



The background of the image is a solid, warm orange-brown color. Overlaid on this background are several faint, stylized outlines of autumn leaves. The leaves are scattered across the frame, with some showing prominent veins. The overall aesthetic is cozy and seasonal.

**Good Morning!**

# *The Plan*

Pesticide Use and Safety

Sustainable Landscape Management

-- Integrated Pest Management

-- Organic Control Methods

# Why Have This Talk?

- When applying pesticides, safe use and handling is the first order of business.
- Protect yourself and others.
- Protect the environment.
- You will be the **EXPERT!**

# What is a Pesticide?

- Any substance used to control a pest, or to reduce the unwanted or harmful effects of a pest.
- Any substance “intended for preventing, destroying, repelling or mitigating any pest....”

# Who Uses These Pesticides?

- Almost everyone (including Master Gardeners)
- Private Applicators
- Registered Technician
- Commercial Applicators

# Restricted Use Pesticides

Extremely hazardous to humans,  
[animals] and/or the environment ...

May only be purchased, or applied, by  
certified applicators who [should] have  
the knowledge to use these pesticides  
safely and effectively.

# What is a Pest?

Organisms may be pests because they harm materials humans need or want, because they are a health risk, or simply because they are a nuisance.

A pest is anything that damages food, fiber, structures or other things humans need or value.



# Pesticide Terminology -- Types

- Acaricides
- Attractants
- Avicides
- Bacteriacides
- Fungicides
- Growth Regulators
- Anti-microbials
- Herbicides
- Insecticides
- Miticides
- Nematicides
- Repellants
- Rodenticides
- Repellants

# Mode of Action

- Contact (insects, fungi)
- Stomach poisons
- Systemic pesticides
- Contact herbicides
- Translocated herbicides
- Selective pesticides
- Non-selective
- Protectant fungicides
- Curative/Eradicant fungicides

# Methods of Application

- Banding
- Broadcast
- Dip
- Directed
- Drench
- In-furrow
- Spot treatment
- Side-dress

# The Pesticide Label

Label – information printed on, or attached to, the container.

Labeling – the label itself, plus all other information you receive from the manufacturer about the product when you buy it.

-- **The label is the law.**

# Signal Words and Symbols

- **Danger, Poison w/ Skull and Crossbones**
  - Highly toxic, likely to cause acute injury from oral, dermal or inhalation exposure.
- **Warning** – acute illness from oral, dermal or inhalation exposure.
- **Caution** – slightly toxic/relatively non-toxic

# Signal Words and Symbols

Signal Word	Toxicity	Approximate Human Lethal Dose
Danger/Poison (w/ skull and crossbones)	High	A few drops to a teaspoonful
Warning	Moderate	A teaspoonful to a tablespoonful
Caution	Low, or relatively non-toxic	More than an ounce

# Determining Pesticide Hazard

- Lethal Dose (LD<sub>50</sub>)
- Hazard = Toxicity x Exposure

# Formulations (physical state)

- Aerosols (A)
- Baits (B)
- Dust (D)
- Granules (G) or Pellets (P)
- Emulsifiable Concentrate (EC or E)



# Formulations (physical state)

- Concentrated Solution (C or LC)
- Ready to Use Solutions (RTU)
- Wettable Powder (WP)
- Water- dispersable Granules (WDG)/ Dry Flowable (DF)

# Adjuvants

An adjuvant is a chemical added to a formulation, or mix, to increase its effectiveness or safety.

# Adjuvants

- Surfactants – affects surface tension
- Spreaders – builds spray deposits
- Stickers – improves adherence
- Wetting agents – lowers surface tension



# Influences on Drift Potential

## ■ Volatility:

- temperature
- low humidity
- pesticide
- formulation
- air movement

## ■ Particle drift:

- droplet size
- wind speed and direction



# Minimizing Drift Potential

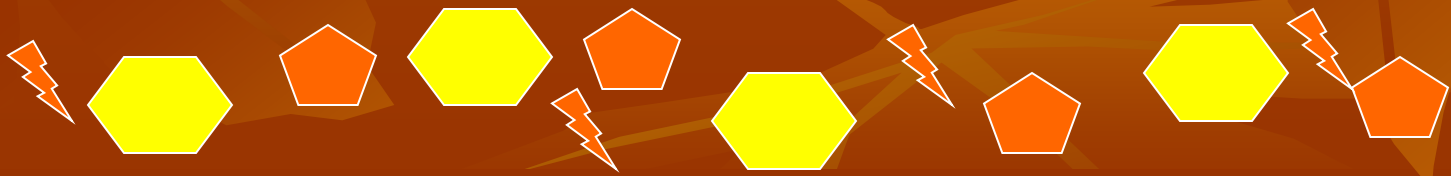
Spray Characteristics (droplet size, pesticide/formulation)

Application equipment (nozzle, pressure, release point)

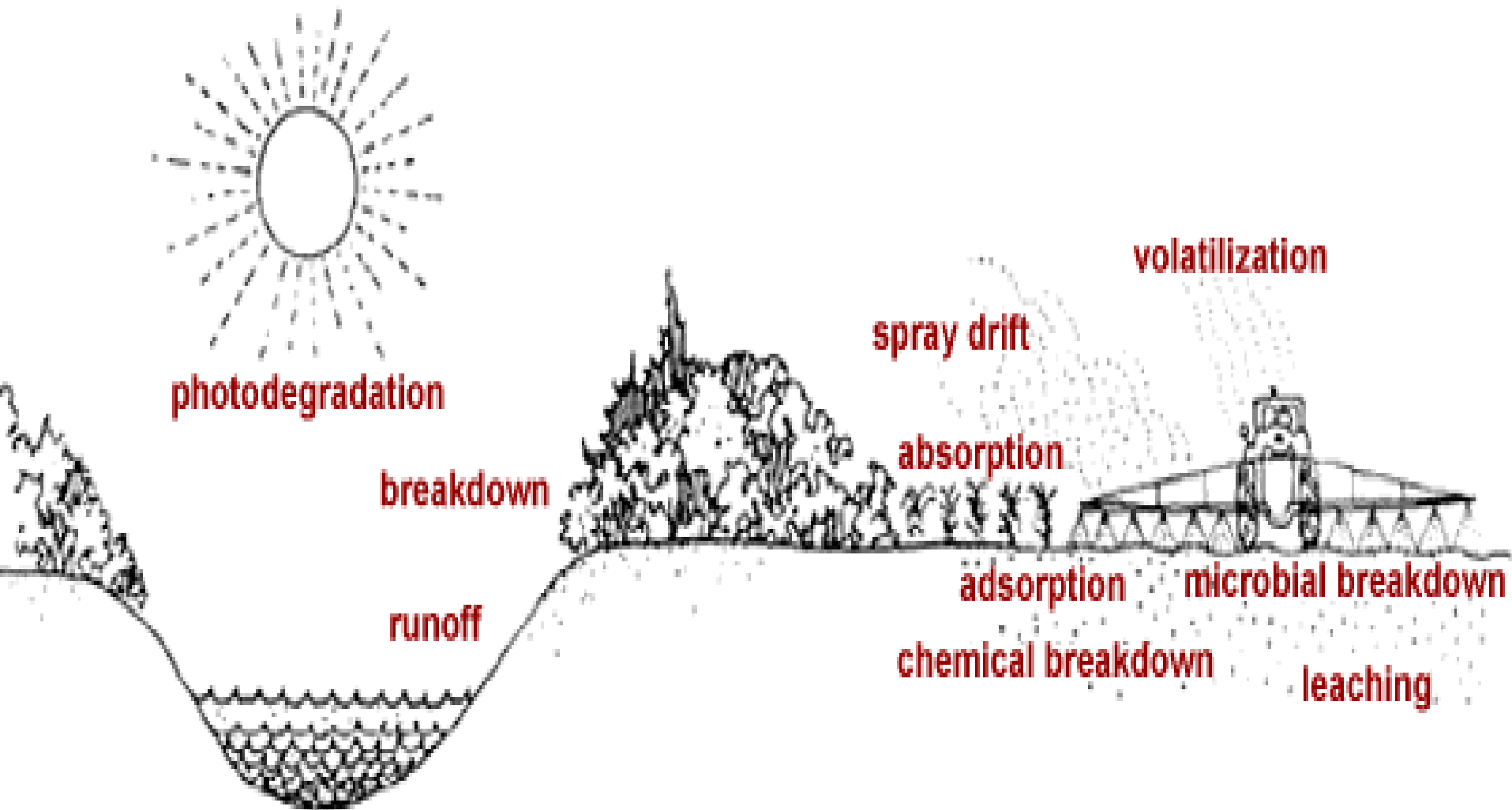
Environmental factors (air movement, temperature, humidity)

# Fate of Pesticides in the Environment

- Degrades (breaks down):
  - Photo
  - Chemical
  - Microbial

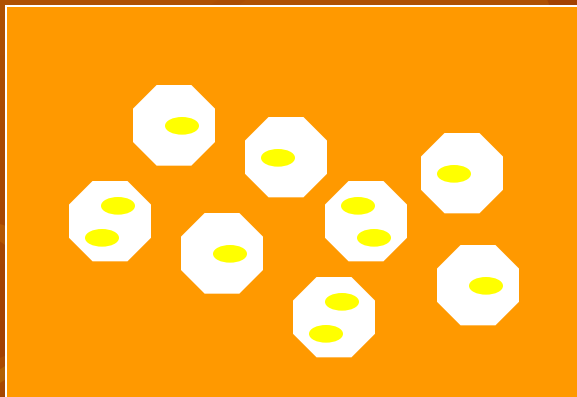


# Fate of Pesticides in the Environment



# Fate Processes

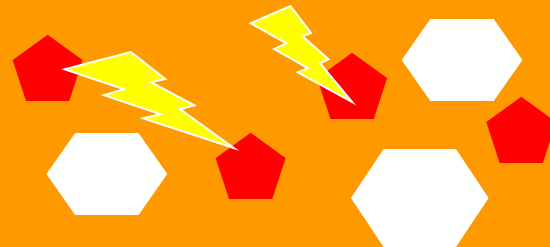
“Hit the Target”



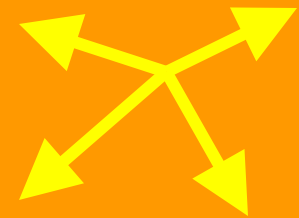
*or*

“Miss the Target”

Degrade (Break Down)



Transfer







# Some Factors Affecting Environmental Fate

- **Water solubility**
  - Dissolve in water?
- **Adsorption**
  - Stick/cling to soil?
- **Volatility**
  - Vaporize readily?
- **Mode of Action**
  - Contact vs. Systemic?

# Maintain a Safe Storage Area

- Keep products in their original containers.
- Keep containers closed
- Keep labels legible
- Watch for damage to containers.
- Consider the shelf-life of the product.
- Store granule above liquids, if necessary.
- Store volatile products separately.

# Pesticide Storage (continued)

- Prevent water damage.
- Control temperature, as much as possible.
- Properly dispose of chemicals that are no longer useful.

# Pesticide Safety and Security

- Only buy what you will use
  - remove old, stored pesticides
- Add fuels and fertilizers to the list

# Personal Safety Considerations

- Read the label
- Avoid exposure to pesticides
- Check equipment
- Wear necessary Personal Protective Equipment (PPE)

# Personal Protective Equipment

- Clothing and other devices that are worn to protect the body from contact with pesticides.
- An applicator is legally required to follow all PPE instructions that appear on the label or labeling.

# More Personal Safety Considerations

- Avoid accidental spread of pesticides.
- Be prepared for emergencies.
- Keep people and animals out of treated area(s).

# Spill Management – Three C's

- Control the spill
- Contain the spill
- Clean up the spill



# Proper Disposal of Pesticides

- See label statements about disposal.
- Excess pesticides
  - VPPSA, SPSA, professional companies
- Triple-rinse or pressure-rinse containers

*One more point about safe  
use and storage of  
chemicals --*

**Keep Out of Reach of  
Children!**



# Questions/Discussion



**Sustainable Landscape  
Management  
with  
Integrated Pest Management  
Principles**

# Sustainable Landscapes

Sustainable landscape begin with an appropriate design that includes functional, cost efficient, visually pleasing, environmentally friendly and maintainable areas.

An attractive environment that is:

- in balance with the local climate
- requires minimal resource inputs

(fertilizer, pesticides, gasoline, time and water)

# Sustainable Landscape Management (SLM)

**Sustainable landscapes require less maintenance, reduce environmental harm, benefit wildlife, provide seasonal interest, use native plants, and encourage the use of local, renewable, and recyclable materials.**

# Integrated Pest Management (IPM)

A management program for maintaining a healthy and aesthetically pleasing landscape, while minimizing the environmental effects of pesticides.

# Integrated Pest Management (IPM)

-- combining appropriate pest control tactics into a single plan (strategy) to reduce pests and their damage to an acceptable level.



# Pest Management

. . . the reduction of pest problems by actions selected after the life systems of the pests are understood and the ecological as well as economic consequences of these actions have been predicted, as accurately as possible, to be in the best interest of mankind".

Rabb, R. L. and F. E. Guthrie, 1970.

# Pest Management

. . . the reduction of pest problems, by actions selected after the life systems of the pests are understood . . . -

# Integrated Pest Management (IPM)

- Utilization of all available strategies to reduce pest damage below threshold levels (*economic / aesthetic threshold*)
- Examples:  
selecting disease resistant plants, hand picking insects, amending soil, applying Milky Spore disease, and applying insecticides

# Principles of IPM

- Potentially harmful pests will exist.
- View entire landscape as management ecosystem.
- Use of natural control agents is maximized.

# Principles of IPM cont'd

- Any management procedure may produce unexpected and undesirable results.
- Management approach should be interdisciplinary.

# Elements in IPM Program

- Goals
- Monitoring
- Thresholds
- Recordkeeping
- Evaluate practices at end of season.

# Steps of an IPM Program

- Goal(s) – set tolerances for pest control
- Scout and Monitor (inspect and observe)
- Identify Pest(s)
- Know thresholds and what tactics are available

# Steps of an IPM Program (cont'd)

- Evaluate risks and benefits of each tactic
- If control is necessary, choose the most effective strategy with the least harm to people and the environment.
- Use each tactic correctly.



# Pest Identification

- Insects
- Weeds
- Diseases
- Nematodes
- Rodents
- Others

The background of the slide features a pattern of stylized autumn leaves in various shades of orange and brown, set against a darker orange gradient. The leaves are scattered across the frame, with some showing detailed vein structures.

Know what normal is for  
the plant in question.

# Learn to Recognize Plant Parts and Characteristics that Resemble Problems.

- Seed pods like galls, or galls themselves.
- Seeds on juniper
- Variegated plants
- Crepe myrtle and the exfoliating bark
- *Magnolia grandiflora* and pines losing leaves and needles

# More Elements in IPM Program

- Know damage symptoms and signs of pest(s)
- Analyze the damage
- Decide when and how to control pest(s) – know thresholds
- Use a pesticide, or not?

# Monitoring & Diagnosis

Look for symptoms and signs of pests.

*Symptoms* - a plant's reaction to a pest.

*Signs* - the actual pest.

# Landscape Design

- Right plant, right place
- Use insect and disease resistant plants
- Design diversity into the grounds
- Plant trees and shrubs according to recommendations

# Maintaining the Yard

- Know when and how to prune plants
- Use mulch around plants
- Irrigate drought-sensitive plants during extended periods of dry weather

# Managing Turfgrass

- Choose adapted varieties
- Apply lime and fertilizer based on soil test results
- Seed/over-seed at the proper time
- Mow turf at the recommended height



# Turfgrass Management Continued . . .

- Aerate turf to relieve soil compaction
- *Irrigate* in periods of drought
- Turf needs about 1” of water per week

# Why Utilize IPM?

- Pests can, and do, develop resistance to pesticides.
- Chemical use ( esp. broad-spectrum ones) reduces the populations of beneficial insects.
- There are unintended, adverse effects to non-target organisms – including humans.

# Why Utilize IPM? (continued)

- People are becoming more cautious concerning the use of chemicals/pesticides.
- Money may be saved on the purchase of chemicals.
- Environmental impacts of chemicals and pesticides are reduced.

# *Thresholds and Deciding to Apply Controls*

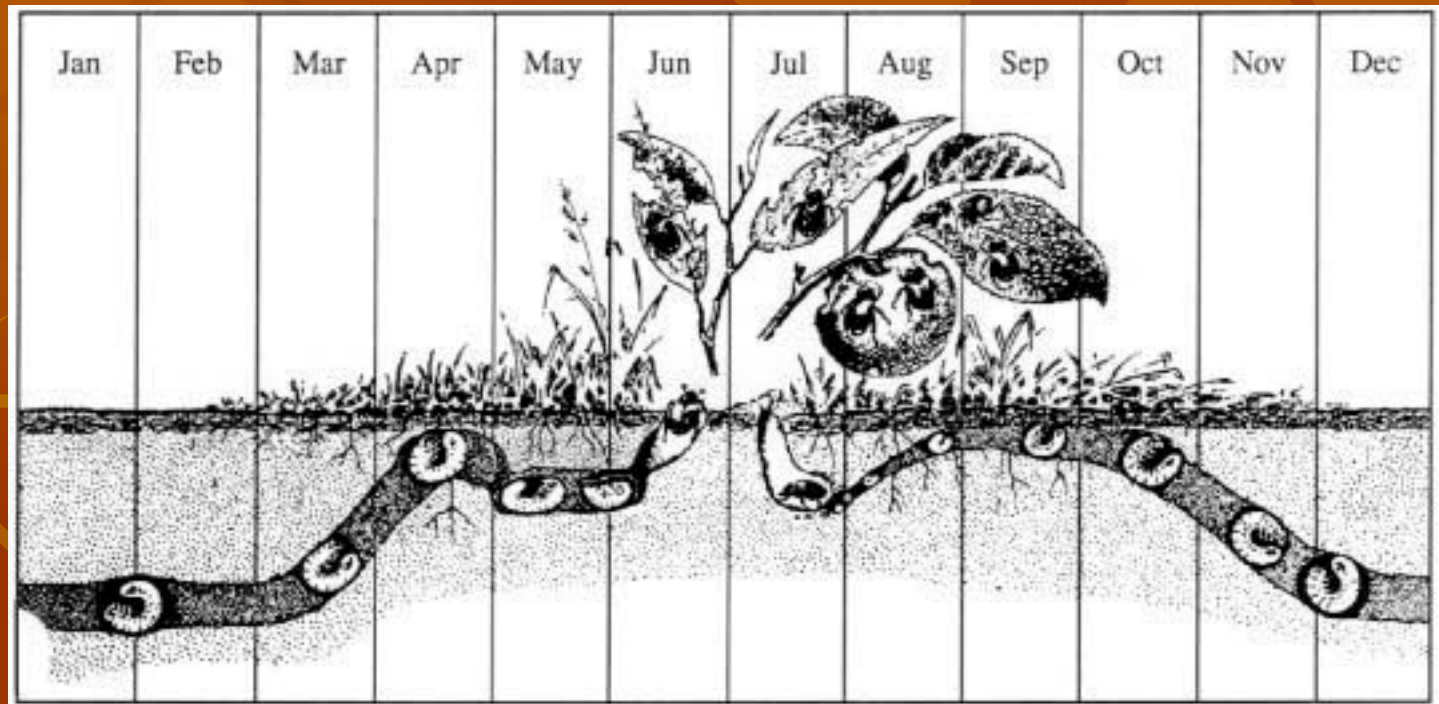
- **What level of the pest population can be tolerated before control measures must be taken?**

**Ask the question:**

*Is it an economic or aesthetic problem?*

# Identify Problem

- Selecting an applied control
- Timing the applied control



# IPM Applied Control

- **Host Resistance**
- **Mechanical**
- **Cultural**
- **Biological**
- **Chemical**
- **Sanitation**

## Examples:

VCIA recommended grass seed, Tanglefoot, Japanese Beetle traps, crop rotation, fertilizing, remove diseased leaf debris, release lady beetles, Malathion

# IPM Biological Control

- The use of:
  - predators (lady bugs, lacewings)
  - parasites (braconid wasps, some nematodes)
  - pathogens (*Bacillus thuringiensis*)

to keep pests below damaging levels.

# Beneficial insects

- lady beetles
- praying mantids
- lacewing
- ground beetles
- predatory mites
- assassin bug
- pirate bugs
- predaceous stink bug
- syrphid fly larvae
- parasitic wasps
- spiders



# Further Controls....Organic Products

- **Neem Oil**
- **Diatomaceous Earth**
- **Compost tea**
- **Horticultural Oil**
- **Insecticidal soap**
- **Rotenone**
- **Pyrethrin**

# Chemical Controls

- minimize chemical application
- may be the only effective control
- effective control is only accomplished when problem/pest is positively identified.

# Evaluation

- **Take notes and keep records of your IPM practices**
- **Refer to scouting records prior to taking control measures**
- **Use previous year's records to anticipate pest problems**
- **Learn from your mistakes**

# The Plant Disease Triangle



**Host**

**Pathogen**

**Environment**

# Plant Disease

- Susceptible host
- Presence of a virulent pathogen
- Suitable environment

# Biotic and Abiotic Causes

- **Abiotic** -- Non-living; of non-biological origin.
- **Biotic** – Living, biological organisms

# Abiotic vs. Biotic

## ■ *Biotic (living)*

- Fungi
- Bacteria
- Nematodes
- Viruses
- Insects
- Parasitic plants

## ■ *Abiotic (non-living)*

- Drought stress
- Over-fertilization
- Over-watering
- Mechanical injury
- Environmental stress



# *Integrated Pest Management*

Exclusion

Eradication

Sanitation

Biological Control

Resistance

Stress Management

Chemicals



# Pest Management

- Proper cultural practices
- Pest identification
- Remove by hand, if possible
- Use biological methods when available.
- Practice good sanitation
- When a pesticide is necessary, choose the least invasive product.

# Pest Management Options

- Identify the pest
- Determine the potential for injury
- Consider management options
- Use the best option
- Keep good records for future years

# Get the Weeds Out

- Identify weed before attempting controls
- Dig, maybe
- If necessary, use a pre-emergent control for crabgrass
- Selectively control broadleaf weeds at the appropriate time(s)
- Use “spot” treatments for weed control

# Know your weeds

- Grasses

- Summer

- Winter

- Broadleaf

- Summer

- Winter

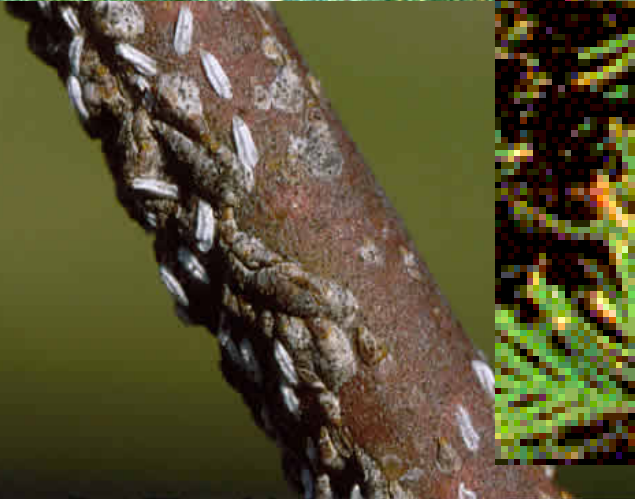
# Know your weeds

- Winter annual
- Summer annual
- Perennial



**Questions???????,  
Discussion . . .**

# Identify and Recommend Control



# Pest Management Guide (PMG)

## Exercise

**What are the crawler dates, treatment dates and chemical control for *Euonymus* scale?**

**Someone just called with a questions about small bags hanging from their shrub. What would be your recommendation?**

**When is the best time to control chickweed and dandelion in a lawn?**