Pesticide Toxicity and Safety for Master Gardeners

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Pesticide

- Any substance used to kill, control, or repel pests.
- Pests can include weeds, insects, diseases, rodents, slugs, etc.
- Therefore, “pesticide” is an all encompassing word that includes herbicides, insecticides, fungicides, rodenticides, molluscicides, etc.

Toxicity:

Relative Toxicity

- Organisms can't differentiate between "natural" and "synthetic" chemicals.
- "Synthetic" not automatically toxic
- "Natural" not automatically safe or non-toxic
- Chemicals must be evaluated in their biological context of behavior in organisms.
- Mode of action, not source, is the concern.
- Pesticides just one of the common chemicals that should be treated with respect (gasoline, bleach, paint, drain treatments, etc.)

- By nature, pesticides are toxic to the target organism(s) and unfortunately, sometimes toxic to, or contaminate, non-targets.

Pesticide Toxicity

- Toxicity – a measure of the ability of a chemical or substance to injure/kill.
- Exposure – contact with the chemical
- Risk/hazard – the degree of exposure & toxicity level.
- $LD_{50,}$ LC_{50} – lethal dose or concentration to kill 50% of the test animals.

But…

- Almost any substance can be toxic.
  - Sugar: LD_{50} of 30g/kg or 4.5 lbs for 150 lb person
  - Alcohol: LD_{50} of 13.7g/kg or 2lbs/person
  - Water: LD_{50} of 80g/kg or 12lbs/person
  - Spinosad (organic): LD_{50} >5g/kg or >0.75lb/person
  - Malathion: LD_{50} of 5.5g/kg or 0.82lb/person
  - Roundup: Same as spinosad
  - Bleach: LD_{50} of 0.2g/kg or 0.03lb/person
  - Caffeine: LD_{50} of 0.12g/kg or 0.02lb/person
  - Nicotine: LD_{50} of 0.003g/kg or 0.0005lb/person

  - Remember: less is more when dealing with LD_{50} and LC_{50}

Toxicity: Parts per million (PPM)

- 1 ppm = 1mg/liter = 1ug /ml = 1000ug/liter
  - 1 gram dissolved in 1000ml = 1000 ppm

- PPM = 1Tbs in 3,906 gallons or 4 drops of ink in a 55 gallon barrel of water.
- 1 inch in 16 miles
- 1 minute in 2 years
- 1 penny out of $10,000
- 1 ounce of salt in 30 tons of potato chips
- 1 bad apple in 2,000 barrels of apples
-

PPB

- PPB = 1 Tbs in 3.9 million gal. (6 olympic size swimming pools)
- 1 inch in 16,000 miles
- 1 second in 32 years
- 1 cent in $10,000,000
- Pinch of salt in 10 ton bag of potato chips.
- 1 bad apple in 2,000,000 barrels of apples

Exposure & Risk

- Related but not the same
- The mere presence of a chemical/substance does not automatically produce risk.

Exposure & Risk

- A fundamental principle of toxicology is that the *dose makes the poison* (doesn't apply to diseases),
- A certain level of a toxin is required to produce adverse affects.

Exposure & Risk

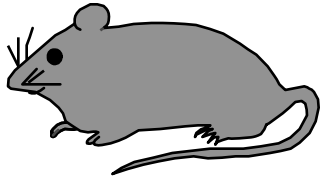
- We are exposed to toxins every day at levels that never cause us harm.
- Our body, and nature itself, is resilient.
- Many lines of defense

Pesticides on Produce

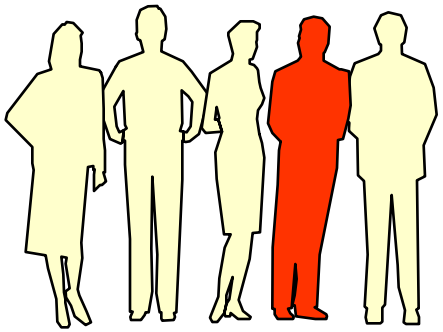
- Pesticides are tested and approved for use at certain rates and pre-harvest intervals.
- Ensures residues are below established tolerances.
- Based on laboratory tests
- There is some uncertainty with these tests; they usually use healthy mice (males) and test one chemical at a time.
- They account for the uncertainty with additional safety factors.
- They look for both acute and chronic toxicity

300 ppm No Effect Level

animal testing, 10x



30 ppm



human variability, 10x

3 ppm

< 10x, kids

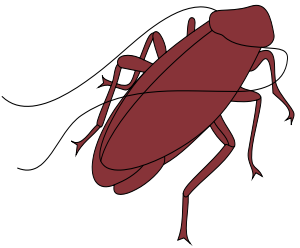
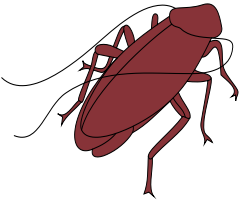
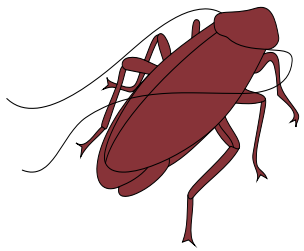
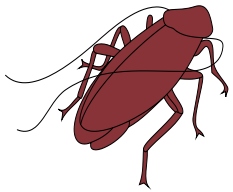
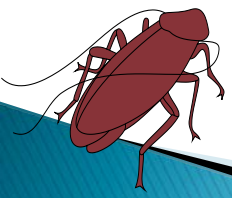
0.3 ppm

Pesticide Labeling

Your safety as well as the safety of other people and the environment all depend on reading and understanding the label.

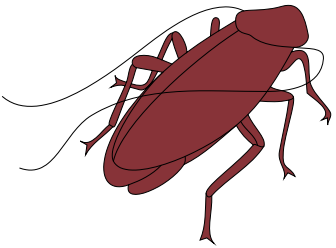
Not following the label instructions is a violation of Federal and/or State law.

The State Plant Board enforces laws and penalizes violators but does not settle damages.

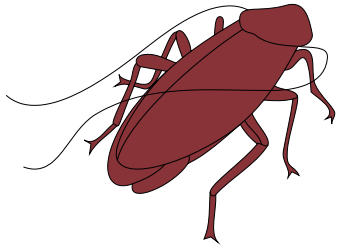






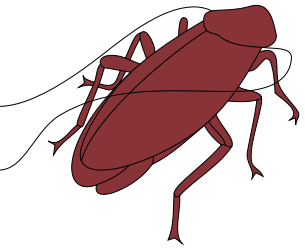
Follow the Label?

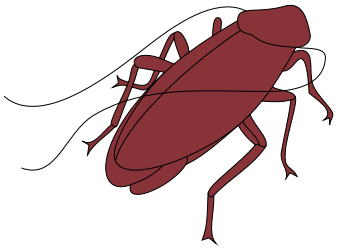
- What would you do if you had a severe roach problem and you knew of a pesticide that would provide control, even though it was not registered for home use?
- Would you recommend its use to other people?
- What if you could make some additional money by spraying homes with the product?



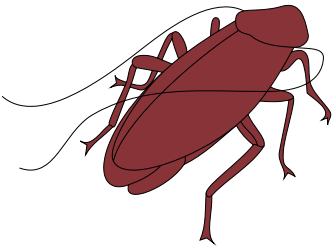
Follow the Label?



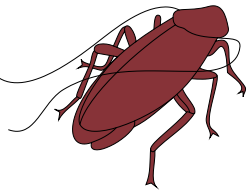


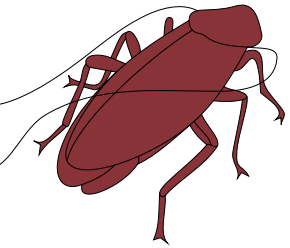


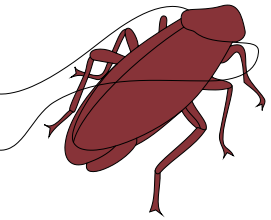
- Methyl parathion: An effective, economical and widely used organophosphate agricultural insecticide.
- Toxicity Class I – most toxic category.
- For use only by licensed applicators on agricultural commodities.
- Short half life when used outdoors.
- Persistent to very persistent if used indoors.



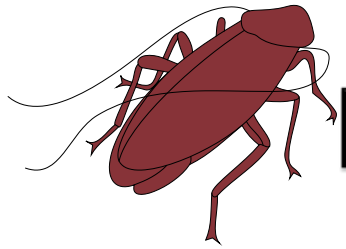
Methyl Parathion



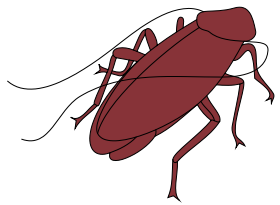


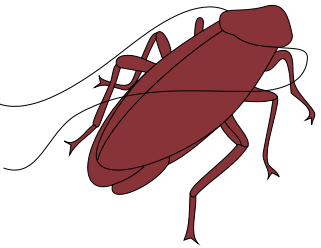


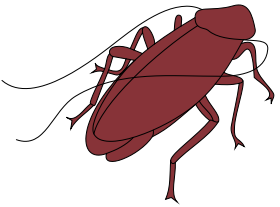
- Two licensed private applicators were found to have been spraying MP in homes and selling it for home use since the early 1990s in Mississippi..
- Investigation began in 1996.
- The two individuals had sprayed churches, daycare centers, and over 300 homes.
- 1200 people had to be relocated.



Methyl Parathion







- Decontamination costs were well over $80 million – became a Superfund site.
- No deaths from the applications, but some people reported headaches, nausea, and dizziness soon after the application.
- One of the applicators received a 5 year prison sentence, the other 6 1/2

U.S. Court Sentences Oneida Co. Father-Son For Animal Poisonings

Peterson for conduct relating to the possession of an American bald eagle. Alvin Sowinski received a $30,000 fine, a seven-year ban on his hunting, fishing and trapping privileges, $100,000 in restitution, and one year of probation and four months of home confinement. Paul Sowinski received a $10,000 fine, a five-year ban on his hunting, fishing and trapping privileges, $100,000 in restitution, and one year of probation. Both men pleaded guilty to the charge on May 14, 2014.

Law enforcement discovered that the pesticide, Carbofuran, was being used to kill wildlife on the Sowinski property in Sugar Camp. The use of the chemical killed several species of birds and mammals between May 2007 and March 2010, including a black bear, bobcat and at least two American bald eagles.

Fumigant pesticide suspected in girls' deaths (Feb. 2010)

A 15-month-old and her four-year-old sister have died and the rest of the family was sickened in Layton, Utah, after an extermination company treated their yard with Fumitoxin pellets to control voles. Fumitoxin contains aluminum phosphide, which upon contact with moisture releases phosphine, a lethal gas with no antidote.

An explosion caused by the improper use of an insecticide ripped through a beauty parlor in Chinatown on Thursday afternoon, causing a partial collapse of the building and a fire, and injuring eight occupants, three of them critically, the authorities said.

The blast, which was powerful enough to blow out windows on the first three floors of the five-story tenement building at 17 Pike Street, was set off by aerosol insecticide foggers commonly referred to as bug bombs, according a law enforcement official familiar with the investigation.
NYC, July 2013

Pesticide Labels

- Contain the information critical to using the product effectively and safely.
- Include detailed information on safety precautions (human and environmental)

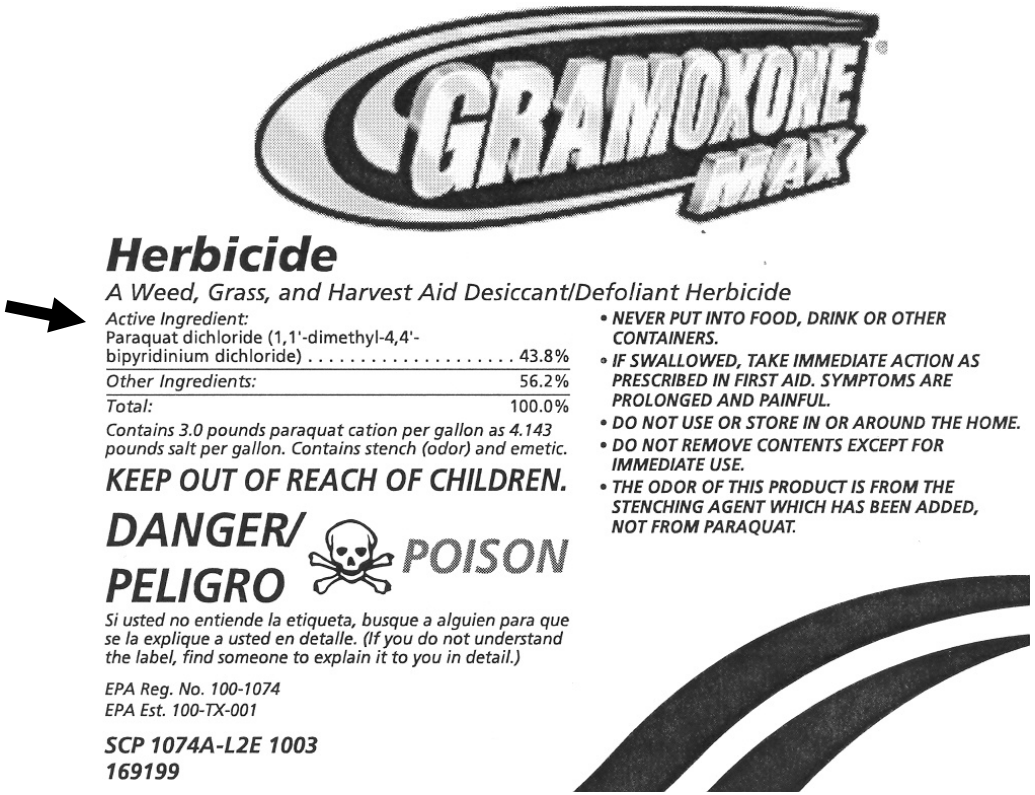
Labels

- Don’t take it for granted that this year’s label is the same as last year’s.
- Do not rely on third party recommendations for labeled crops, rates, and preharvest intervals without checking the label first.

- RUPs can NEVER be used in or around the house by homeowners or in home gardens.
- Homeowners do not qualify for a pesticide license. You must be involved in the commercial production of agricultural commodities in order to get a license.

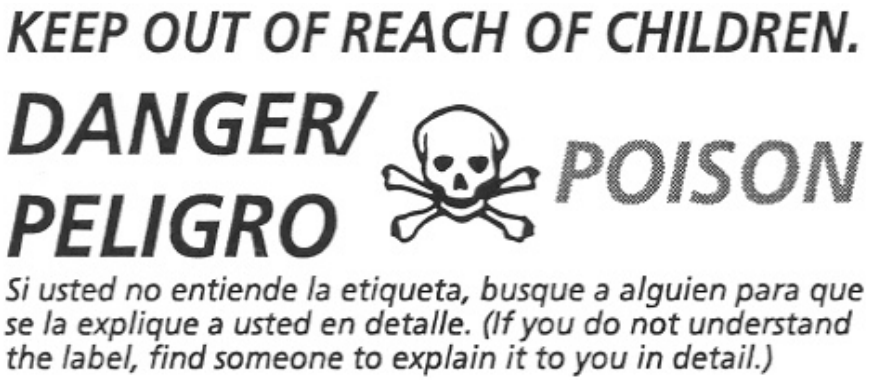
Label Sections

- The trade name does not tell you what is in the product – go to the active ingredients section.



Signal Words

- The signal word gives the relative toxicity of the concentrated product.
- Danger/Poison = Very toxic (a few drops may be lethal)
- Warning = Moderately toxic
- Caution = Slightly toxic
- Risk = Toxicity + Exposure



Gramoxone Max

Precautionary Statements

- This section addresses hazards to humans, animals, and the environment.
- Take these statements very seriously!

- ***NEVER PUT INTO FOOD, DRINK OR OTHER CONTAINERS.***
- ***IF SWALLOWED, TAKE IMMEDIATE ACTION AS PRESCRIBED IN FIRST AID. SYMPTOMS ARE PROLONGED AND PAINFUL.***
- ***DO NOT USE OR STORE IN OR AROUND THE HOME.***
- ***DO NOT REMOVE CONTENTS EXCEPT FOR IMMEDIATE USE.***
- ***THE ODOR OF THIS PRODUCT IS FROM THE STENCHING AGENT WHICH HAS BEEN ADDED, NOT FROM PARAQUAT.***

PRECAUTIONARY STATEMENTS

Hazards to Humans and Domestic Animals

DANGER/ PELIGRO  **POISON**

May be fatal if swallowed. Fatal if inhaled. Causes substantial but temporary eye injury. Harmful if absorbed through skin. Do not get in eyes or on clothing. Avoid contact with skin. Do not breathe spray mist. Wash hands before eating, drinking, chewing gum, using tobacco, or using the toilet. Remove contaminated clothing and wash clothing before reuse.

IMPORTANT: Inhalation is an unlikely route of exposure due to low vapor pressure and large spray droplet size, but mucosal irritation or nose bleeds may occur. Prolonged contact with this concentrated product can irritate your skin.

Gramoxone Max

Pesticide Safety

Risk = Toxicity X Exposure

- The health risks with any pesticide are a function of the toxicity and the exposure.
- Bottom line: If you don't get the product on you or in you the risks are low.
- You can avoid exposure by wearing the required personal protective equipment (PPE), cleaning up thoroughly, and using common sense to avoid unnecessary exposures.

Preventing Pesticide Exposure

- The potential for human exposure is greatest during mixing/loading.
- Be extra careful when handling the concentrated product.

PPE

- See what the label specifies, but long-sleeve shirt, long pants, waterproof gloves, and shoes and socks should be the minimum.

PPE: Gloves

- If the label says “waterproof”, you may choose gloves made of rubber or synthetic materials.
- No holes, no lining, no knit cuffs. Check for leaks before using.
- Never use leather gloves.

PPE: Boots

Choose knee-high rubber or synthetic boots without holes. Wear cuff on outside of boot. Never wear leather.

- Wash contaminated clothing daily.
- Do not attempt to clean clothing contaminated with undiluted pesticide – throw away.

Washing Contaminated Clothing

- Prerinse, don't crowd washer, use hot water
- Use long cycle & heavy duty liquid detergent
- Keep separate from other clothing

PPE: Eye Protection

Goggles or face shield are required if label calls for eye protection. Face shield offers more protection when mixing and loading. A chemical resistant hat is sometimes specified on the label.

PPE: Respirators

- Label will specify type of respirator.
- Chemical cartridge. Wash chemical cartridge respirator with soap and water after use.
- Make sure it fits correctly – no air gaps.
- Dust/Mist

Cleaning Contaminated PPE

- Wash boots and gloves before removing them.
- Clean all of your PPE after use to insure it is uncontaminated and ready for the next use.

- Wash contaminated clothing daily.
- Throw away clothing contaminated with undiluted pesticide.
- Prerinse, use hot water, heavy duty liquid detergent
- Keep separate from other clothing

Spill on Skin

- Remove pesticide and contaminated clothing immediately.
- Use liquid soap and don't forget hair and fingernails. Do not use waterless hand cleaners!

Skin Absorption Rates are Different for Different Parts of the Body

Forearm – 1.0
Forehead – 4.2
Groin – 11.8

Any area having thin skin and a relatively large blood supply will absorb pesticides rapidly (underarms, tops of feet, etc.).

Symptoms of Pesticide Poisoning

- Headache, nausea, dizziness, muscle twitching, anxiety, cramps, sweating, diarrhea, constricted pupils.
- Stinging, burning, itching of skin
- If you have unusual symptoms soon after exposure you should seek medical attention.

Eye Exposure

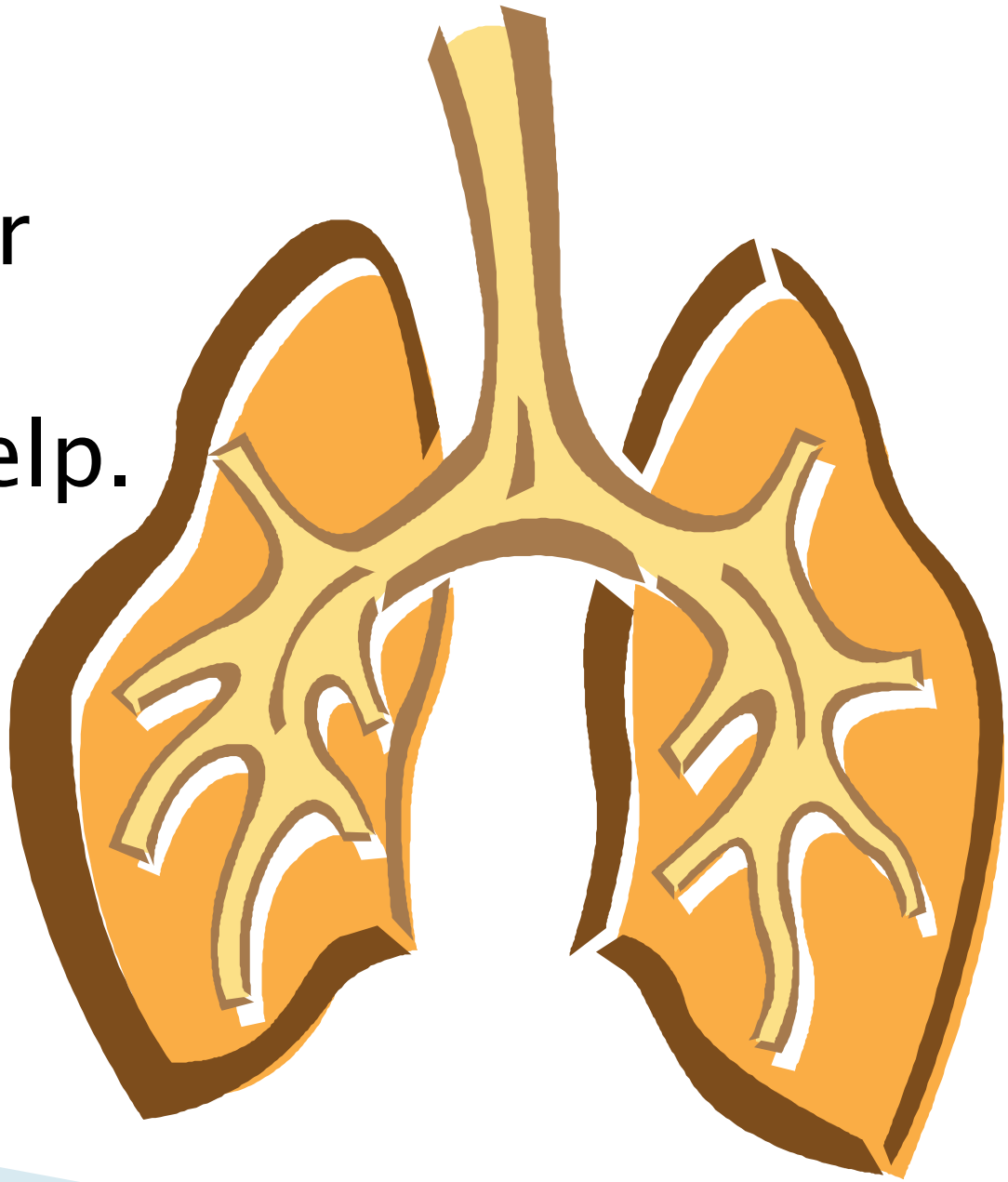
Eye tissues are very absorbent

Use eye protection around sprays and dusts or when specified on the label.

If exposure occurs, rinse eyes with clean water for at least 15 minutes. Get medical help

Breathing a Pesticide

- Get to fresh air immediately.
- Get medical help.



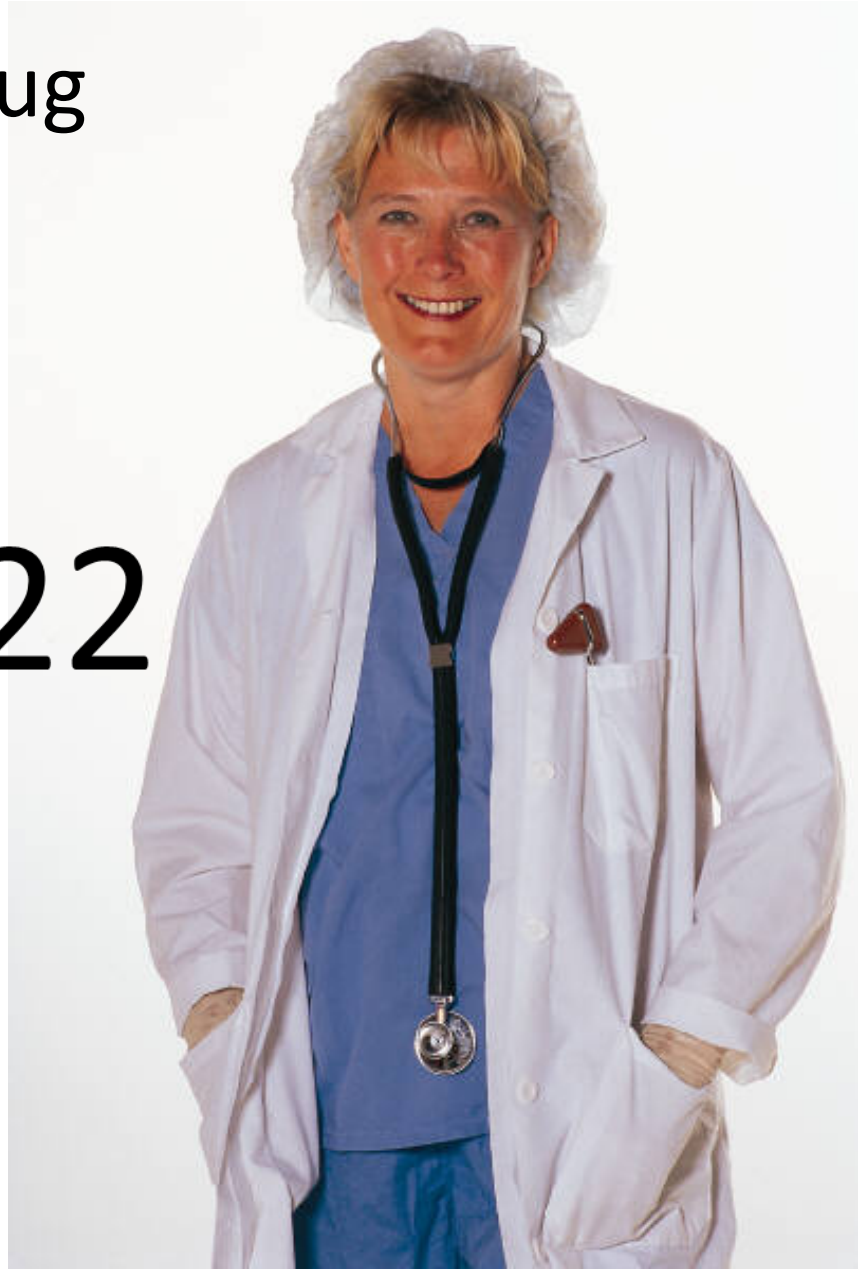
First Aid

- Swallowing a Pesticide
  - Rinse mouth repeatedly with water.
  - Get medical help – don't induce vomiting without first checking the label.

National Poison & Drug Information Center

In emergencies call:

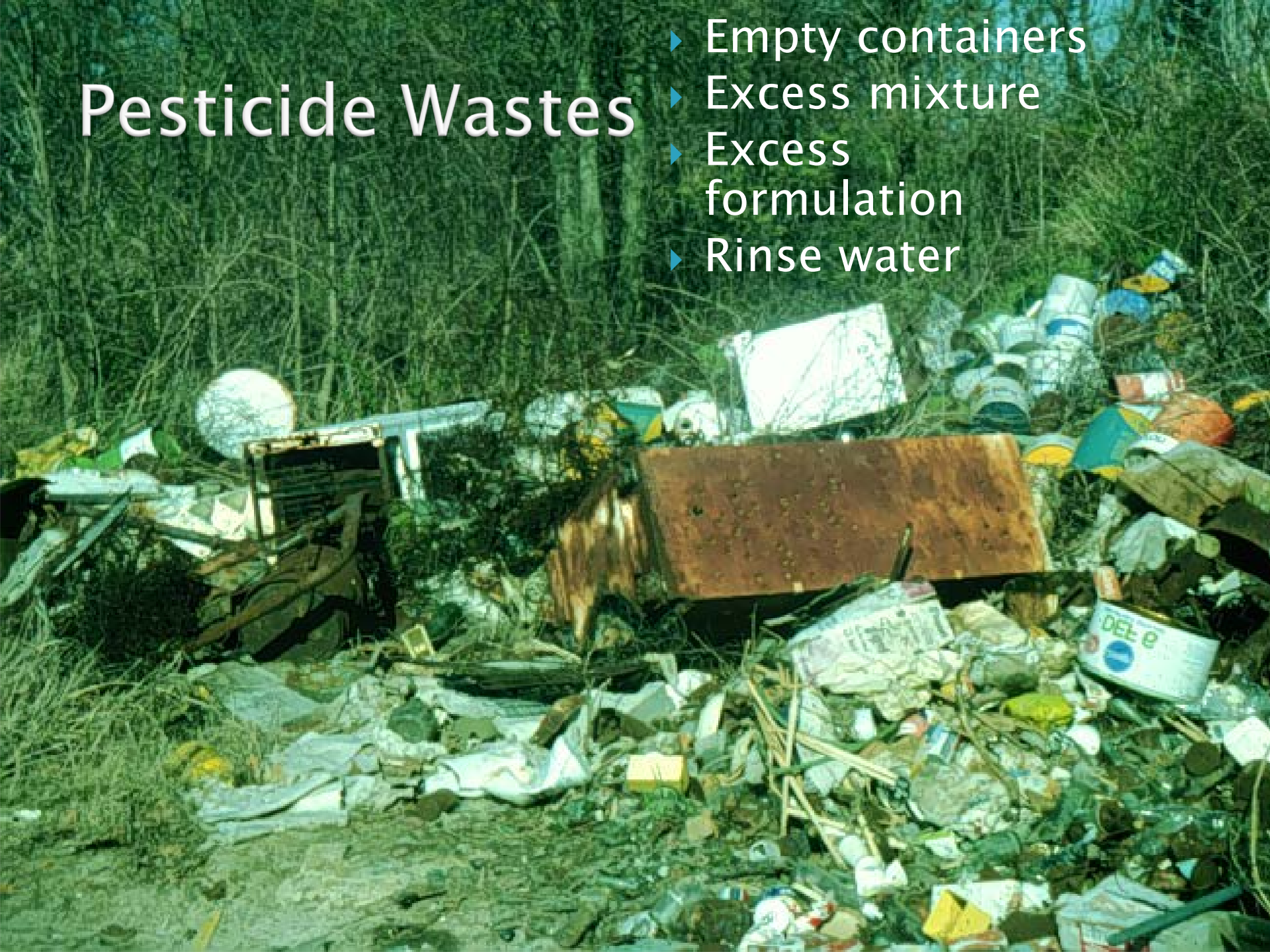
800-222-1222



Pesticide Disposal

Pesticide Wastes

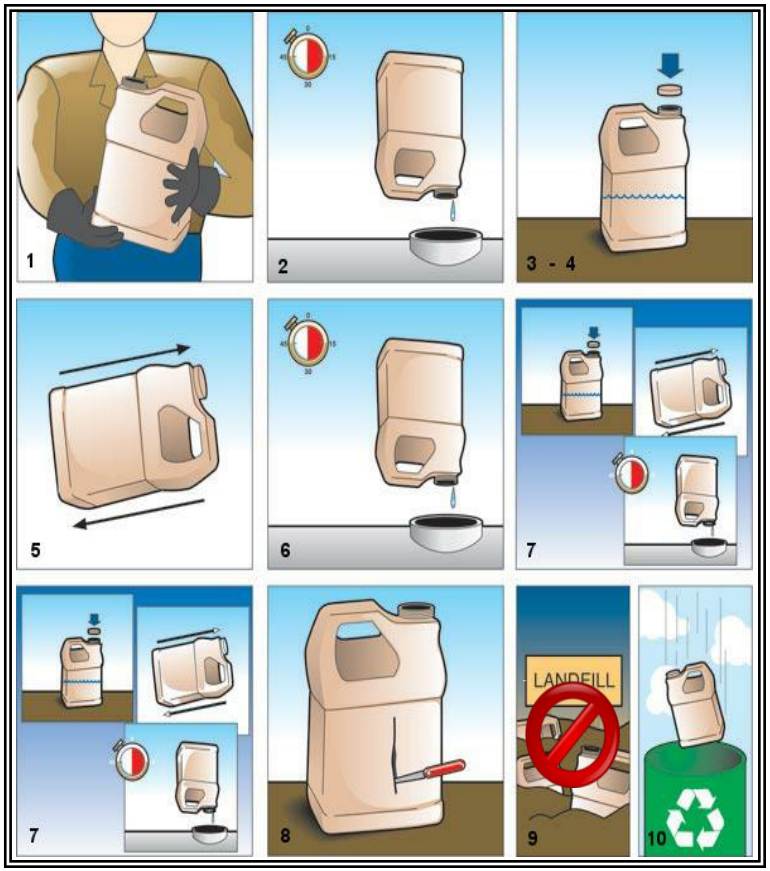
- Empty containers
- Excess mixture
- Excess formulation
- Rinse water



Empty Containers

- Triple rinse <u>immediately</u> after emptying.
- RECYCLE plastic containers if possible.
- Don’t burn or bury, and landfills are not recommended.

Triple Rinsing



Photos provided by Univ. of Nebraska

Excess Spray Mixture

- Must be used on a labeled site
- Avoid the problem by careful measurement and calibration

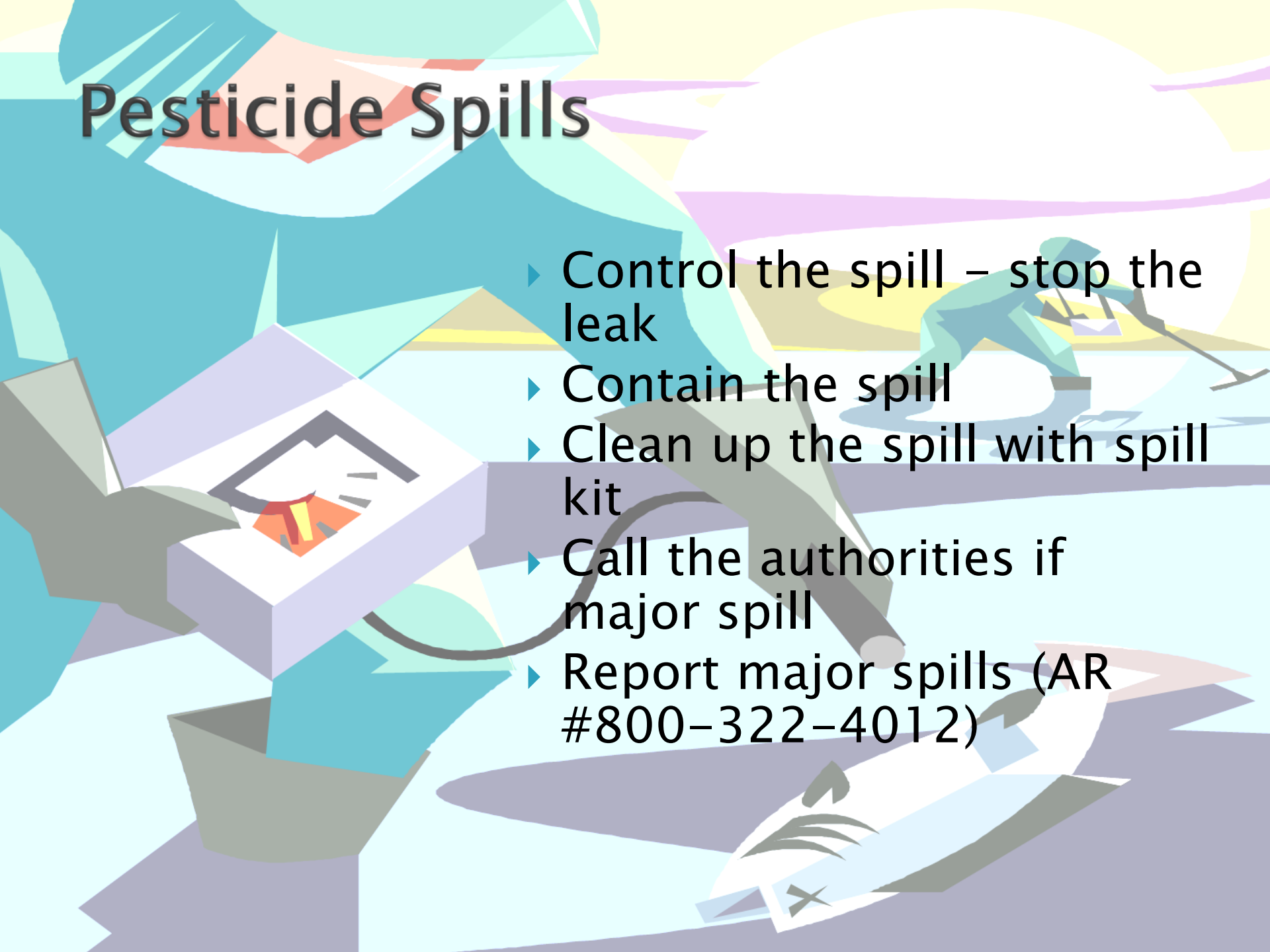
Excess Formulation

- Find a labeled site to use or give to someone who can use it according to the label.
- Always keep it in the original container.
- Pesticide Collection Program

Rinse water

- Minimize
- Apply to a labeled site.
- Do not dump on ground, in ditches, septic systems or fencerows

Pesticide Spills



- Control the spill – stop the leak
- Contain the spill
- Clean up the spill with spill kit
- Call the authorities if major spill
- Report major spills (AR #800-322-4012)

Calibrating Sprayers

Calibrating a Pump-Up Sprayer or Pistol Type Spray Gun for GPA

1. Lay out a calibration plot that is 18.5 ft b 18.5 ft. (this equals about 1/128th acre).
2. Note how many seconds are required to spray that area uniformly with water. Maintain a comfortable steady pace while keeping the tank pressure uniform.
3. Collect the output from the nozzle for the for the number of seconds timed in step 2.
4. Ounces collected equal gallons per acre.
5. Repeat at least once and get an average

Calibrating a Pump-Up Sprayer or Pistol Type Spray Gun for Ft^2

- Lay out a calibration plot that is 32 ft by 32 ft. (this equals about 1000 ft^2).
- Note how many seconds are required to spray that area uniformly with water. Maintain a comfortable steady pace while keeping the tank pressure uniform.
- Collect the output from the nozzle for the for the number of seconds timed in step 2.
- Ounces collected equal ounces per acre.
- It is a good idea to repeat and get an average.

Questions?