of pesticide back into the water supply by keeping an air gap or using anti-siphoning devices on garden hoses (page 45)



# Water advisory statements on labels

- These are related to leaching & runoff issues
  - May not be mixed or loaded within 50 feet of intermittent streams...
  - May not be applied aerially or by ground within 66 feet of the points...
  - May not be mixed, loaded or used within 50 feet of all wells and sinkholes...

# Spills p. 58

- ❑ Do everything to stop the spill
- ❑ Attend to injured people, wear your protective equipment
- ❑ Confine spilled pesticides
- ❑ Contact the proper authorities for large spills
- ❑ For large spills contact Illinois Emergency Management Agency (IEMA)
- ❑ Remove the spilled materials



# Protecting Nontarget Species p. 59

1. Use pesticides with low bee toxicity
  2. Spray when bees are not active (before dawn/after dusk)
  3. Notify the beekeeper to remove bees
    - 48hr prior to spraying if within 3 miles
- 
- Remember:
    - microencapsulated formulas are harmful to honeybees
    - endangered plant & animal species are protected by the U.S. Fish & Wildlife Service

# Sample Questions

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- If you spill herbicide should you hose down the spill or mop it up?

# Sample Questions

---

- If you spill herbicide should you hose down the spill or mop it up?

Use absorptive material such as cat litter to clean up and dispose of it properly.

# CHAPTER 6: EQUIPMENT AND CALIBRATION



# Applications p. 61

- Spot
  - Treat only a portion of the total area
  - used to control pests that are clustered
- Band
  - Treat only a narrow strip
  - Over/alongside a row of desirable plants & areas between untreated
  - Uniformly within the band
- Broadcast
  - Treat the entire area or field
  - Most uniformity throughout field



# Liquid Application Equipment p. 65

- Pumps move liquids & create pressure for spraying solutions
  - Centrifugal- low pressure up to 140psi & high volume
  - Roller- medium pressure up to 300 psi & higher pressure
    - not as many gallons per minute as Centrifugal
  - Diaphragm- medium-high pressure up to 725psi & medium flow
  - Piston- high pressure up to 1,000 psi and low flow
    - cannot be used with abrasive formulas

# Agitation p. 66

- Most pesticide solutions need to be mixed to keep pesticide from settling out
  - Hydraulic agitation-
    - Solution circulates through the pump & back into tank to mix solution
  - Mechanical agitation
    - Uses paddles instead
- If sprayer not equipped with agitation do not use it to apply pesticides that may settle out of the solution

# Hoses p. 66

- Hoses used must be the right size, strength & material for flow, pressure and type of chemical
  - If hose damaged replace it with same material & size
  - Hose of wrong material is dangerous may become weak & break
  - Oversized hoses
    - may allow pesticides to settle out before sprayed
  - Undersized hoses
    - Restrict flow & pressure

# Strainer & Pressure Gauge p. 66

- Strainers
  - Filters made of slotted metal, wire or plastic mesh that prevent foreign objects in solutions from damaging equipment
- Pressure Gauge
  - Allows applicator to see pump is working properly
  - Monitor application problems
    - Rise or drop in pressure

# Nozzles

- Nozzle meters liquid through its orifice or spray opening
  - ▣ Applicators control how much spray is applied by choosing a nozzle & setting the pressure so the right amount of liquid comes out
  - ▣ Larger orifice- more liquid can pass
- **Flat fan-** thin sheet of spray
- **Even flat fan-** thin sheet spray with uniform deposit
- **Hollow cone-** sprays in a circle, no droplets in center
- **Solid cone-** sprays in a circle droplets throughout

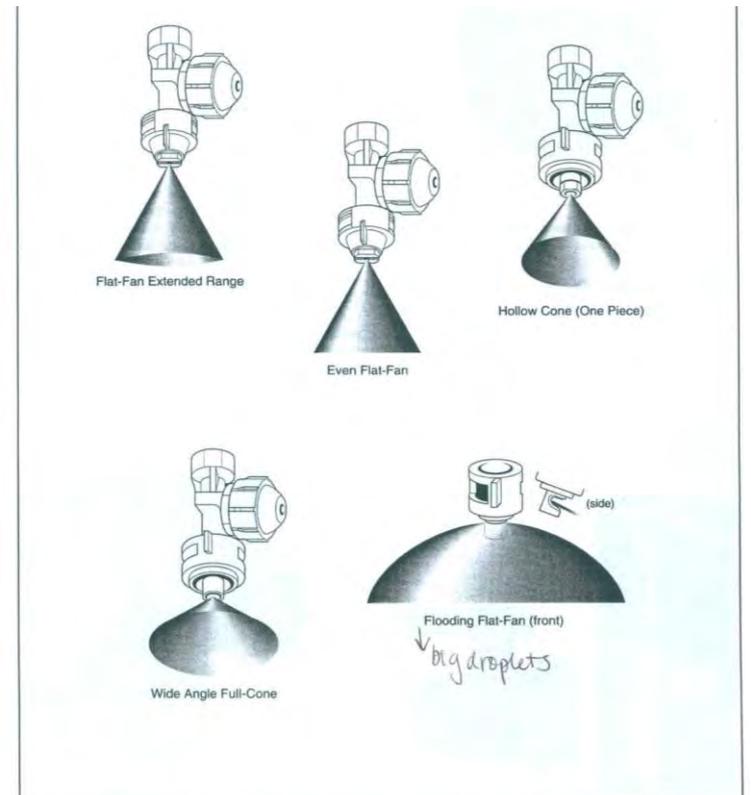


Figure 6.15 Nozzles have different spray patterns including flat-fan, even flat-fan, hollow cone, full cone, and flood.

# Calibration

- Selecting the right sized orifice (nozzle size) & operating pressure
- Hand held sprayers can be calibrated to figure out how much spray is being applied
  - Spray into a container and see how much time it takes
    - Helps you to know about how much product you spray in 15 minutes, etc.
  - Spray onto an area and measure the area to see how much product is used for that much area

# Boom Sprayer Height

- Raising the boom sprayer does what?



<http://www.arnoldsinc.com/cih-sprayers.htm>

It increases overlap, but it also increases the amount of drift



[http://www.norac.ca/media/ca/en/image/product/preview/page\\_sprayhtcontrollers.jpg](http://www.norac.ca/media/ca/en/image/product/preview/page_sprayhtcontrollers.jpg)

# Boom Sprayer Height

- Lowering the boom sprayer does what?



<http://www.arnoldsinc.com/cih-sprayers.htm>

Reduces drift & overlap



[http://www.norac.ca/media/ca/en/image/product/preview/page\\_sprayhtcontrollers.jpg](http://www.norac.ca/media/ca/en/image/product/preview/page_sprayhtcontrollers.jpg)

# Calibration & Calculations p. 70

Make sure to bring a calculator  
Cell phone calculator apps are NOT  
allowed!



Review & try at least 1 question of each type in your General Standards Manual and Workbook

# Formulas given on test- back of book

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Abbreviations

Weights

Linear Measurements

Area Measurements

Fluid Measures

Aquatic Liquid Measures

Formulas

- Given but often do not spell out abbreviations
- ~10 math questions on the exam

# Application Rate Calculation GPA

To calculate application rate (Gallons per Acre GPA):

*Flow rate per nozzle, in gallons per minute (GPM)*

*Application speed, in miles per hour (MPH)*

*Effective sprayed width per nozzle, in inches (W)*

$$\text{GPA} = \frac{\text{GPM} \times 5,940}{\text{MPH} \times W \text{ (effective width sprayed per nozzle in inches)}}$$

OR

$$\text{GPA} = \frac{\text{GPM} \times 495}{\text{MPH} \times \text{SW} \text{ (swath width, in feet)}}$$

# Flow Rate Calculation GPM

## Calculating Gallons per Minute (GPM)

$$\text{GPM} = \frac{\text{GPA} \times \text{MPH} \times \text{W (effective width sprayed per nozzle in inches)}}{5,940}$$

OR

$$\text{GPM} = \frac{\text{GPA} \times \text{MPH} \times \text{SW (swath width, in feet)}}{495}$$

# Example test questions Page 78

18. What Gallons per Minute (**GPM**) should your nozzles provide if you want to apply 30 GPA (gallons per acre) traveling 8 MPH with nozzles 20-inches apart?

Which formula do we use when we want GPM as the answer?



# GPM Calculation

18. What **GPM** should your nozzles provide if you want to apply **30 GPA** traveling **8 MPH** with nozzles 20-inches (W) apart?

Answer is in **GPM** using **nozzle effective width (W)**

Formula to use: **GPM =  $\frac{\text{GPA} \times \text{MPH} \times \text{W inches}}{5,940}$**

# GPM Calculation

18. What **GPM** should your nozzles provide if you want to apply **30 GPA** traveling **8 MPH** with **nozzles 20-inches (W)** apart?

$$\text{GPM} = \frac{\text{GPA} \times \text{MPH} \times \text{W inches}}{5,940}$$

$$\text{GPM} = \frac{30 \text{ GPA} \times 8 \text{ MPH} \times 20''}{5,940}$$

$$\text{GPM} = \frac{4800}{5940}$$

$$\text{GPM} = 0.81$$

*\*Watch the decimal place when selecting the correct exam answer!*

# Example test questions Page 78

3. How many square feet are in a circle **80 feet** in diameter?

**Area of a circle =  $\pi r^2$  (3.14 x radius squared)**

First convert diameter (d) to radius (r)

$$r = \frac{1}{2} d$$

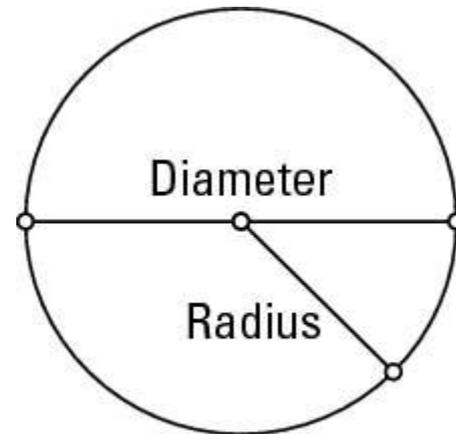
$$r = \frac{1}{2} \times 80\text{ft}$$

$$r = 40\text{ft}$$

**Area of a circle =  $\pi r^2$**

$$\text{Area} = 3.14 \times 40\text{ft} \times 40\text{ft}$$

$$\text{Area} = 5,024 \text{ sq. ft.}$$



# A.I. Rates of Application

To convert a dry a.i. rate to a product rate, use this equation:

$$\text{lb of prod per A} = \text{lb of a.i. per A} \times \frac{100\%}{\% \text{ a.i. for prod}}$$

To convert a liquid a.i. rate to a product rate, use this equation:

$$\text{gal of prod per A} = \frac{\text{lb of a.i. per A}}{\text{lb of a.i. per gal of prod}}$$

To convert a dry product rate to an a.i. rate, use this equation:

$$\text{lb of a.i. per A} = \text{lb of prod per A} \times \frac{\% \text{ a.i. in prod}}{100 \%}$$

To convert a liquid product rate to an a.i. rate, use this equation:

$$\text{lb of a.i. per A} = \text{gal of prod per A} \times \text{lb of a.i. per gal of prod}$$

# Calculate Active Ingredient: DRY

7. How much of a **20G** pesticide is needed to provide 1 pound of A.I. ?

Wet or dry formulation?

G means Granular, or DRY

20G means 20% (or in decimal form 0.20)



# Calculate Active Ingredient: DRY

How much of a **20G** pesticide is needed to provide **1 pound** of A.I. ?  
*asking you to convert from a dry a.i. rate to a product rate*

To convert a dry a.i. rate to a product rate, use this equation:

$$\text{lb of prod per A} = \text{lb of a.i. per A} \times \frac{100\%}{\% \text{ a.i. for prod}}$$



To convert a liquid a.i. rate to a product rate, use this equation:

$$\text{gal of prod per A} = \frac{\text{lb of a.i. per A}}{\text{lb of a.i. per gal of prod}}$$

To convert a dry product rate to an a.i. rate, use this equation:

$$\text{lb of a.i. per A} = \text{lb of prod per A} \times \frac{\% \text{ a.i. in prod}}{100 \%}$$

To convert a liquid product rate to an a.i. rate, use this equation:

$$\text{lb of a.i. per A} = \text{gal of prod per A} \times \text{lb of a.i. per gal of prod}$$

# Calculate Active Ingredient: DRY

How much of a **20G** pesticide is needed to provide **1 pound** of A.I. ?

*20G means 20% (or in decimal form 0.20)*

*A=acre*

lb of product per A = lb of a.i. per A x  $\frac{100\%}{\% \text{a.i. for product}}$

lb of product per A = **1** lb of a.i. per A x  $\frac{100\%}{\mathbf{20\%}}$  for product

lb of product per A = 1 x  $\frac{100\%}{\mathbf{20\%}}$

**lb of product per A=5**

# Calculate Active Ingredient: WET

8. How many pints of an 8 EC pesticide is needed to provide 1 pound of A.I. ?

Wet or dry formulation?

EC means Emulsifiable Concentrate, or WET

8EC means 8 lbs of active ingredient per gallon of product



# Calculate Active Ingredient: WET

How many **pints** of an **8 EC** pesticide is needed to provide **1 pound of A.I.** ?  
*asking you to convert from a wet a.i. rate to a product rate*

To convert a dry a.i. rate to a product rate, use this equation:

$$\text{lb of prod per A} = \text{lb of a.i. per A} \times \frac{100\%}{\% \text{ a.i. for prod}}$$

To convert a liquid a.i. rate to a product rate, use this equation:

$$\text{gal of prod per A} = \frac{\text{lb of a.i. per A}}{\text{lb of a.i. per gal of prod}}$$

To convert a dry product rate to an a.i. rate, use this equation:

$$\text{lb of a.i. per A} = \text{lb of prod per A} \times \frac{\% \text{ a.i. in prod}}{100 \%}$$

To convert a liquid product rate to an a.i. rate, use this equation:

$$\text{lb of a.i. per A} = \text{gal of prod per A} \times \text{lb of a.i. per gal of prod}$$



# Calculate Active Ingredient: WET

How many **pints** of an **8 EC** pesticide is needed to provide **1 pound of A.I.**?

**8 EC** means *8 pounds per gallon*

*A=acre*

$$\text{gallon of product per A} = \frac{\text{lb of a.i. per A}}{\text{lb of a.i. per gallon of product}}$$

$$\text{gallon of product per A} = \frac{\mathbf{1} \text{ lb of a.i. per A}}{\mathbf{8} \text{ lb of a.i. per gallon of product}}$$

$$\text{gallon of product per A} = \frac{1}{8}$$

**gallon of product per A = 0.125**

# Calculate Active Ingredient: WET

How many pints of an 8 EC pesticide is needed to provide 1 pound of A.I.?

**WATCH THE UNIT OF MEASURE!**

Looking for the answer in PINTS not gallons

**gallon** of product per A= 0.125

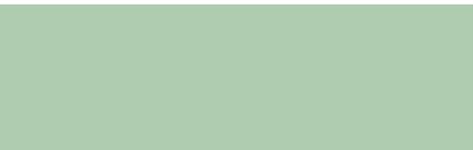
1 pint = 16 fluid ounces

1 gallon = 128 fluid ounces

**0.125 gallons** x 128 fluid ounces = **16 fluid ounces**

**16 fluid ounces** ÷ 16 fluid ounces = **1 pint**

# CHAPTER 7: PESTICIDES LAWS AND REGULATIONS



# Insecticide Act of 1910 p. 80

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- Truth in Labeling Act
- Required chemical producers to label packages with the word “poison”

# Federal Insecticide, Fungicide, and Rodenticide Act (FIFRA)- 1947 p. 80

- Regulates the use of pesticides to protect humans, wildlife and the environment
- Administered by the U.S. EPA
- Pesticide user assurance
- Pesticide registration
  - general use
  - restricted use- too hazardous for general public

# Federal Environmental Pesticide Control Act (FEPCA)- 1972 Amendment p. 80

- Extended federal authority to cover pesticide manufacturing, shipment and use
- Made the product label a legal document
- Products used in US to register with U.S. EPA
- Requires states to laws paralleling FIFRA
- Classified products general use & restricted use pesticides

# 1975 Revisions p. 80

- Added provisions for state enforcement
- Misuse penalties
- Cooperative Extension Services to inform & educate pesticide users
- Strengthened certification & restricted uses

# Food Quality and Protection Act (FQPA)- 1996 p. 80

- Tolerance reevaluation
- Special provision for infants and children
- Endocrine disruptor testing
- Minor use registrations
- Right to know

# Office of Safety and Health Administration (OSHA) p. 81

- Regulations for employers with 10 or more employees
- “*Worker Right-to-Know*” intended to protect our nations workers
- dissemination of chemical safety information on labels, SDS’s & training programs
- SDS sheets are to be available to employees

# Clean Water Act (CWA) p. 81

- Regulates water pollution in navigable waters
- Including pesticide spills or point sources that enter these water from urban & agricultural sources



[http://mjcdn.motherjones.com/preset\\_16/frontline.jpg](http://mjcdn.motherjones.com/preset_16/frontline.jpg)

# Illinois Department of Public Health (IDPH)

- Administers Illinois Structural Pest Control Act
  - Enforces laws that regulate the use of pesticides to:
  - Control pests inside or under manmade structures
  - Licensing restricted pesticide use
    - commercial businesses
    - Individuals- technician certs.

Indoor pests, rodents, wood treatment,  
fumigation, bird, termites, food storage



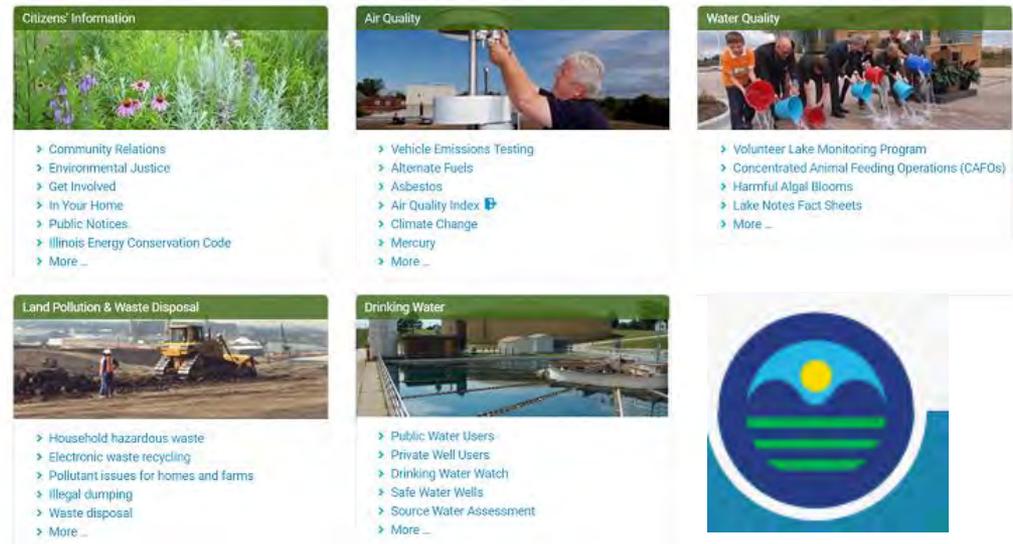
# Illinois Department of Agriculture (IDA) p. 82

- Certification & Licensing
- Misuse Investigation
- And administers the Illinois Pesticide Act which regulates:
  - Labeling, distribution, use & application of pesticides
  - Purchase of Restricted Use Pesticides
  - Registration of Dealers & Record- keeping
  - Registration of Pesticides



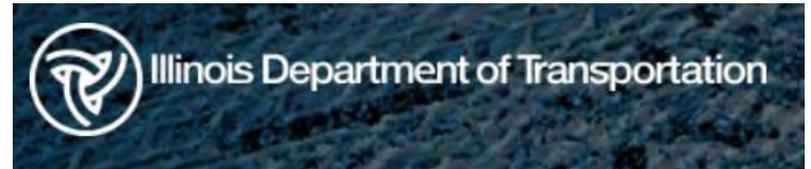
# Illinois Environmental Protection Agency (IEPA) p. 82

- Protecting air and water quality
- Determining appropriate procedures to remediate contaminated land and water resources



# Illinois Department of Transportation (IDOT) Regulation.<sup>89</sup>

- Governs storage & transport of toxic substances, including pesticide to minimize the chance of discharge from:
  - Accidents
  - Negligence
  - Intentional ( on purpose)
- Pesticides are exempt if:
  - In containers approved by U.S. Department of Transportation (DOT)
  - Amount does not exceed max. quantity in 1 package permitted for express rail car



# Lawn Care Products & Notice Act p. 87-88

- Lawn Care Products Application & Notice Act
  - Any applicator that applies lawn care products
  - Requires the placement of markers immediately after application is made
    - Must be placed at the points of entry into the area
  - Requires containment area must be used for the loading of products for distribution to a customer
    - Intercept, retain, recover & reuse pesticide spills
    - Portable & non-portable containment areas
      - Permitted & installed provided they are constructed of impervious materials compatible with pesticide

# Worker Protection Standards (WPS) p. 90

- Protects agricultural workers & pesticide handlers in farms, forests, nurseries & greenhouses
  - Facts about each pesticide application
  - Provide safety training
  - Decontamination areas with clean up supplies- water/ soap/ towels
  - Emergency assistance from poisoning/ injury

# Record-keeping requirements p. 91

- Restricted Use- All certified applicators are required to keep records
  - Private Applicators- recorded within 14 days & kept 2 years
    - Pesticide product name & USEPA reg. #
    - Amount applied
    - Size of area treated
    - Site treated
    - Location
    - Date
    - Applicators name & certification #

# Record-keeping requirements p. 91

- Commercial Applicators
  - Addition to above private requirements
  - Federal regulations state they must also furnish a copy of State or Federal records to customer within 30 days of application

Chapter 1: Integrated Pest Management

Chapter 2: Understanding Pesticides

Chapter 3: Labels & Labeling

Chapter 4: Human Pesticide Protection

Chapter 5: Pesticides in the Environment

Chapter 6: Application Equipment & Calibration

Chapter 7: Pesticide Laws & Regulations

QUESTIONS?