Weed Management in the Landscape

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Attractive, Functional Landscape

What is a Weed?

- **Plant out of place**

Bermuda grass

Noxious Weed

- Plant species that have been designated by state or national agricultural authorities as plants that are injurious to agricultural and/or horticultural crops and/or humans and livestock.
- Most have been introduced into a foreign ecosystem either by accident or mismanagement, but some are native.

Noxious Weed

- California Department of Food and Agriculture categorizes noxious weeds into the following:
  - "A" – Eradication, containment, or other holding action at the state-county level. Quarantine interceptions to be rejected or treated at any point in the state.
  - "B" – Eradication, containment, control or other holding action at the discretion of the county ag commissioner.
  - "C" – State endorsed holding action and eradication only when found in a nursery
  - "Q" – Temporary "A" action outside of nurseries at the state-county level pending determination of a permanent rating.

http://www.cdfa.ca.gov/phpps/ipc/weedinfo/winfo_list-pestrating.htm

"C" rated

Yellow Starthistle (*Centaurea solstitialis*)

"A" rated

Capeweed
(*Arctotheca calendula*)

Invasive Weed

- Non-native species whose introduction causes economic or environmental harm or harm to human health.
- No regulatory framework.

- In California, Cal-IPC has developed the most extensive list
  - http://www.cal-ipc.org/ip/inventory/weedlist.php

Weed impacts

- Weeds are costly
  - $24 billion in agricultural crop loss
  - $3 billion in control cost

Pimentel et al. 1999

Weeds are costly

- Yellow starthistle
  - Infests over 15 million acres in CA
  - Reduces forage value
  - Toxic to horses
  - Millions are spent every year to control

Weeds reduce property value

- Leafy spurge
  - Western U. S.: land value reduced 83% by reducing grazing capacity

- Gorse
  - West coast: impenetrable thickets of gorse, with persistent growth after removal

Weeds reduce recreational value and tourism

- Yellow starthistle
  - Inaccessible to hiking, walking, horseback riding
  - Decreases camping accessibility

Weeds reduce recreational value and tourism

- Eurasian watermilfoil
  - Forms thick mats in water
  - Reproduces from small fragments
  - Limits boating, swimming, fishing
  - Clogs water intakes, canals, flood control
  - Decays in large masses on beaches

Weeds threaten biodiversity

- Invasive weeds considered second greatest threat to endangered species
- Purple loosestrife:
  - Displaces native cattails, reeds, and sedges
  - Reduces habitat for endangered bog turtles and ducks

Weeds decrease water resources

- Saltcedar (Tamarisk)
  - Grows along stream banks and marshes
  - Consumes more than 200 gallons of water per day
  - Increases salinity of soil to the point where other plants will not grow

Courtesy TNC

Weeds can endanger human health

- Giant hogweed
  - Rapid, extensive growth
  - Causes severe dermatitis and blistering

Why do weeds always win?

- Dormancy: broken when conditions favor survival
- Rapid early growth and expansion
- Early and fast root growth and penetration of a large area
- Efficient uptake and processing of nutrients and water
- Tolerate low levels of resources
- Ability to reproduce early in life cycle
- Prolific seed production
- Ability to develop resistance to control measures

Reproduction by seed

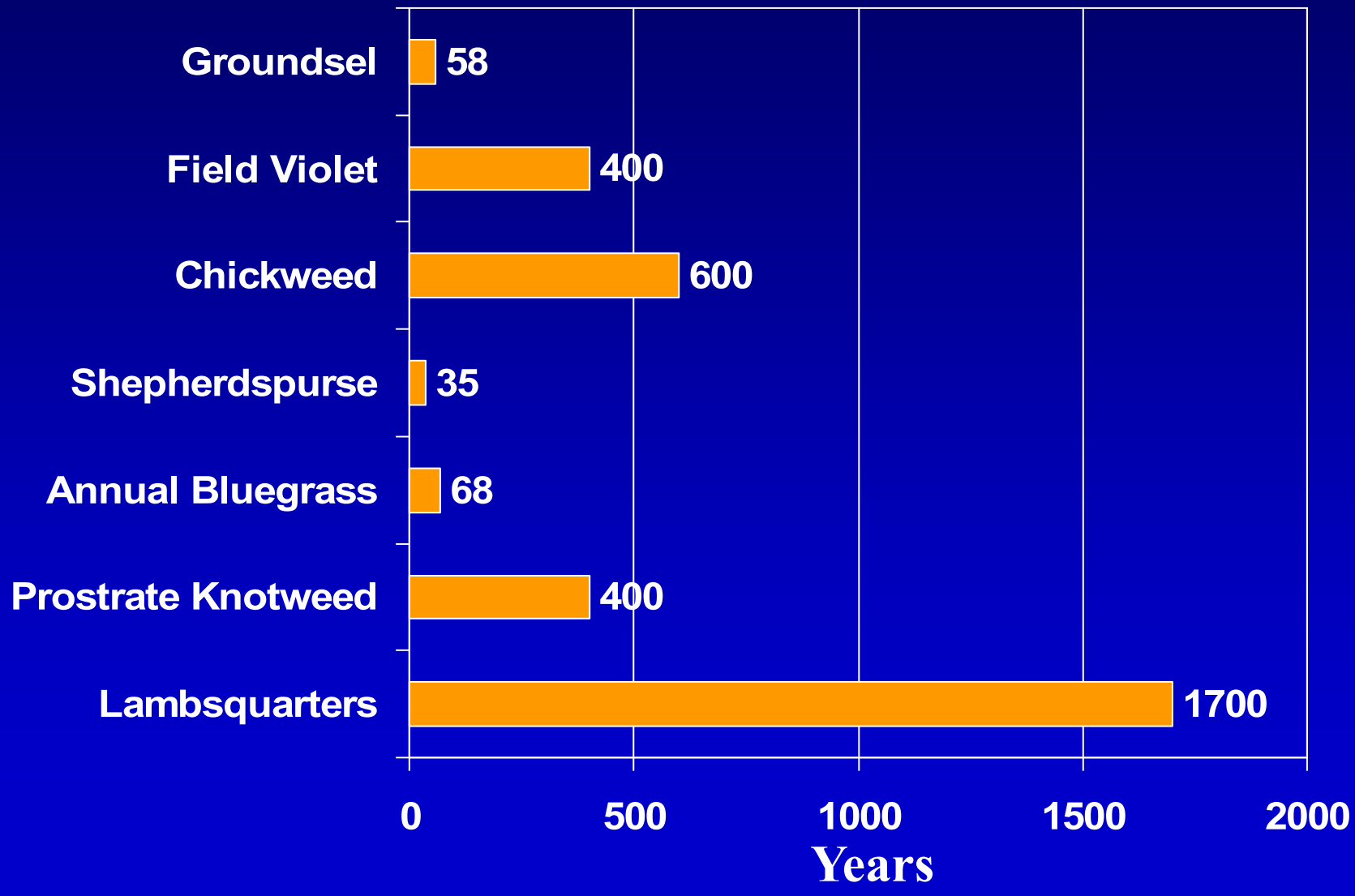
- First infestation is often dependant on seed
- Seed production varies greatly
  - Canada thistle: ~700 seeds per plant
  - Small broomrape: ~1,000,000 seeds plant
- Seed longevity can be up to 1,000 years!

Seed dispersal

Weed Seed Production

	Seed / Plant
Pigweed	>200,000
Lambsquarters	>70,000
Crabgrass	53,000
Annual Bluegrass	2,000

Longevity of Weed Seeds in Soil



"A year of seeds means decades of weeds"

Crossing paths on their respective journeys of destiny, Johnny Appleseed and Irving Ragweed nod "hello."

Weeds are for the birds:

Weed seed in 6 random sources bought in retail shops:

Green foxtail
Witchgrass
Russian thistle
Nightshade
Safflower
Downy brome
Poaceae
Yellow bristlegrass
Flax
***Brassica* spp.**
Jointed goatgrass
Niger
Oat
Common mallow
Pineappleweed
Wheat
Pigweed
Buffalobur
Wild buckwheat
Barnyardgrass
***Poygonum* spp.**
Velvetleaf
Italian millet
Sorghum
Corn
Puncturevine
Sandbur
Sweet clover
Sumpweed
Kochia
Common Lambsquarters
Johnsongrass
Lanceleaf sage
Common ragweed
Stinkgrass
***Bromus* spp.**
Little burnet
Wild poinsettia
Panicgrass
Asteraceae
***Sage* spp.**
Broadleaf dock
Bur ragweed

Weeds are for the birds:

Weed	Seeds per pound feed
Foxtail	1,400
Kochia	1,100
Pigweed	1,000
Russian thistle	100
Large crabgrass	50
Witchgrass	33
Wild buckwheat	18
Wild sunflower	15
Buffalobur	12
Sage	12
Nightshade	3
Canada thistle	3
Ragweed	3

Juniper seed deposited by birds on fence

Vegetative reproduction

- Less longevity in soil than seeds
- Very small structures can reproduce
  - Canada thistle: ¼” root results in new plant
- Can be as prolific as seed production
  - Yellow nutsedge: 1,900 new plants and 18,000 tubers in one year from one plant

Weed Life Cycle

Annual: Completes growth cycle in a single growing season (warm and cool season plants)

Biennial: A plant that normally requires two growing seasons to complete its life cycle, flowering and fruiting in its second year

Perennial: A plant that can persist more than two years, and reproduces through roots or seeds

Two Major Groups of Weeds

Broadleaf

Grasses

Bermuda Grass
Cynodon dactylon

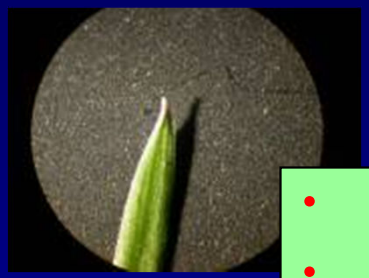
- Perennial
- Description:
  - Dormant in winter
  - stolons & rhizomes
  - runners send down roots
  - smooth, narrow leaf

Crabgrass

Digitaria ischaemum

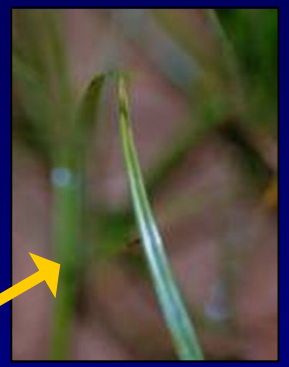
- Annual
- Warm
- Description:
  - Grows in clumps
  - No runners
  - Wide blade

Annual Bluegrass
Poa annua



- Annual
- Cool
- Description:
  - Clump forming
  - shorter grassy leaf bunch
  - Boat-shaped leaf blade
  - Tiny white seed heads

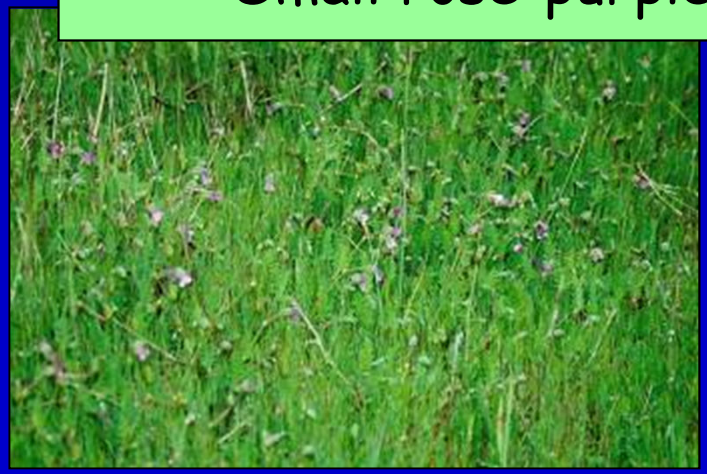
Yellow Nutsedge
Cyperus esculentus



- Perennial
- Description:
  - Long, grassy, narrow leaf
  - Shiny, glossy leaf
  - Leafs produced in groups of 3
  - Stems are triangular shape
  - Underground tubers form at the tips of rhizomes
  - Favor low, moist areas

Filaree
Erodium species

- Annual
- Cool
- Description:
  - Looks like fern
  - "scissors" shaped fruit
  - Low growing
  - Small rose-purple flowers



Dandelion
Taracacum officinale

- Perennial
- Description:
  - Serrated leaf
  - Edible leaf and flower
  - Milky, white sap
  - Pink, rose colored stem
  - Large, fleshy taproot
  - Bright yellow flower
  - "Puff-ball" seed head

Sow Thistle

Sonchus oleraceus

- Annual
- Cool (All year in some regions)
- Description:
  - Darker purple-green leaves
  - Purple-pinkish midrib
  - Leaves are spoon-shaped
  - Milky, white sap
  - Yellow flowers turn into fluffy seed heads

Prickly lettuce

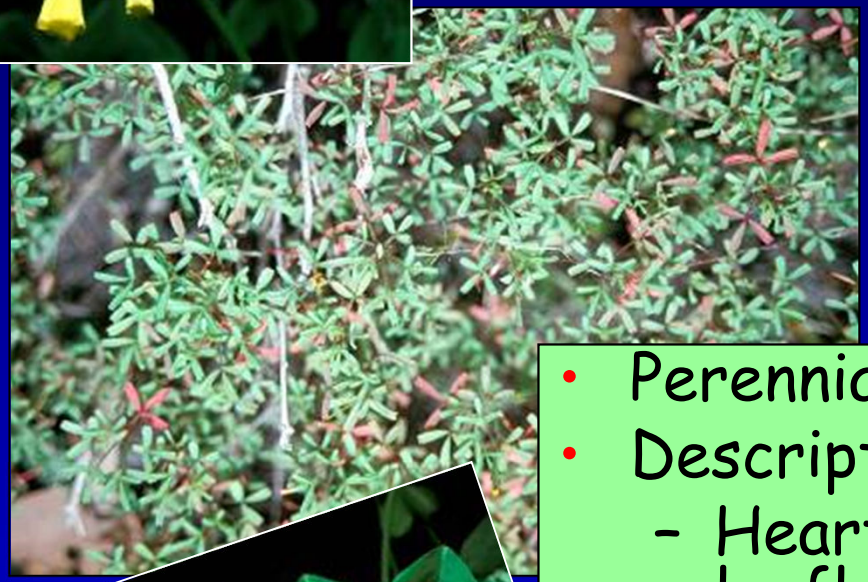
Lactuca serriola

- Annual
- Cool
- Description:
  - Large taproot
  - 1-5 feet tall
  - Leaves clasp stem and have sharp spines on midrib
  - Milky, white sap
  - Yellow flowers

Prostrate Spurge
Euphorbia maculata

- Annual
- Warm
- Description:
  - Grows prostrate
  - Leaves are opposite
  - Stems are reddish-brown color
  - Milky-white sap
  - Toxic plant

Oxalis
Oxalis Species



- Perennial
- Description:
  - Heart shaped leaflets
  - Pink-reddish stems
  - Smaller leaflets (clover-like)
  - Yellow flowers

Bur Clover
Medicago polymorpha

- Annual
- Cool
- Description:
  - Common lawn weed
  - Larger leaflets (clover-like)
  - Red stem
  - Yellow flowers
  - Spreads prostrate which allows it to tolerate mowing

Common Groundsel
Senecio vulgaris

- Annual
- Cool
- Description:
  - Dandelion-like flower
  - Leaves are alternate and smooth
  - Smooth, green-reddish stems

Shepherd's Purse
Capsella bursa-pastoris

- Annual
- Cool
- Description:
  - Heart shaped "purses" full of seeds
  - Flowers are small and white
  - Deep-cut leaves resemble a dandelion

Lambsquarters
Chenopodium album

- Annual
- Cool
- Description:
  - Grows large
  - Dark red stem
  - New leaves look frosty
  - Alternate leaf arrangement

Broadleaf Plantain

Plantago major

- Perennial
- Description:
  - Leaves have distinct parallel vei
  - Leaves are smooth
  - Seedheads have "rat-tail" appearance

Field bindweed
Convolvulus arvensis

- Perennial
- Description:
  - Stems are prostrate, forming a mat.
  - Extensive root system, up to 20ft deep.
  - White-pink bell shaped flowers.

Common purslane
Portulaca oleracea

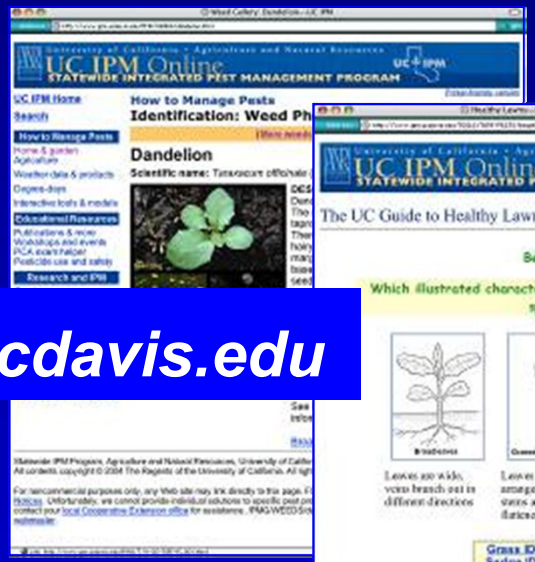
- Annual
- Warm
- Description:
  - Fleshy, mat forming plant.
  - Stems are smooth reddish-flesh colored.
  - Braches radiate from a central rooting point.
  - Tear shaped leaves
  - Yellow flowers

Want more information on weed ID?

- **ID weed to species for most effective management approach**

Pest Notes

www.ipm.ucdavis.edu



Weed photo gallery

Key to weeds in lawn

Why are weeds invading?

- **Poorly maintained areas**
- **Underlying problem**

Why are weeds invading?

Maintenance problem

Overwatered or waterlogged areas

Why are weeds invading?

Maintenance problem

Compacted soils or bare areas

Knotweed

Spotted spurge

Why are weeds invading?

Maintenance problem

Lawns low in nitrogen fertilizer


White clover


Black medic


Burclover

Why are weeds invading?

Maintenance problem

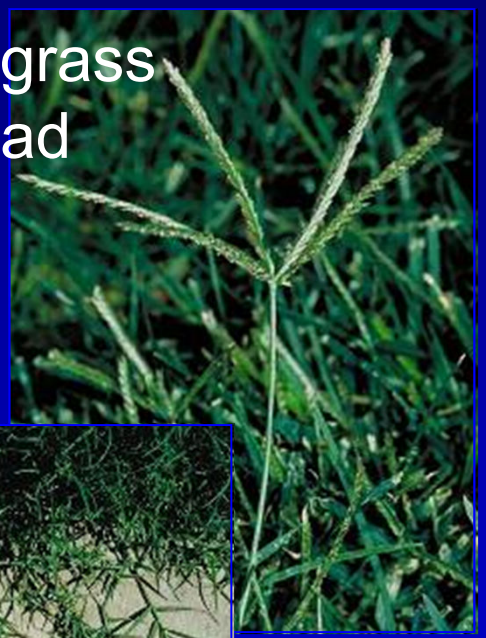
Thin areas in lawns

Why are weeds invading?

Maintenance problem

Lawns mowed too short

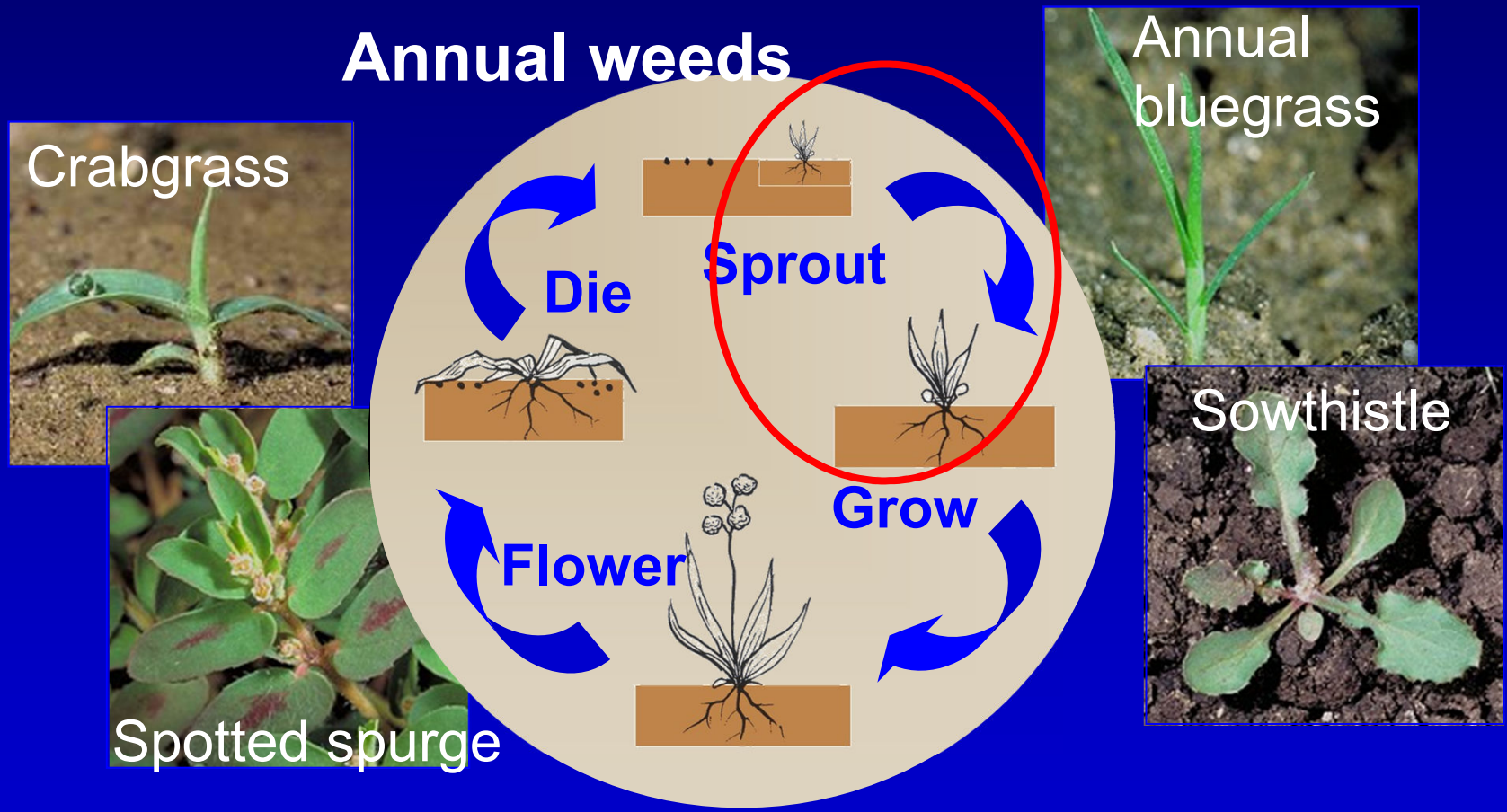
Bermudagrass flower head



Invading Bermudagrass

Know the life cycle of your weed

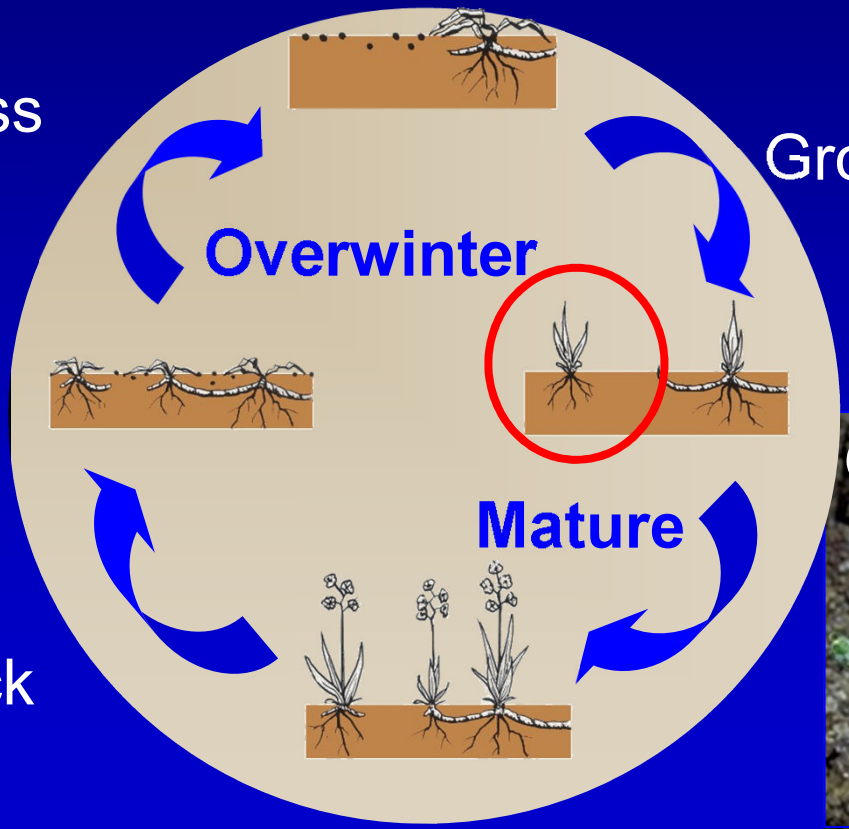
Control weeds before they spread



Know the life cycle of your weed

Control before vegetative parts or seeds form

Perennial weeds



Control vs. Eradication

Control - Process of limiting a weed infestation to a desirable level.

Eradication - Elimination of all plants and plant parts.

Weed Management Strategy

- Identify weed, life cycle, habitat
- Integrated Pest Management
  1. Cultural
  2. Mechanical
  3. Physical
  4. Biological
  5. Chemical

Cultural Methods

Modify the immediate environment to improve the competitive advantage of desirable plants and decrease the weed's competitive edge

Cultural Methods

Modify the immediate environment

- **Proper soil preparation**
- **Correct plant selection**
- **Irrigation management**
- **Proper mowing height**
- **Reduction of soil compaction**
- **Crop rotation**

Mechanical Methods

The use of tools and/or labor to control weeds

Hand Pulling

- Best to do when plants are small
- Most effective on annuals or perennials that don't spread by underground rhizomes
- Inexpensive

Hoeing

- Good for small weeds
- Easier to control annuals

Weed Wrench

- Tool used to extract woody plants

Cultivation

- Annuals
  - Should be shallow
  - “Water, wait, cultivate”
- Perennials
  - Cut below soil surface to reduce root carbohydrate
  - Repeat cultivation at 2 to 3 week intervals during the growing season

Rototilling or Discing

Flaming

- Kills annual weeds like a contact herbicide
- Treated leaves go from glossy to a mat finish

Mowing or Chopping

- Useful in turf and pastures
- Reduces seed production if done before flowering

Physical Methods

Use of a barrier to prevent weed growth

Mulches

- **Organic – conserve water, provides nutrients, must be replenished.**
  - **Leaves**
  - **Needles**
  - **Bark**
  - **Straw**
  - **Newspaper**
  - **Rice hulls**
  - **Compost**

Mulches

- **Inorganic – conserve water, long lasting**
  - **Commercial weed block fabric**
  - **Black plastic**
  - **Gravel**

Solarization

- Heats the top layers of soil, killing weeds, insects, pathogens, and nematodes
- Takes 4 to 6 weeks during the summer months when solar radiation is greatest

Biological Methods

Employs animals or natural enemies to reduce weed populations

Geese or Chickens

- Non-selective
- Must provide shade and water
- Must be fenced

Livestock

- Goats are more effective on brush
- Sheep / Cattle are more effective on grasses

Insects and Pathogens

- **Long term control strategy**
- **Not a practical tool for home gardeners**

Chemical Methods

Use of a chemical to kill weeds

Herbicide Classification

Contact: Causes localized plant tissue injury. Does not readily move through the plant.

Systemic: Is moved (translocated) throughout the plant.

Herbicide Classification

Selective: **Kills some plant species, but does not damage others**

Nonselective: **Generally kills all plant species**

Herbicide Classification

Preemergence: **Applied before weed seed germination. Generally no control of emerged weeds.**

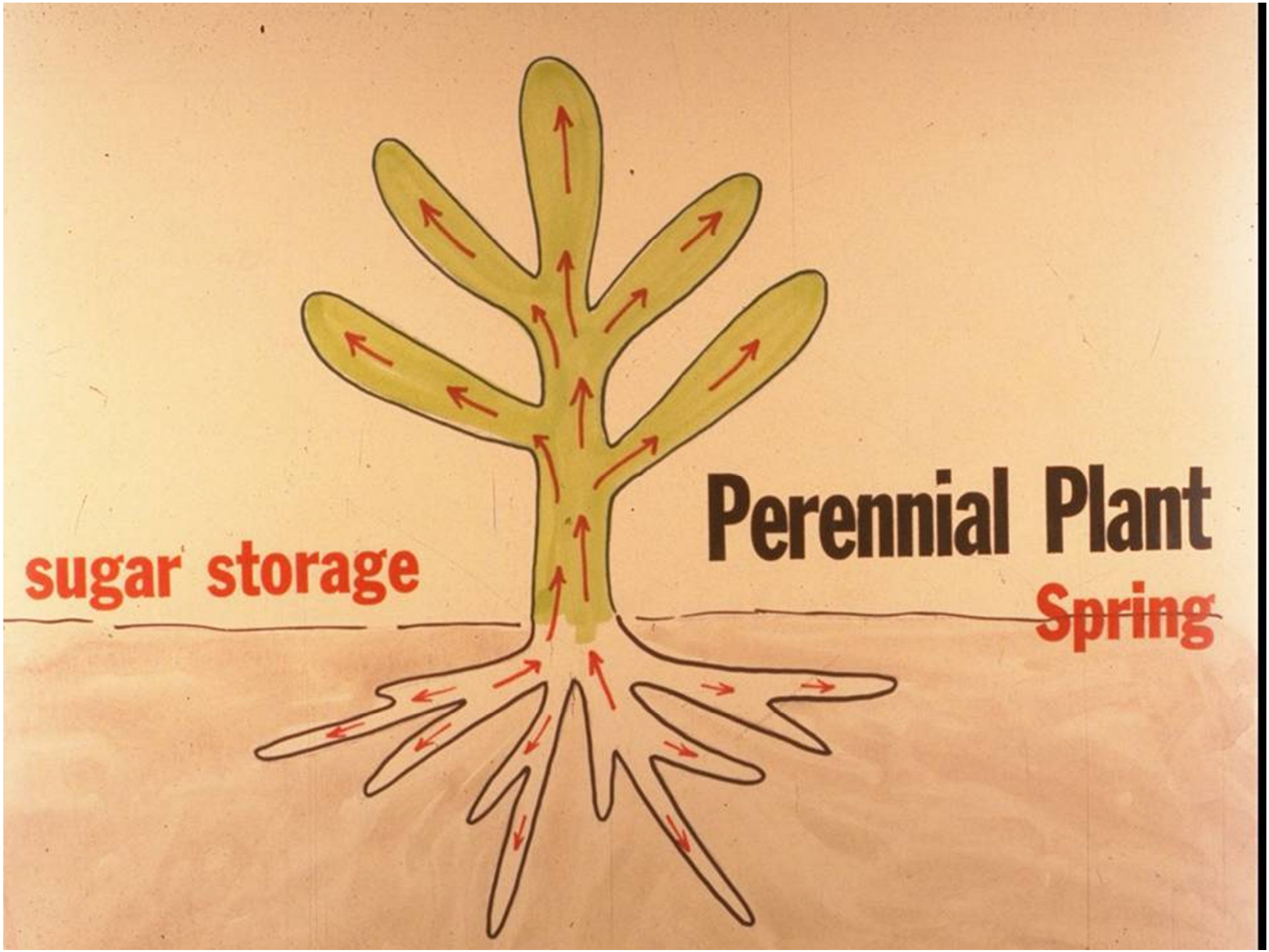
Postemergence: **Applied after weed emergence. Generally no control of unemerged weeds.**

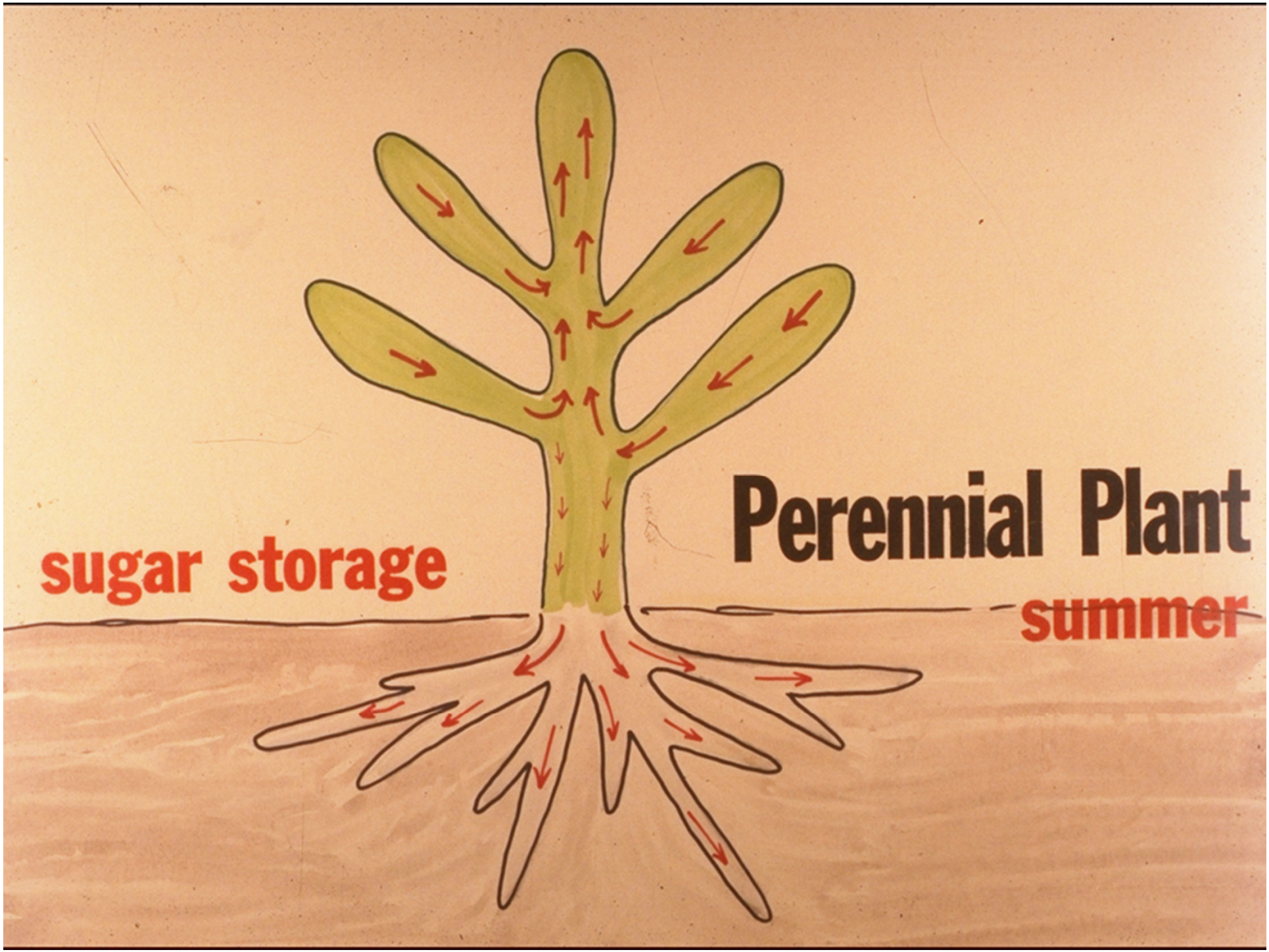
Preemergence Herbicides

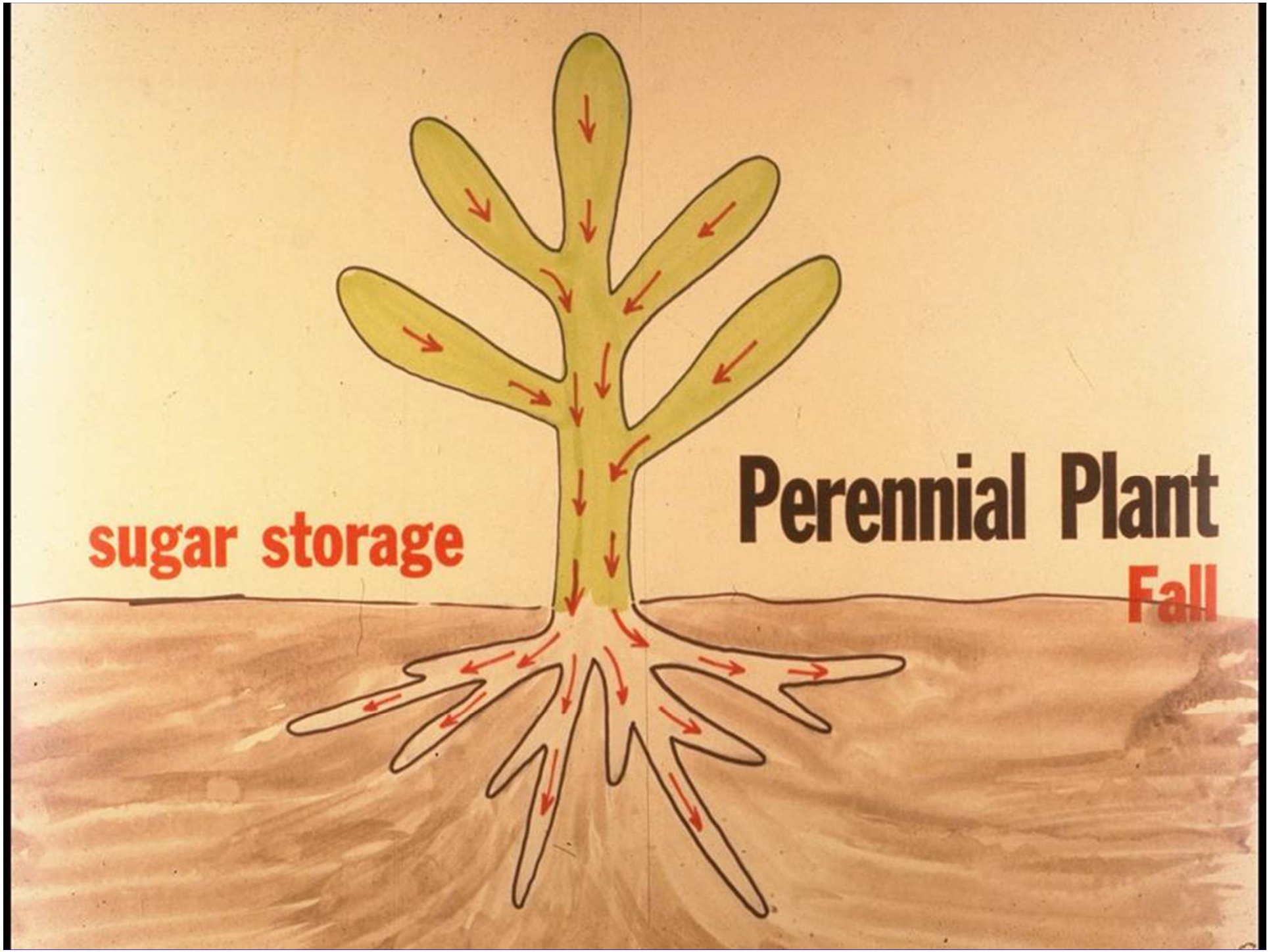
- Application is made with the notion that weeds will be a problem
- Must apply before weeds emerge
- Fewer choices for homeowners
- Can give season long control with one application

Postemergence Herbicides

- Weeds must be actively growing
- More flexible application time
- Spot treatment
- Small containers
- Fits well into IPM programs
- Must apply frequently
- For perennial plants timing is more critical


Perennial Plant
Spring
sugar storage


Perennial Plant
sugar storage
summer


sugar storage
Perennial Plant
Fall

Turfgrass Herbicides

Preemergent Turfgrass Herbicides

- **Herbicides applied before weeds emerge**
  - **Monterey Weed Stopper (oryzalin)**
  - **Balan (benefin)**
  - **Green Light Amaze (benefin + oryzalin)**
  - **Green Light Crabgrass Preventer (benefin + trifluralin)**
  - **Vigoro Crabgrass Preventer (dithiopyr)**
  - **Green Light Portrait Broadleaf Weed Preventer (isoxaben)**
  - **Scotts Halts Crabgrass Preventer (pendimethalin)**

Postemergent Turfgrass Herbicides

- **Herbicides applied after weeds emerge**
  - **Trimec Lawn Weed Killer, Spectracide Weed Stop, Ortho Weed-b-gon (mixtures of 2,4-D, dicamba, and mecoprop)**
  - **Bayer all in one Weed Killer (mixtures of 2,4-D, dicamba, MCPP, and MSMA)**
  - **Monterey Weed Whacker (2,4-D, 2,4-DP, MCPP)**
  - **Monterey Turflon ester (triclopyr)**
  - **Monterey Spurge Power (ticlopyr, MCPA, dicamba)**
  - **Monterey Nutgrass Nilhilator (bentazon)**
  - **Ortho Weed-b-gon Crabgrass Killer (CAMA)**
  - **Monterey Weed-Hoe (MSMA)**

Turfgrass Fertilizer / Herbicide Combinations

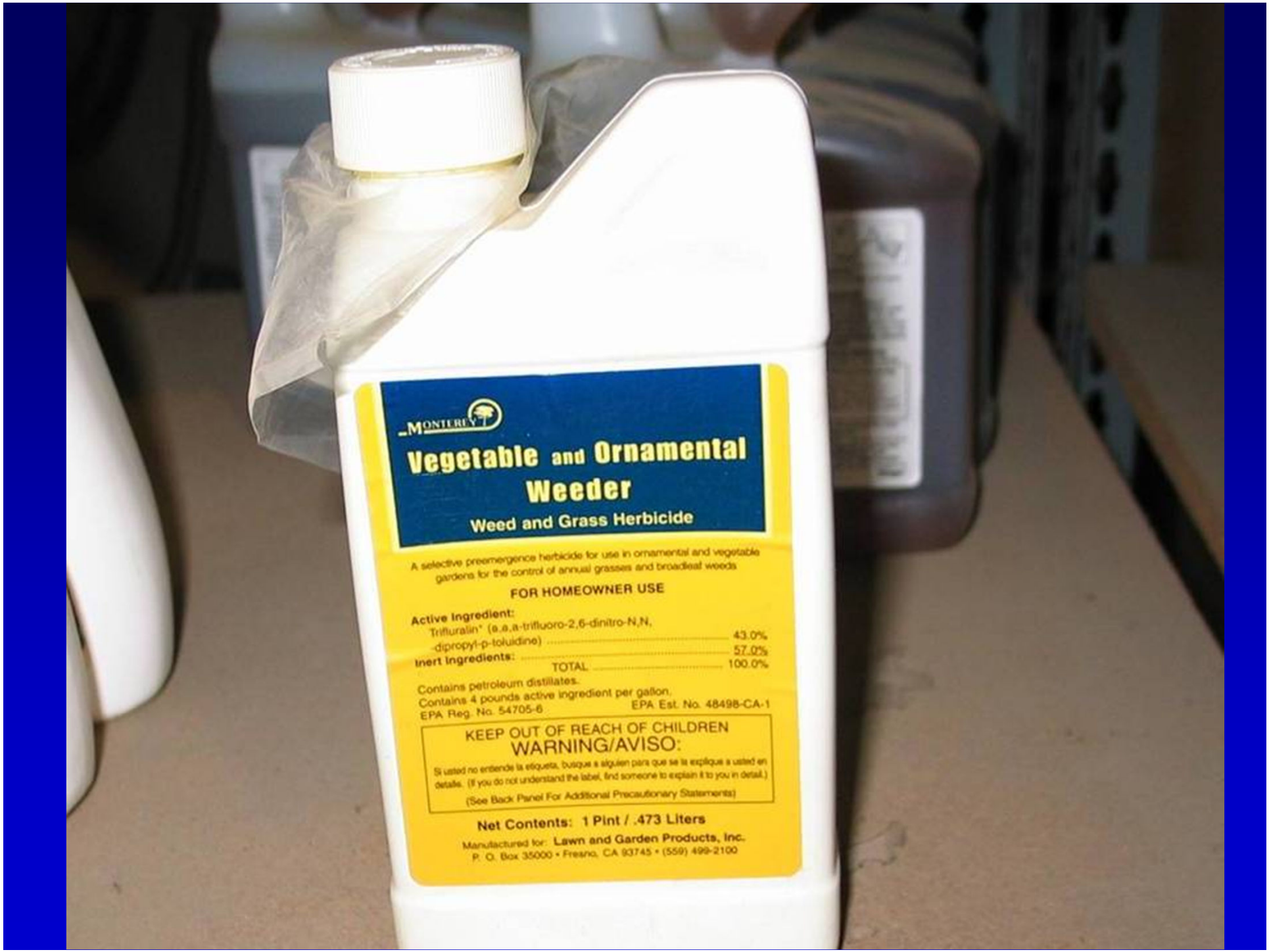
- Fertilizers can be combined with either pre- or postemergence herbicides.
- Created so you don't have to make separate applications of fertilizers and herbicides.
- Products available from many manufactures selling nearly identical products.
- Not always the best option.

Herbicides for use in the Landscape

Preemergent Herbicides

- Monterey Weed Stopper (oryzalin)
- Monterey Vegetable and Ornamental Weeder (trifluralin)
- Dacthal (DCPA)
- Dimension (dithiopyr)
- Devrinol (napropamide)
- Goal (oxyfluorfen)
- Dendulum (pendimethalin)
- Pennant (metolachor)
- Gallery (isoxaben)


Many Broadleaf Weeds In:
• Landscape Ornamentals & Bulbs
• Bedding Plants & Ground Covers
• Nonplanted Areas
MONTEREY
Active Ingredient:
Oryzalin: 3,5-dinitro-N⁴,N⁴-dipropyl-
sulfanilamide 40.40%
Inert Ingredients: 59.60%
Total 100.00%
WEED STOPPER
Selective Preemergence Herbicide
Control Annual Grasses and
Many Broadleaf Weeds In:
• Landscape Ornamentals & Bulbs
• Bedding Plants & Ground Covers
• Nonplanted Areas
MONTEREY
Active Ingredient:
Oryzalin: 3,5-dinitro-N⁴,N⁴-dipropyl-
sulfanilamide 40.40%
Inert Ingredients: 59.60%
Total 100.00%
Contains 1.0 pound of active ingredient per quart.
EPA Reg. No. 54705-5
EPA Est. No. 48496-CA-1
KEEP OUT OF REACH OF CHILDREN
CAUTION
NET CONTENTS
1 QUART / 946 mL


MONTEREY
Vegetable and Ornamental Weeder
Weed and Grass Herbicide
A selective preemergence herbicide for use in ornamental and vegetable gardens for the control of annual grasses and broadleaf weeds
FOR HOMEOWNER USE
Active Ingredient:
Trifluralin* (a,a,a-trifluoro-2,6-dinitro-N,N,-dipropyl-p-toluidine) 43.0%
Inert Ingredients: 57.0%
TOTAL 100.0%
Contains petroleum distillates.
Contains 4 pounds active ingredient per gallon.
EPA Reg. No. 54705-6
EPA Est. No. 48498-CA-1
KEEP OUT OF REACH OF CHILDREN
WARNING/AVISO:
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.)
(See Back Panel For Additional Precautionary Statements)
Net Contents: 1 Pint / .473 Liters
Manufactured for: Lawn and Garden Products, Inc.
P. O. Box 35000 • Fresno, CA 93745 • (559) 499-2100

Postemergent Herbicides

- Grass-B-Gon (Fluazifop) selective, kills grass
- Ortho Brush-b-gon (triclopyr) selective, kills broadleaf
- Roundup (glyphosate) non-selective
- Ground Clear (imazapyr) non-selective


24 HOURS!
Roundup
WEED & GRASS KILLER
READY-TO-USE
NO ROOT.
NO WEED.
NO PROBLEM.®
Active Ingredient:
Glyphosate, isopropylamine salt 2.0%
Other Ingredients 98.0%
KEEP OUT OF
REACH OF CHILDREN
See back panel for additional precautionary statements.
CAUTION
NET 128 FL OZ (1 GAL)
1 Unhook. PULL CORD ALL THE WAY OUT.
2 Insert green plug into spout (on cap) until it clicks.
3 Flip up spout. Open nozzle at end of sprayer.
$11 99
75305
070183500321
HERB ROUNDUP GL RTU
05/03


FAST ACT™ TECHNOLOGY
RESULTS IN 24 HOURS!
Roundup®
WEED & GRASS KILLER
CONCENTRATE PLUS
NO ROOT.
NO WEED.
NO PROBLEM.™
KEEP OUT OF REACH OF CHILDREN
See back panel booklet for additional precautionary statements.
CAUTION
NET 16 FL OZ (1 PT)
Active Ingredients
Glyphosate,
Isopropylamine salt 18.00%
Diquat Dibromide 0.73%
Other Ingredients 81.27%


CONCENTRATE
WEED
&GRASS
KILLER
Kills
the root
Herbicida de pasto
y maleza
Elimina la raíz
Active Ingredient:
Glyphosate, Isopropylamine salt 25.00%
Other Ingredients 75.00%
Total 100.00%
KEEP OUT OF REACH OF CHILDREN
CAUTION See back booklet for additional precautionary statements
MANTENGA FUERA DEL ALCANCE DE LOS NIÑOS
PRECAUCIÓN Consulte el folleto en la parte posterior para obtener información adicional sobre las precauciones
NET 32 FL.OZ.
(1QT. /946 mL)
F71005158A1


NEW Convenient Package Size
Covers up to 32,000 sq. ft.
RODEO®
EMERGED AQUATIC WEED AND BRUSH HERBICIDE
by Monsanto
For Weeds in Ditches and Ponds
Keep out of reach of children.
CAUTION! Read precautions on back panel.
ACTIVE INGREDIENT: 53.8%
*Glyphosate, N-(phosphonomethyl)glycine, in the form of its isopropylamine salt: 46.2%
INERT INGREDIENTS: 100.0%
*Contains 648 grams per litre or 5.4 pounds per U.S. gallon of the active ingredient, glyphosate, in the form of its isopropylamine salt. Equivalent to 480 grams per litre or 4 pounds per U.S. gallon of the acid, glyphosate.
Read "LIMIT OF WARRANTY AND LIABILITY," which appears in the label booklet, before buying or using. If terms are not acceptable, return at once unopened.
REFORMULATION OR REPACKAGING IS PROHIBITED
21061V1-2-1
EPA Reg. No. 524-343
NET 32 FL OZ (1QT)

FORMERLY TRIOX®

ORTHO®

GROUNDCLEAR®

COMPLETE VEGETATION KILLER

Concentrate

Kills Weeds AND Prevents Regrowth For Up To 1 Year

Active Ingredients
Glyphosate, isopropylamine salt...5.00%
Imazapyr, isopropylamine salt.....0.08%
Other Ingredients.....94.92%

KEEP OUT OF REACH OF CHILDREN
WARNING See back panel booklet for additional precautionary statements.


ORTHO®
GRASS B GON®
GRASS KILLER FOR
LANDSCAPES
Ready-To-Use
Kills Weedy Grasses
Without Injuring
Ornamental Plants
When used as directed
Active Ingredient
Fluazifop-P-butyl: Butyl (R)2-[4-[[5-(trifluoromethyl)-2-
pyridinyl]oxy]phenoxy] propanoate 8.48%
Other Ingredients 99.52%
KEEP OUT OF REACH OF CHILDREN
CAUTION See back panel booklet for additional
precautionary statements.
NET 24 FL OZ / 709 mL
OUTDOOR
USE ONLY
WATER BASED

Hard Water??

Before using Roundup

- Use ammonium sulfate (fertilizer) to neutralize hard water ions **before** adding the herbicide.
- Use 1/3 of a cup per gallon of water.

Postemergent Herbicides - Environmental Factors

- Wind
- Rain/irrigation
- Temperature

Glyphosate drift on to grapes

Glyphosate injury on mock orange

Triclopyr injury
on grape

Dicamba injury
on tomato

Postemergent Selectivity

- Selective timing
- Selective placement

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Formula
herbicide

"Chemical" Alternatives

- Vinegar (Acetic acid)
  - Very accessible, inexpensive
- Citric acid
  - Not widely available, more costly
- Boiling water
  - Cheap!
- Clove Oil
  - Available as a registered herbicide, more costly

Equipment

Hand pump Sprayer

Handheld rotary spreader

Calibration

Hand held granular spreaders:

- **Know the size of the area to be treated**
- **Weight out granular herbicide needed for that area**
- **Uniformly apply the pre-weighted granular herbicide to the designated area**

Calibration and Application

Pump type sprayers:

- Measure the area to be treated.
- Using the herbicide label, determine the amount of herbicide needed
- Measure out herbicide
- Mix water and herbicide concentrate
- Pressurize sprayer, and uniformly apply herbicide solution to the are

Always read and follow the herbicide label!

Where can you get more information?

www.ipm.ucdavis.edu

wric.ucdavis.edu