

Play It Safe with Pesticides

How to Properly Handle Hazardous
Materials

Pesticides are chemicals used to destroy, prevent or control pests. Pests include weeds, diseases, and insects. Pesticides also include chemicals used to regulate plant growth or remove or coat leaves.

“Pesticide” can mean a fungicide, herbicide, insecticide, rodenticide, etc.

Pest Types

- Insects
- Mites, ticks, spiders
- Diseases
- Weeds
- Mullosks
- Vertebrates
- Nematodes

Examples

- Lace bugs
- Spider mites
- Leaf spots, wilts
- Crabgrass
- Snails, slugs
- Chipmunks, moles
- Root knot

Before controlling a pest:

- Identify it first
- It may not be a pest
- It may be beneficial
- Select best control

Monitor pests for:

- Kinds
- Numbers
- Time to control
- Check on control efforts

*scouting, trapping, inspections, etc.

Goals of Pest Control

- Prevention
- Suppression
- Eradication
- Fungus diseases
- Many insects
- Boll weevil in some states

Pesticides

- Pesticides are usually the fastest way to control a pest.



**Successful control means
using a variety of methods**

Definitions?

IPM is a pest management system based on sanitation, maintenance, inspection and monitoring. Pesticides are applied only in response to insect pressure, as indicated by monitoring the pest population, and only if all cultural and mechanical methods fail.

No monitoring, no inspection, no IPM

IPM

■ Natural Controls

- Climate
- Natural Enemies
- Geographic barriers
- Food & water
- Shelter

■ Examples

- Adverse temperatures
- Lady beetles
- Stone Landscape
- Dry leaves (fungi)
- Snakes (remove brush)

IPM

■ Applied controls

- Host plant resistance
- Biological
- Cultural
- Mechanical
- Sanitation
- Legal
- Chemical

■ Examples

- Resistant varieties
- Phorid flies
- Crop rotation
- Animal traps
- Remove infected foliage
- Quarantines, embargos
- Pesticides

Chemical Nature of Pesticides

Inorganic Pesticides

- Made from minerals
 - copper, boron, sodium, sulfur, tin, zinc.
 - Salt & vinegar



Plant Derived Organic Pesticides

- Made from plants or plant parts
 - Pyrethrins, rotenone
 - *Chrysanthemum cinerariaefolium*



Chemical Nature of Pesticides

Synthetic Organic Pesticides

- Man-made pesticides
 - 2,4-D, atrazine, malathion



Living Micro-Organisms

- Viruses, bacteria, and fungi
 - *Bacillus thuringiensis* (B.t), Dagger
 - *Beauveria bassiana*



Pesticide Types

- **Acaracides**
 - Kills mites, ticks and spiders.
- **Algaecides**
 - Control algae in lakes, canals, swimming pools, water tanks, and other sites.
- **Antifouling agents**
 - Kill or repel organisms that attach to underwater surfaces, such as boat bottoms.
- **Antimicrobials**
 - Kill microorganisms (such as bacteria and viruses).
- **Antitranspirant**
 - Reduces loss of water from plant tissues
- **Attractants**
 - Attract pests (for example, to lure an insect or rodent to a trap - however, food is not considered a pesticide when used as an attractant.)
- **Avicide**
 - Kills birds.

Pesticide Types

- **Bactericide**

- Kills bacteria.

- **Biopesticides**

- Pesticides derived from such natural materials as animals, plants, bacteria, and certain minerals.

- **Biocides**

- Kill living organisms.

- **Defoliants**

- Remove unwanted plant growth without killing the whole plant.

- **Fungicides**

- Kill fungi (including blights, mildews, molds, and rusts).

- **Fumigants**

- Produce gas or vapor intended to destroy pests in buildings or soil.

- **Herbicides**

- Kill weeds and other plants that grow where they are not wanted.

Pesticide Types

- **Insecticides**

- Kill insects and other arthropods.

- **Insect growth regulators**

- Disrupt the molting, maturity from pupal stage to adult, or other life processes of insects.

- **Miticides**

- Kill mites that feed on plants and animals.

- **Microbial pesticides**

- Microorganisms that kill, inhibit, or out compete pests, including insects or other microorganisms.

- **Molluscicides**

- Kill snails and slugs.

- **Nematicides**

- Kill nematodes (microscopic, worm-like organisms that feed on plant roots).

- **Ovicides**

- Kill eggs of insects and mites

Pesticide Types

- **Pheromones**

- Biochemicals used to disrupt the mating behavior of insects.

- **Predacide**

- Kills vertebrate pests

- **Repellents**

- Repel pests, including insects (such as mosquitoes) and birds.

- **Rodenticides**

- Control mice and other rodents.

The term pesticide also includes these substances:

- **Desiccants**

- Dry up plant leaves and stems, also insects.

- **Disinfectants and sanitizers**

- Kill or inactivate disease-producing microorganisms on inanimate objects.

- **Plant growth regulators**

- Substances (excluding fertilizers or other plant nutrients) that alter the expected growth, flowering, or reproduction rate of plants.

Types of Formulations

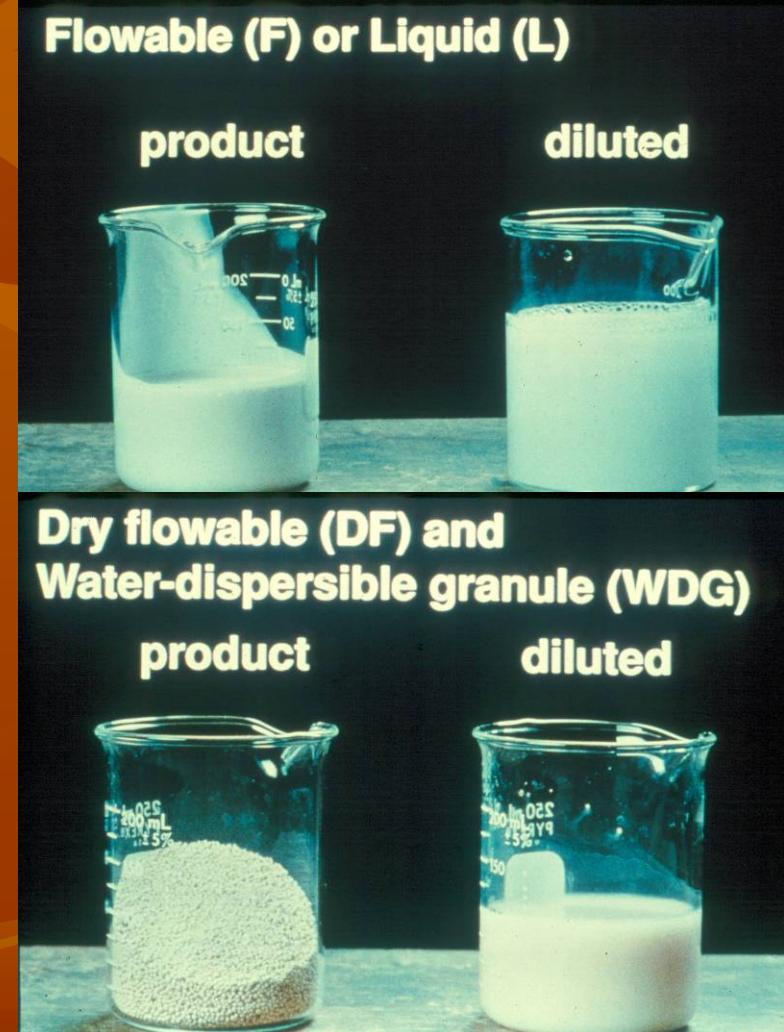
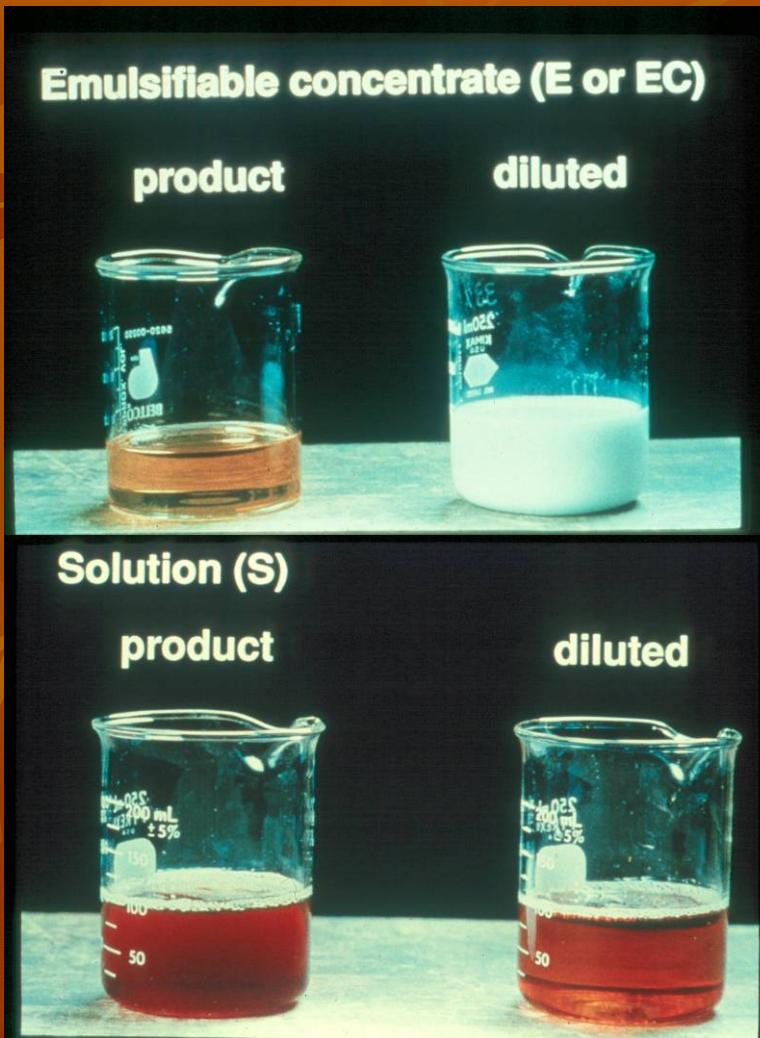
- Dry

- Dust (D)
- Bait (B)
- Granule (G)
- Wettable powder (WP OR W)
- Soluble powder (SP or WSP)
- Water dispersible granule or dry flowable (DF)
- Pellet (P)
- Microencapsulated (M)

- Liquid

- Water soluble concentrate (WS)
- Emulsifiable concentrate (E or EC)
- Oil-soluble amine concentrates
- Ultra-low volume concentrate (ULV)
- Flowable (F or L)
- Liquified gas (Fumigants)
- Aerosols (A)

Types of Formulations



How Pesticides Work

- Protectants
- Sterilants
- Contacts
- Systemics
- Stomach poisons
- Residual herbicides
- Translocated herbicides
- Fumigants
- Anticoagulants
- Selective
- Nonselective
- Pheromones
- Plant growth regulators
- Desiccants and defoliants
- Antitranspirants
 - - reduce water loss (prevent winter damage, maintain color, protect transplants, prevent needle drop in Christmas trees)

Reasons Pesticides Fail

- Pest resistance
- Incorrect pesticide
- Incorrect dose/timing
- Incorrect pest identification
- Improper equipment/calibration
- Infestation after control applied
- Soil factors
 - Soil texture
 - Soil pH
 - Organic matter
- Weather factors
 - Rain
 - Humidity
 - Temperature

Avoid Pest Resistance to Pesticides

- Rotate families of pesticides
- Use only when necessary - IPM

The Label is the Law

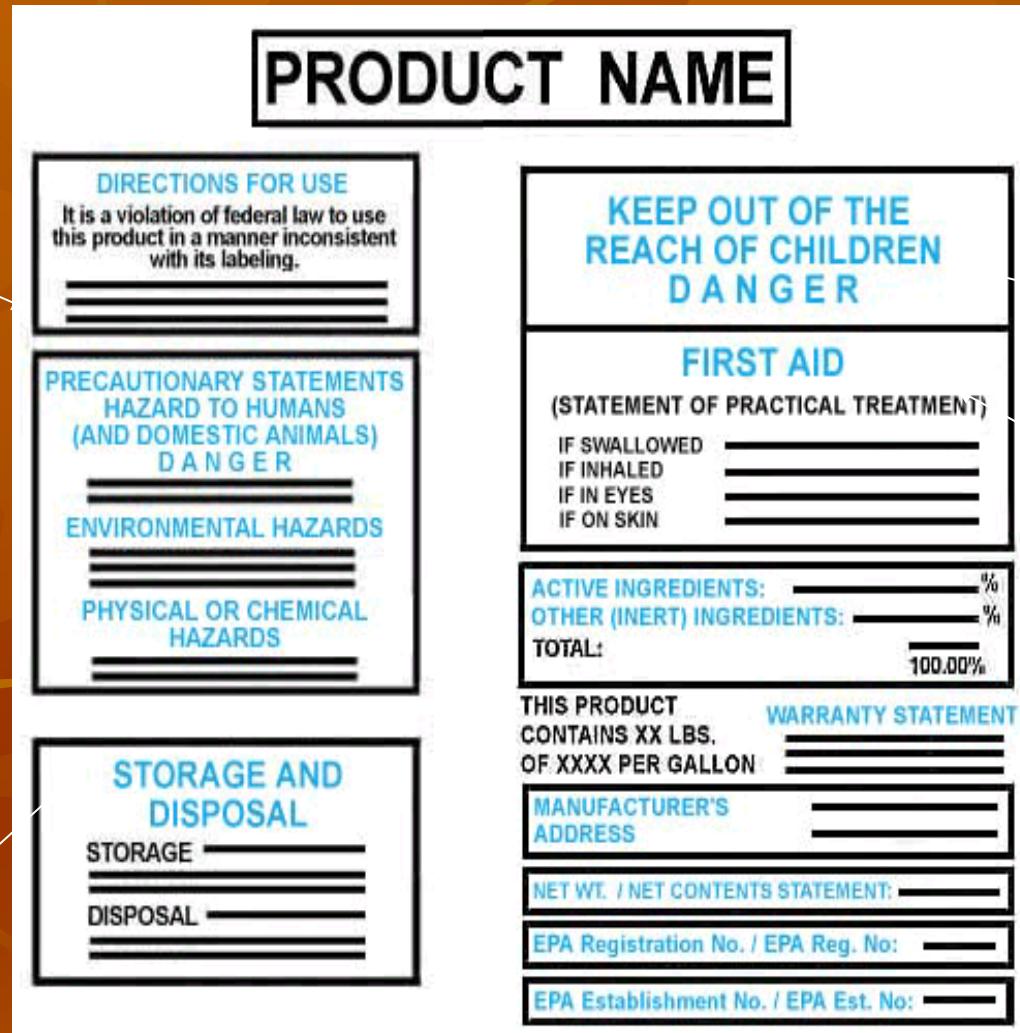
**Do Not Apply Any Pesticide to a Site
Not Specifically Listed on the Label!**

The Label Is the Law

Understanding the Label

Read before you buy to be sure you are buying the right product for the job.

Buy the proper amount so you can avoid storage, and dispose of container and left-over product properly.



Very important! Understand the potential dangers and keep out of the reach of children.

It is important to keep products in the original container in case of accidental poisoning so you can follow the first aid instructions and have the list of ingredients available to give to poison control.

Label Information

Trade Name

Active Ingredients

Inert Ingredients
Dissolve active ingredient or affect how product works (synergist, spreader)



Product or Trade Name



Types of Formulations*

- Emulsifiable concentrates (EC)
- Flowables (F)
- Wettable powders (WP)
- Dry flowables (DF)

Turbo® 8EC
Herbicide

Sevin® 4F

Vendex® 50WP
miticide

Sencor® DF
75% Dry Flowable Herbicide

* Trade names used as examples - no endorsement intended.

Label Information

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.

Label Information

DIRECTIONS FOR USE

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

What the pesticide product controls.
Where, how and when to use the product.
It's critical that applicators understand and follow
these statements!

Signal Words on Labels

Indicate potential hazard

A WEED AND GRASS KILLER – HARVEST AID CHEMICAL
Keep Out of Reach of Children



DANGER
POISON

DO NOT USE OR STORE IN OR AROUND THE HOME.
ONE SWALLOW CAN KILL!

SYMPTOMS ARE PROLONGED AND PAINFUL. ONSET OF SYMPTOMS
MAY BE DELAYED FOR UP TO 3 DAYS AFTER SWALLOWING.

PELIGRO
PRECAUCION AL USUARIO:

Si usted no lee ingles, no use este producto hasta que la etiqueta le
haya sido explicada ampliamente.

DO NOT REMOVE CONTENTS EXCEPT FOR IMMEDIATE USE.
NEVER PUT INTO FOOD, DRINK OR OTHER CONTAINERS.

Can Kill If Swallowed. May Be Harmful or Fatal if Absorbed Through Skin or

Signal Words on Labels

Category	Signal word required on label	Approximate amount needed to kill an average person
Highly Toxic	DANGER POISON	A few drops to one teaspoon
Moderately toxic	WARNING	one teaspoon to one ounce
Slightly toxic	CAUTION	over one ounce
Not toxic	not required	

First Aid

Tells what to do if someone accidentally swallows or breathes the pesticide, or gets it on their skin or in their eyes.

May also contain section labeled “Note to Physicians” which provide doctors with specific medical information

Precautionary Statements

Hazards to humans and domestic animals

Environmental hazards

Physical & chemical hazards

Warranty Statement

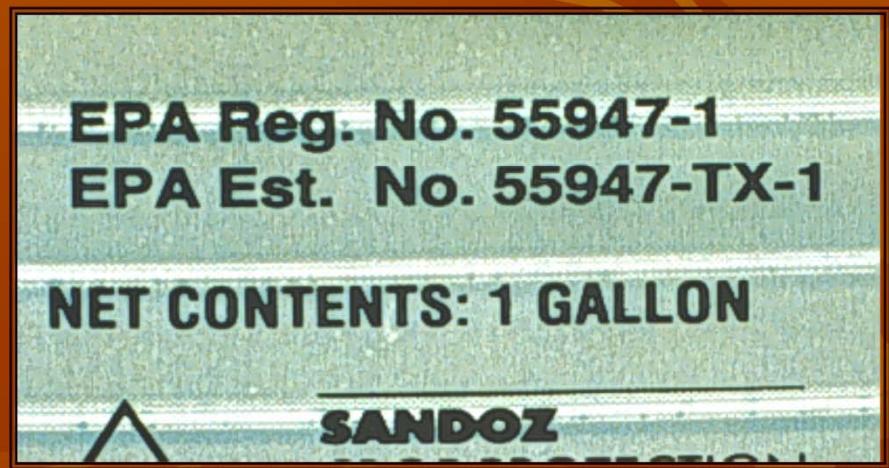
**Statement intended to limit company's liability, or
to act as a disclaimer, or as a warranty for the
product**

Label Information



EPA Registration #
EPA Establishment #
&
Net Wt./Net contents

Manufacturers
Address



Storage & Disposal

Tells how to best store the product and what to do with the unused portion of the product and the empty container.



FUNGICIDES &
MICRO NUTRIENTS

Empty Containers

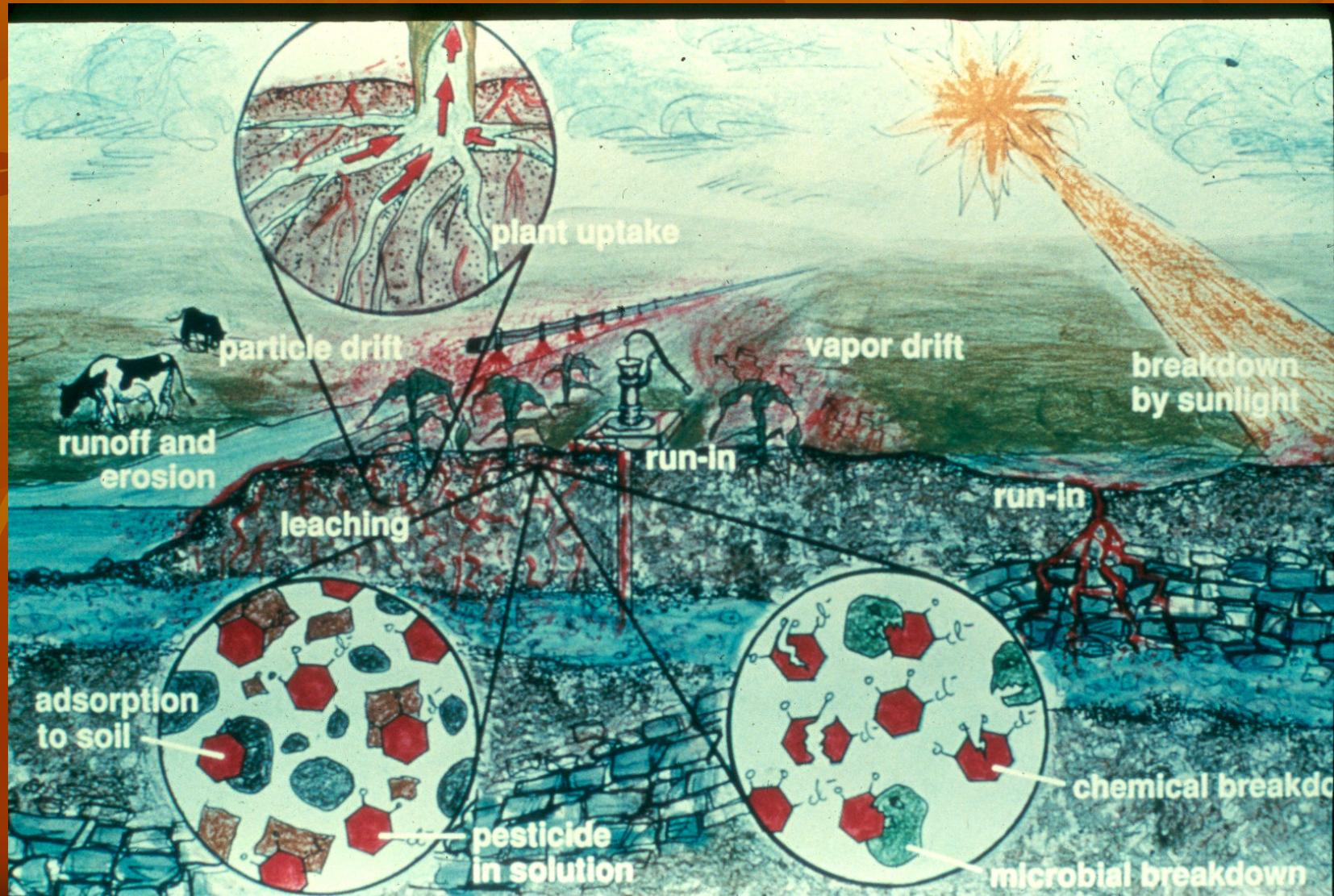
- Triple or jet rinse immediately after emptying
- Turn in plastic containers for recycling
- Landfills - check with operator
- Do not burn containers
- Burying containers on your own property is not recommended



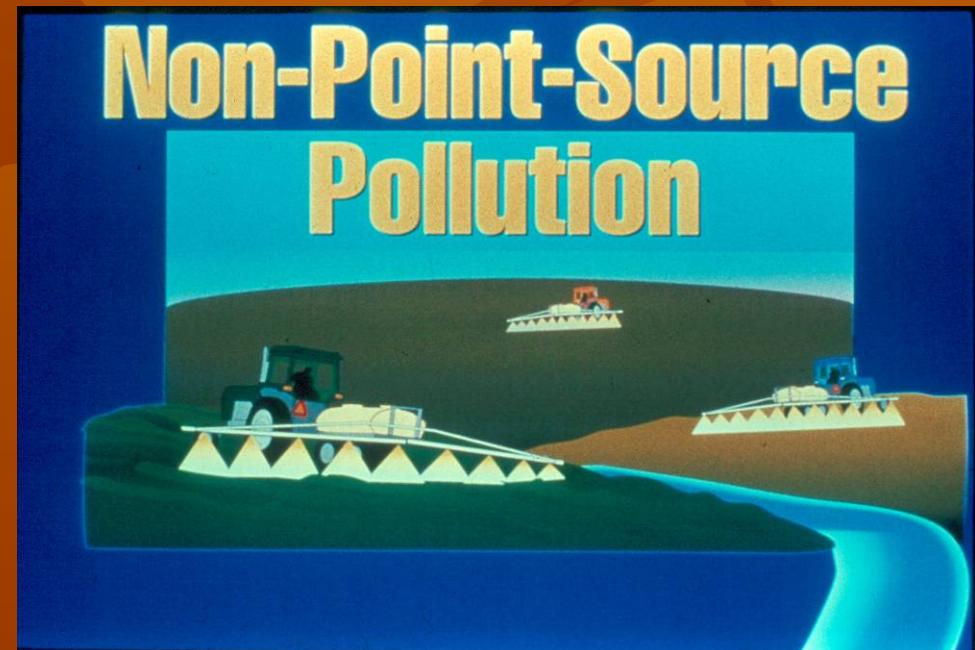
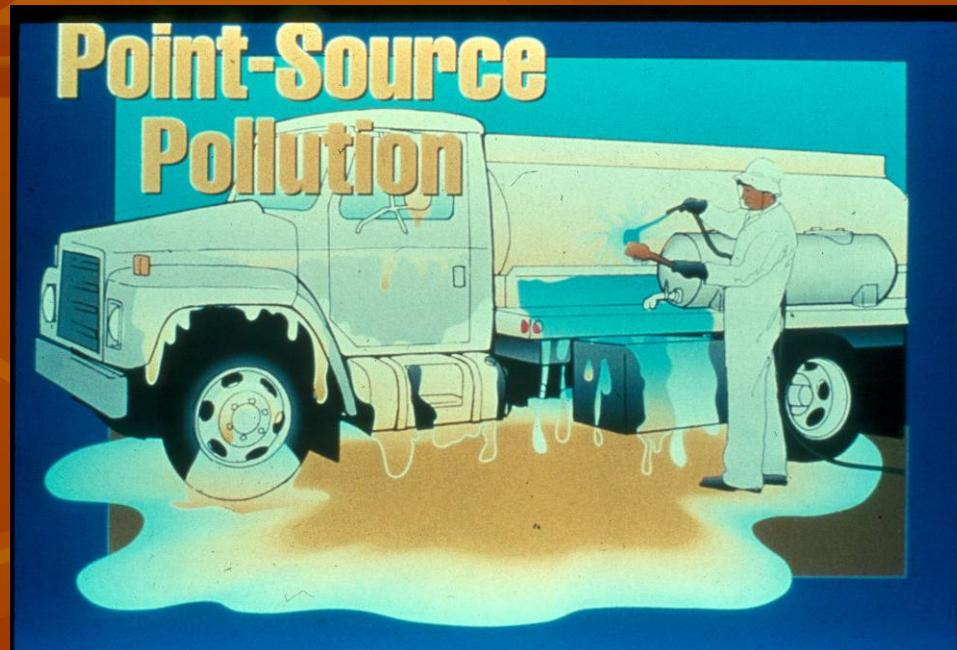
Pesticides in the Environment

- Responsible pesticide applicators should follow good management practices that result in effective pest control with little risk to the environment.
- Protecting the environment starts with reading the pesticide label.
- Each product label has a section on possible environmental hazards.

Pesticides in the Environment



Pesticides in the Environment



Pesticides in the Environment

Three Leading Sources of Water Quality Impairment

Rank	Rivers	Lakes	Estuaries
1	Agriculture	Agriculture	Urban runoff
2	Municipal point sources	Municipal point sources	Municipal point sources
3	Stream/habitat changes	Urban runoff	Agriculture

Source: Water National Quality Inventory, 1994

Pesticide Movement

- Air (drift)
 - particles, droplets
 - vapors (fumigants, non fumigants)
- Water
 - drift, leaching, runoff
 - spills, leaks
 - improper disposal
 - too much water – rain, irrigation, etc.
- On plants, animals, objects
 - contaminated clothing
 - high residues, over tolerances

Drift



How Pesticides Get into Groundwater

- Practices of users
- Water (or lack of) on site surfaces
- Chemical nature of pesticide
- Type of soil at release site
- Location of groundwater
 - distance from surface
 - geological formation above

Groundwater Contaminations Due to Practices of Pesticide Users

- Not following label directions
 - Overdosing (it's illegal!)
 - Application method
 - Back-siphoning
 - Storage close to water*
 - Mixing/cleaning sites*
 - Improper disposal
-
- *100 feet – See State Laws



Groundwater Contamination Due to Pesticide Factors

- Solubility – More soluble, faster moving
- Adsorption – low adsorption allows faster movement through soil
- Persistence - present for longer periods of time, increasing their chance for leaching into the groundwater

How Pesticides Get into Groundwater



When Pesticides Get into Groundwater



Non-target Organisms

- Pollinators



- Endangered species

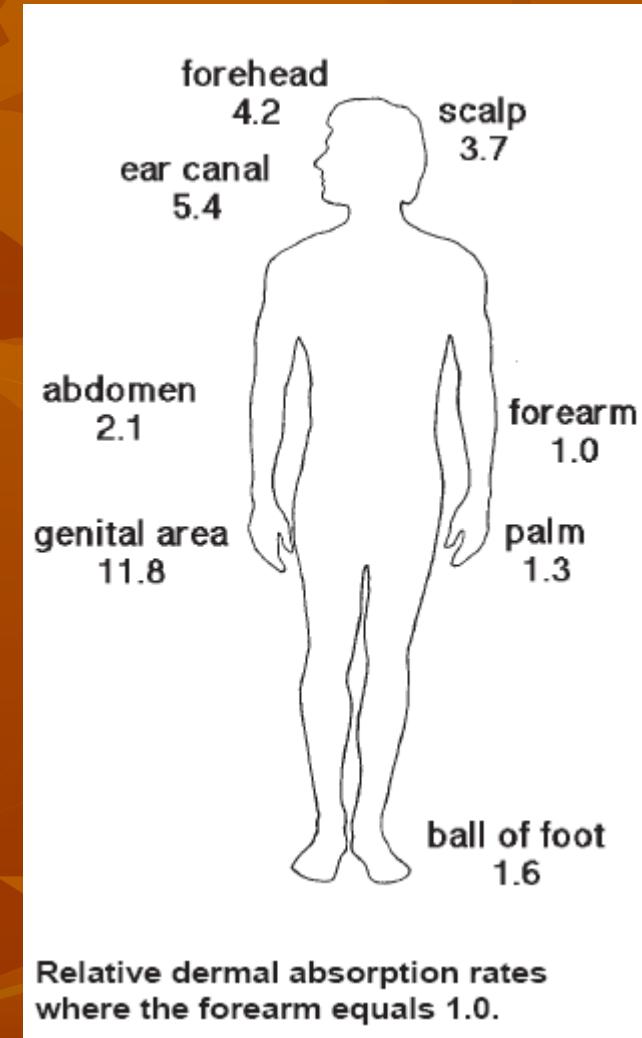


How Pesticides Enter the Body

- Absorption through skin – dermal (includes eyes)
- Absorption through mouth and stomach – oral
- Absorption through the lungs - inhalation

Applicator Safety

Absorption through the skin is the most common route of poisoning of agricultural workers



Applicator Safety

This exposure can be reduced by 99% simply by wearing chemical resistant gloves and a long-sleeve shirt.



Risk = Toxicity X Exposure

■ Product	Oral LD ₅₀ oz	Dermal LD ₅₀ oz
■ Temik (10)	0.003	0.18
■ Furadan (10)	0.2	71.8
■ Sevin (10)	10	64.5
■ Malathion (10)	27	128.1

Personal Protective Equipment (PPE): Body

- Long pants
- Long-sleeved shirt
- Trouzers outside boots
- Keep street clothes away from pesticides
- For highly toxic materials:
 - Application - wear coveralls
 - Handling - wear liquid-proof apron

Always Read the Label for Proper PPE

Personal Protective Equipment (PPE): Gloves

Waterproof or chemical
resistant gloves

Never wear leather!



Natural Rubber

Always Read the Label for Proper PPE

Personal Protective Equipment (PPE): Boots

- For highly toxic materials:
 - Application – wear neoprene or rubber boots
 - Handling - wear neoprene or rubber boots
- Put pants leg outside boots

Always Read the Label for Proper PPE

Personal Protective Equipment (PPE): Goggles

- Wear tight-fitting goggles or a face shield when the chemical could contact your eyes - mixing, some spray situation, etc.



Always Read the Label for Proper PPE

Personal Protective Equipment (PPE): Respirators

- Dust/Mist (MSHA/NIOSH TC-21C)
- Reduces exposure to various dusts and mists.
- Label will specify type of respirator.
- Surgical and dust masks are not respirators!



Always Read the Label for Proper PPE

Mixing and Loading



The potential for human exposure
is greatest during mixing/loading
Wear the correct PPE!

Keep Out of Mouth

- Never mouth siphon
- Use soft brush to unclog nozzles
- Keep in original container
- No eating, smoking, etc. until you have thoroughly cleaned up



Cleaning Nozzles



Changing or Cleaning Nozzles



Spill Kit

- Shovel
- Broom
- Floor sweep, oil soak, kitty litter
- Bleach and activated charcoal

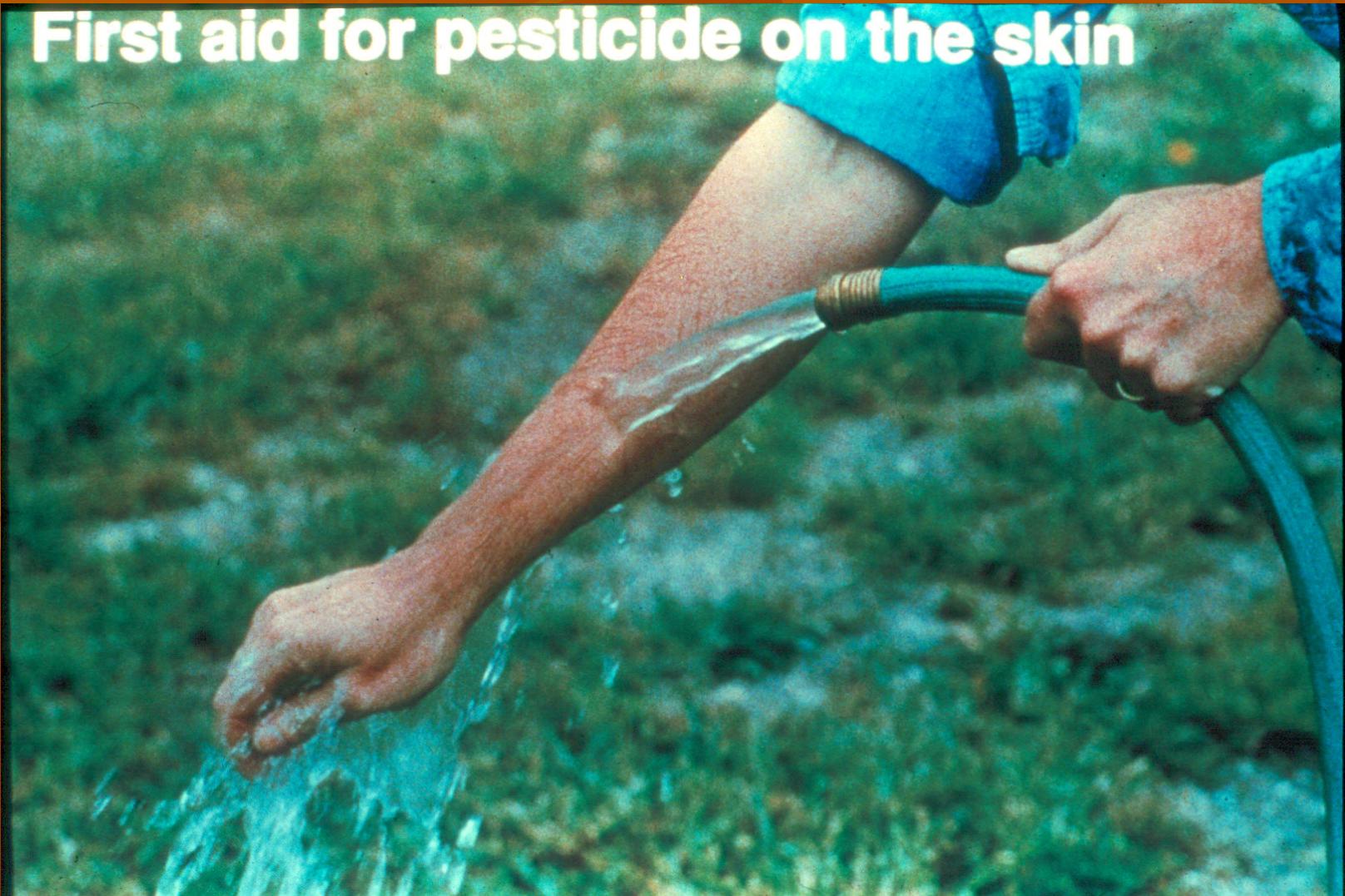


Washing and Bathing

- Shower or bathe daily after using pesticides.
- Wash hands before touching anything that goes into mouth.
- Do not touch face or genitals before washing hands.

First Aid

First aid for pesticide on the skin



First Aid



First Aid

General Symptoms Associated with Pesticide Poisoning



Headache



Giddiness



Nausea



Blurred Vision



Chest Pains

First Aid



Poison Control Centers

**Regional Poison Control Center of the Children's
Hospital of Alabama
Birmingham, AL**

800-292-6678

**Alabama Poison Center
Tuscaloosa, Alabama
800-462-0800**

Transporting Pesticides



Use tie-downs or
brace bars.



Calibration

Tools Needed for Calibration

- Stopwatch
- Measuring tape
- Calibrated liquid container
- Scale
- Calculator
- Pressure gauge
- Flow meter
- Flagging tape

Liquid Sprayers

- Calibrate Frequently
 - Pump wear – decreases amount and pressure
 - Nozzle wear – increases volume of output
- Information needed
 - Tank capacity
 - Travel Speed
 - Flow rate
 - Swath width

Liquid Sprayers

- Tank Capacity
 - Physically measure
 - Mfg may estimate size
 - Calibrate sight gauge
 - Dipstick
- Travel speed
 - Measure under working conditions (full tank)
 - Don't use speedometer – slippage
 - Measure and time

Liquid Sprayers

- Flow Rate (low-pressure systems)
 - Measure actual output from nozzles
 - Measure in GPM
 - Run agitators
 - If PTO driven pump, make sure RPM's same as used in speed calibration
 - Make sure pressure is correct
 - Variation among nozzles – 5%
 - Recheck all nozzles when nozzles are replaced

Liquid Sprayers

- Flow Rate (air blast or high-pressure systems)
 - Move to level spot
 - Fill tank to a level you can duplicate
 - Run at normal speed and pressure
 - Record time
 - Measure amount needed to refill
 - Repeat several times
 - Calculate GPM

Liquid Sprayers

■ Swath Width

■ Solid boom

- Number of nozzles x nozzle spacing
- Adjust boom - 30% overlap of spray from nozzles

■ Banded application

- Swath width = width of band x number of nozzles

■ Air blast sprayer (orchard)

- Swath width = distance between plant rows (2 sided)
- Swath width = 1/2 distance between plant rows (1 sided)

Liquid Sprayers

Changing Sprayer Output

- Change speed
- Change pressure
- Change nozzle size

Dry Applicators

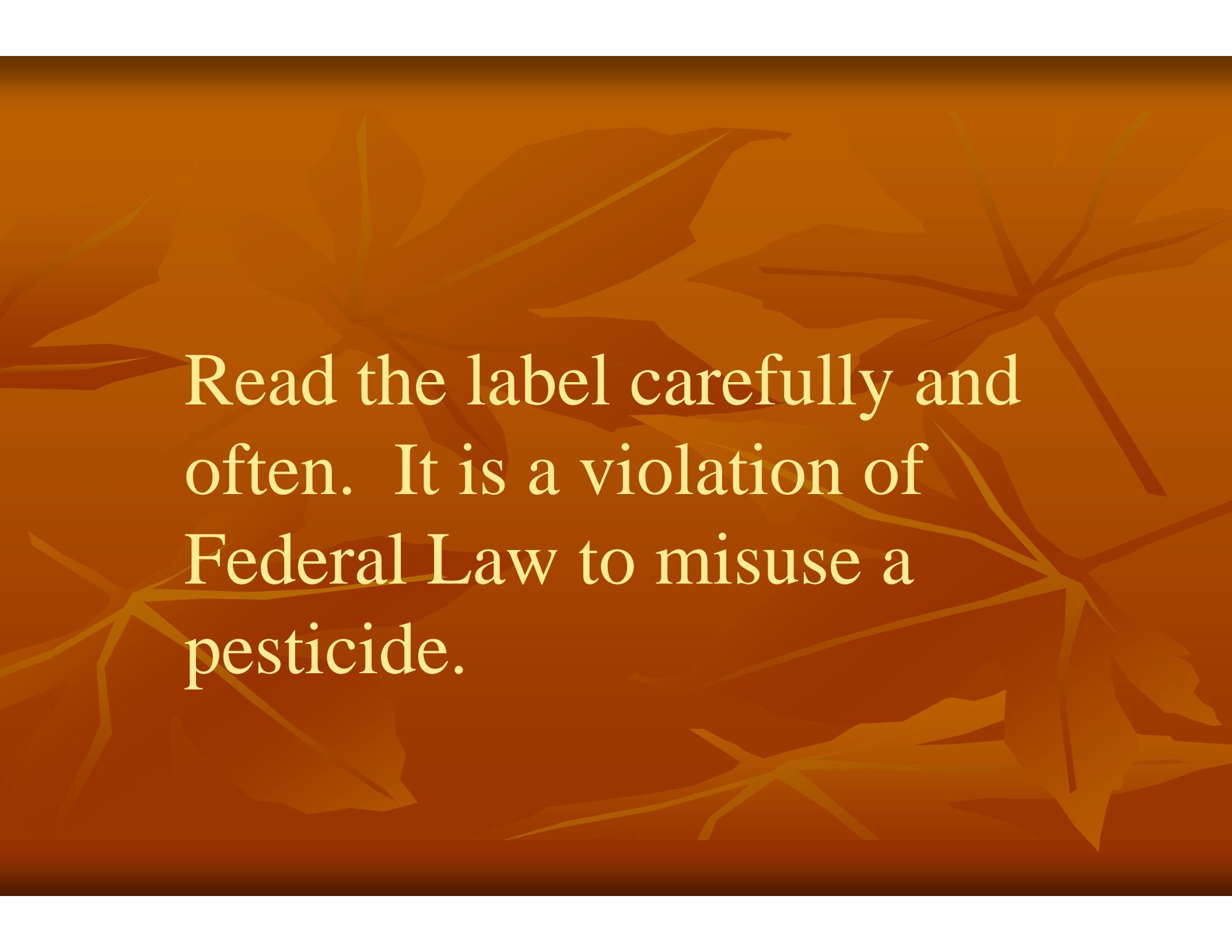
- Information needed
 - Travel speed
 - Output rate
 - Swath width

Dry Applicators

- Output rate
 - Measure granules applied to known area
 - Swath width x tarp length
 - Tarp width x tarp length
 - Collect granules over a known time period
 - Similar to collecting from nozzles
 - For applicators with multiple ports
 - Refill hopper after a measured time

Dry Applicators

- Swath Width
 - Operate equipment under field conditions
 - Place cans, trays, etc. at even intervals across swath
 - Run spreader across plastic
 - If applicator applies bands, measure bands and add



Read the label carefully and often. It is a violation of Federal Law to misuse a pesticide.



It is
YOUR
Responsibility

The Label Is the Law