

# Weed Biology & Ecology



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# What makes a weed a WEED?



# Weeds Re-defined!

*A weed is a weed because it possesses certain definable characteristics that set it apart from other plant species. Weeds are plants that interfere with the growth of desirable plants and that are unusually persistent and pernicious. They negatively impact human activities and as such are undesirable.*

Applied Weed Science, 1999

# Weeds Re-framed

- I want to offer a **different CONTEXT & FRAMEWORK:** Thinking of weeds in terms of their **BIOLOGICAL** and **ECOLOGICAL CHARACTERISTICS**



Photo by:  
Richard Old  
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# Defining Characteristics

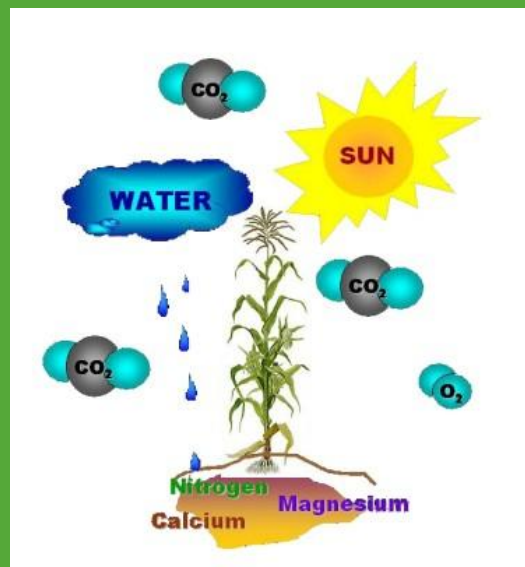
- Interference with growth of desirable plants
- Persistence
- Capacity to occupy sites disturbed by human activities
- Injurious and/or destructive



# Interference

Interference is the total impact one plant has another

- **Competition for light, water, and nutrients**
  - Can emerge before other desirable plants do, so tap into critical resources
  - Rapid population establishment



# Interference

- **Growth Form and Growth Habit**
  - **Extent of root development, height, leaf area, amount of branching**
    - Shading
    - Low-growing, rapidly spreading
  - **Plant growth rates**



# Interference

## ■ Weed Density

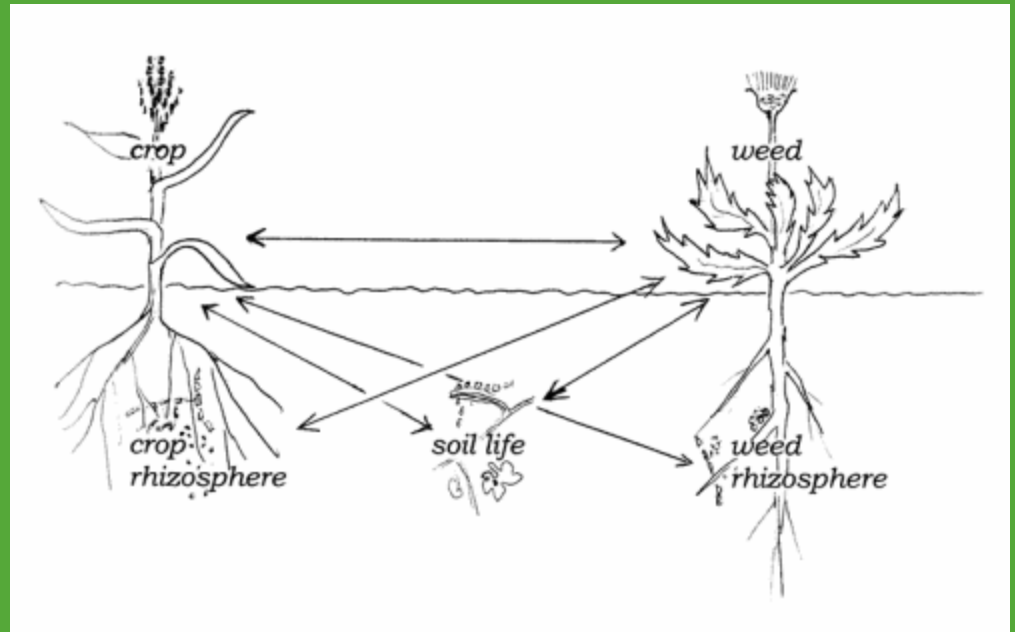
- Capacity of weeds to proliferate in large numbers quickly reduces desirable plant's ability to take up resources
- Huge effect of weed pressure on desirable plants





# Interference

- **Allelopathy**
  - Eliminating competition by producing toxins that adversely affect other plants



# Defining Characteristics

- Interference with growth of desirable plants
- Persistence
- Capacity to occupy sites disturbed by human activities
- Injurious and/or destructive



# Persistence

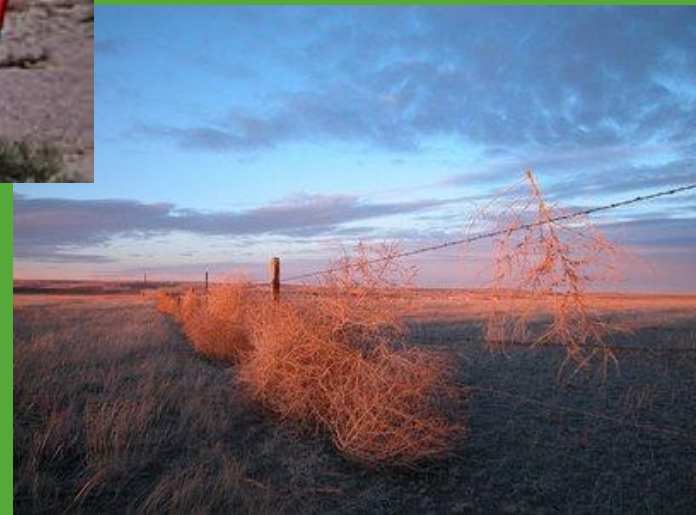
- Ability to produce numerous, long-lived, and easily transportable seeds, as well as utilizing adaptations for spread

- **Seed-Related Characteristics** →

Production of large number of seeds

Weed	Approximate Number Seeds per Plant
Yellow nutsedge	2,400
Giant foxtail	10,000
Jimsonweed	23,400
Common lambsquarters	72,000
<b>Redroot pigweed</b>	<b>117,000</b>
Black nightshade	178,000
<b>Russian thistle</b>	<b>200,000</b>

# Persistence



# Persistence

- **Seed-Related Characteristics**
  - Production of viable seeds under adverse conditions



# Persistence

- **Long- term seed survival (Seed dormancy)**
  - Ability to remain viable indefinitely

Weed	Years Longevity buried in Soil
Common milkweed	3
Shattercane	10
Common cocklebur	16
Foxtail	20
<b>Field bindweed</b>	<b>20+</b>
<b>Johnsongrass</b>	<b>20</b>
Canada thistle	21
<b>Jimsonweed</b>	<b>40</b>
<b>Redroot pigweed</b>	<b>40</b>



**Johnsongrass- 20y**



**Jimsonweed- 40y**



**Canada thistle- 21y**



# Persistence

- Adaptation for short distance and long distance



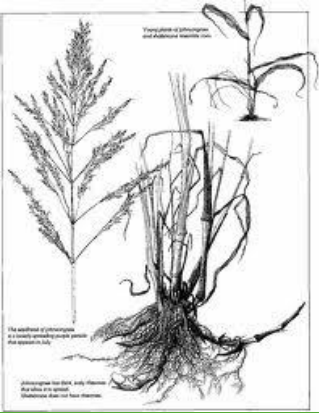


# Persistence

- **Alternative adaptations for spread through presence of vegetative reproductive structures**
  - Serves as major food storage organs, as well as buds capable of generating new plants
  - Provides another structure of overwintering in addition to seeds
  - Allows another means for propagation besides seeds
  - Allows extension to new sites for water and nutrients
  - Allows quicker growth than plants developing from seeds
  - Mechanism for survival even if parent plant is destroyed

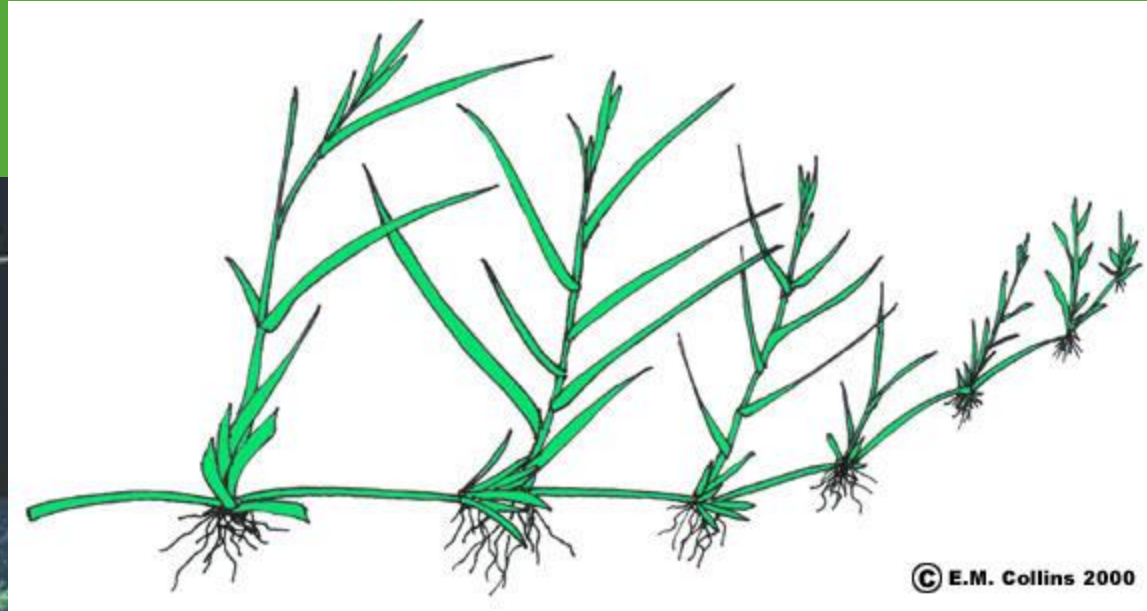
# Persistence

## Johnsongrass



# Persistence

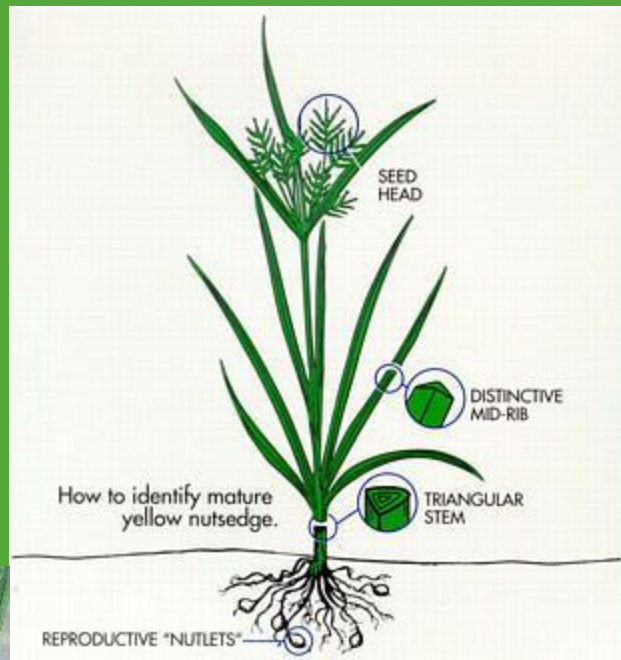
## Bermudagrass



# Persistence

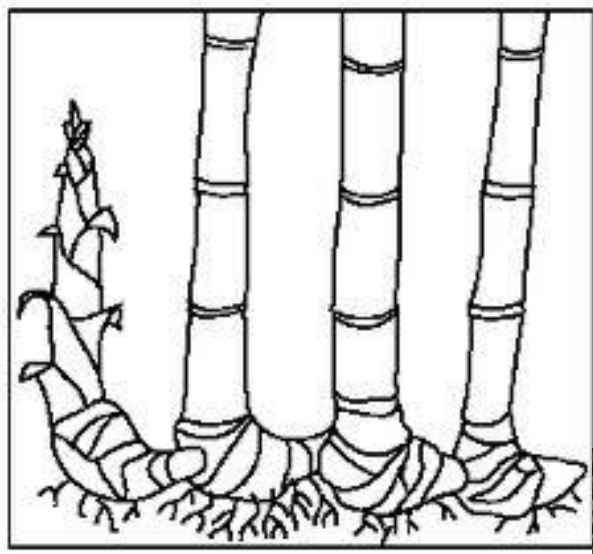
## Nutsedge

**YNS & PNS-**  
**Two of the**  
**world's worst**  
**weeds!!!**



# Persistence

## Bamboo



# Defining Characteristics

- Interference with growth of desirable plants
- Persistence
- Capacity to occupy sites disturbed by human activities
- Injurious and/or destructive



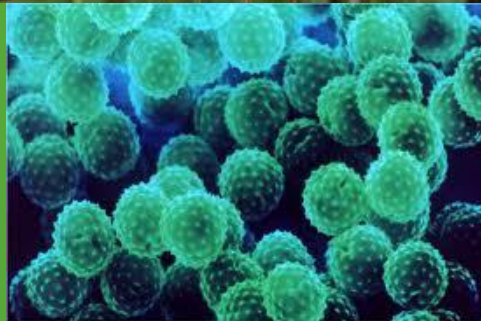
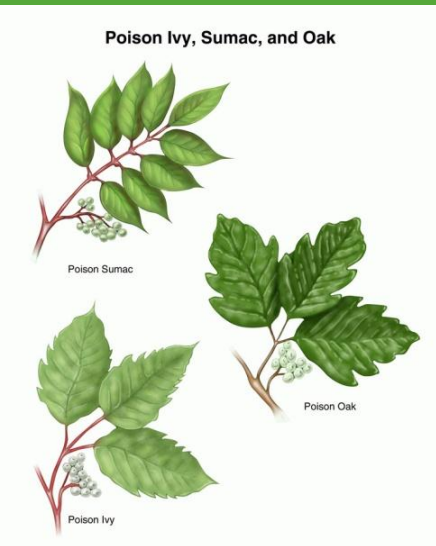
# Defining Characteristics

- **Capacity to occupy sites disturbed by human activities**
  - All the things already described make weeds well suited and more competitive to establish in sites where non-weedy species cannot do so



# Defining Characteristics

- Interference with growth of desirable plants
- Persistence
- Capacity to occupy sites disturbed by human activities
- **Can be injurious and/or destructive**

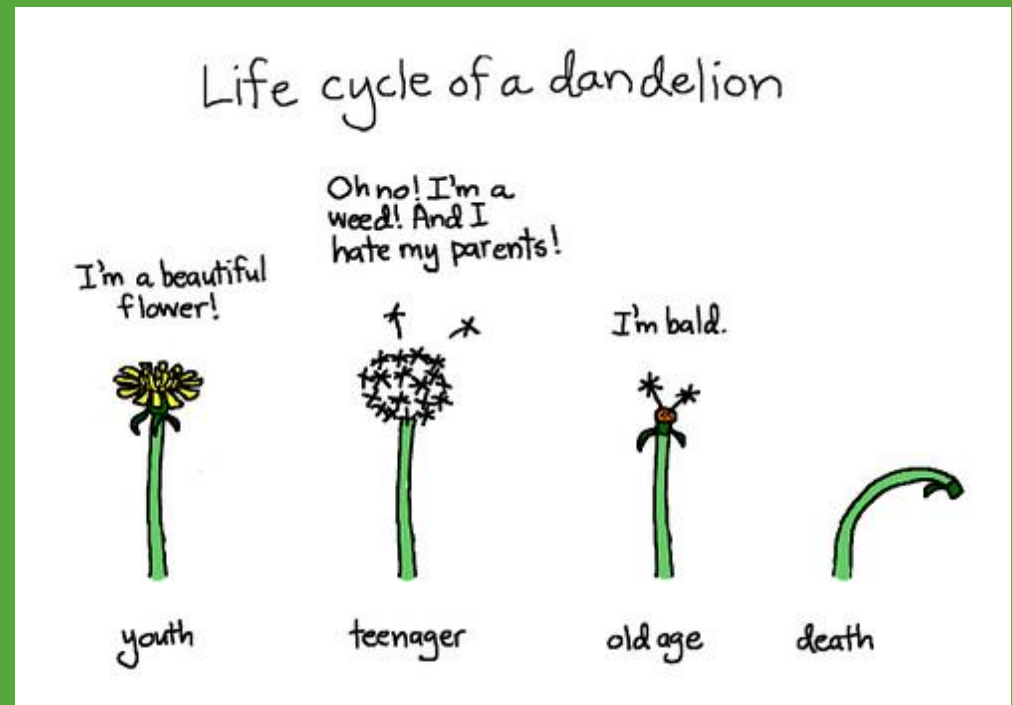




# What makes a weed a weed?

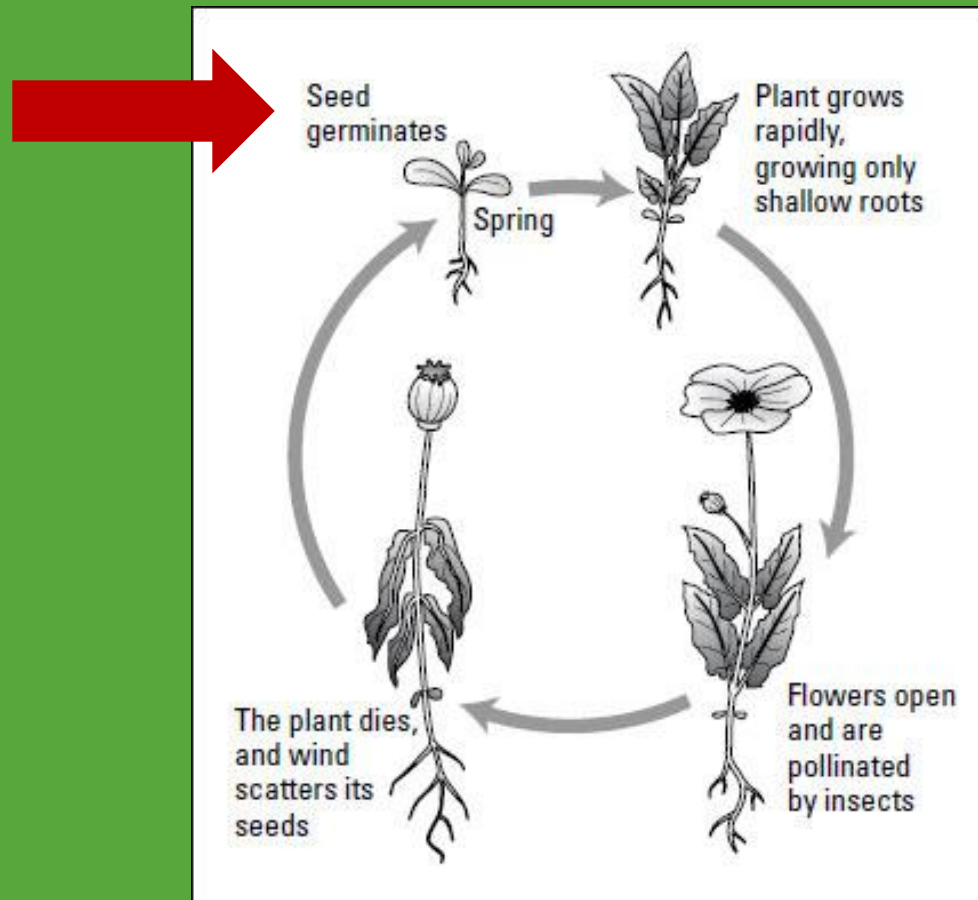
- **Defining Biological Characteristics**
  - Interference
  - Persistence
  - Capacity
  - Destructive/Injurious to animals and crops

- **Weed Life Cycles and Plant Anatomy**



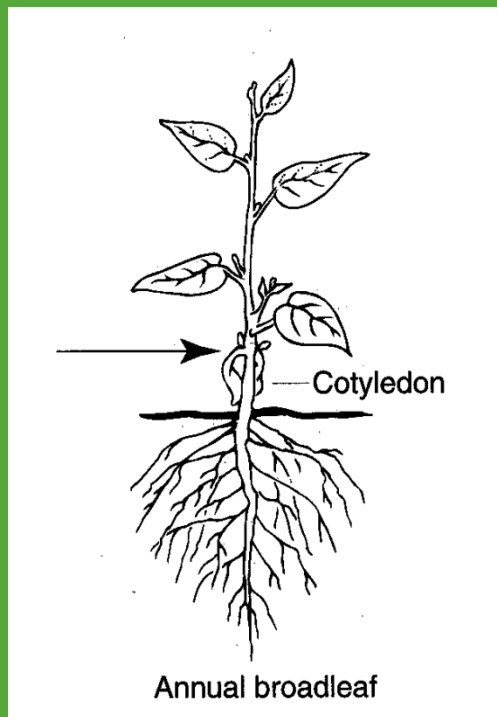
# Annual Life Cycle

- **Herbaceous Plants** (non-woody aerial stems)
  - Annuals (one growing season)

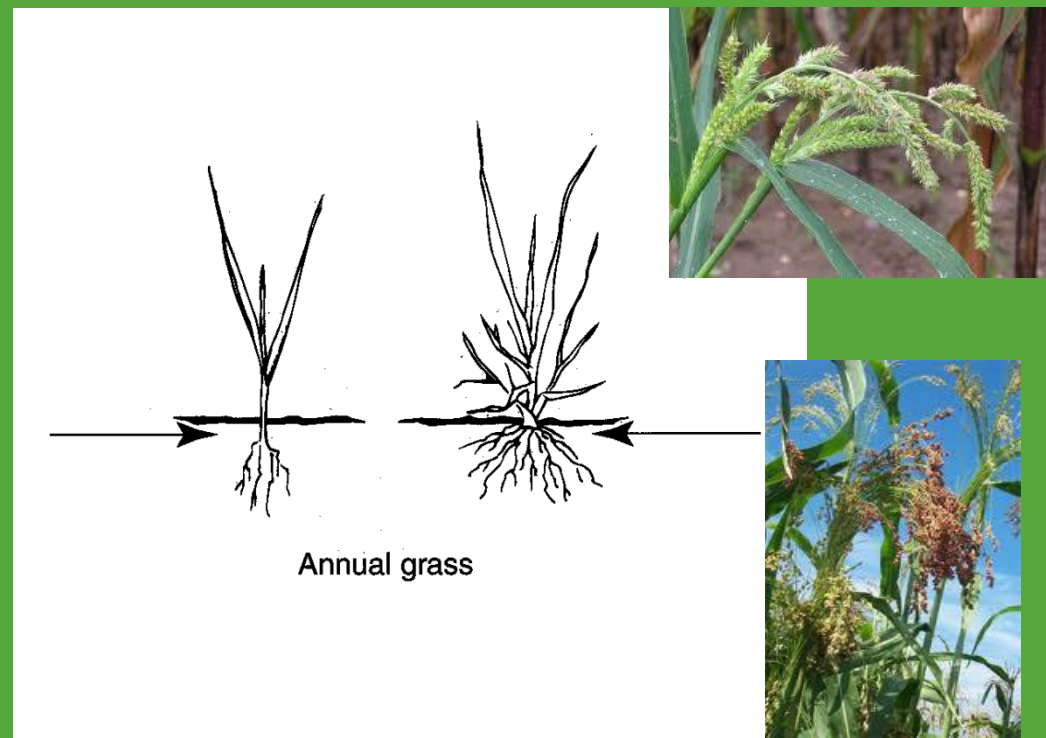


# Annual Life Cycle

- **Herbaceous Plants** (non-woody aerial stems)
  - Annuals



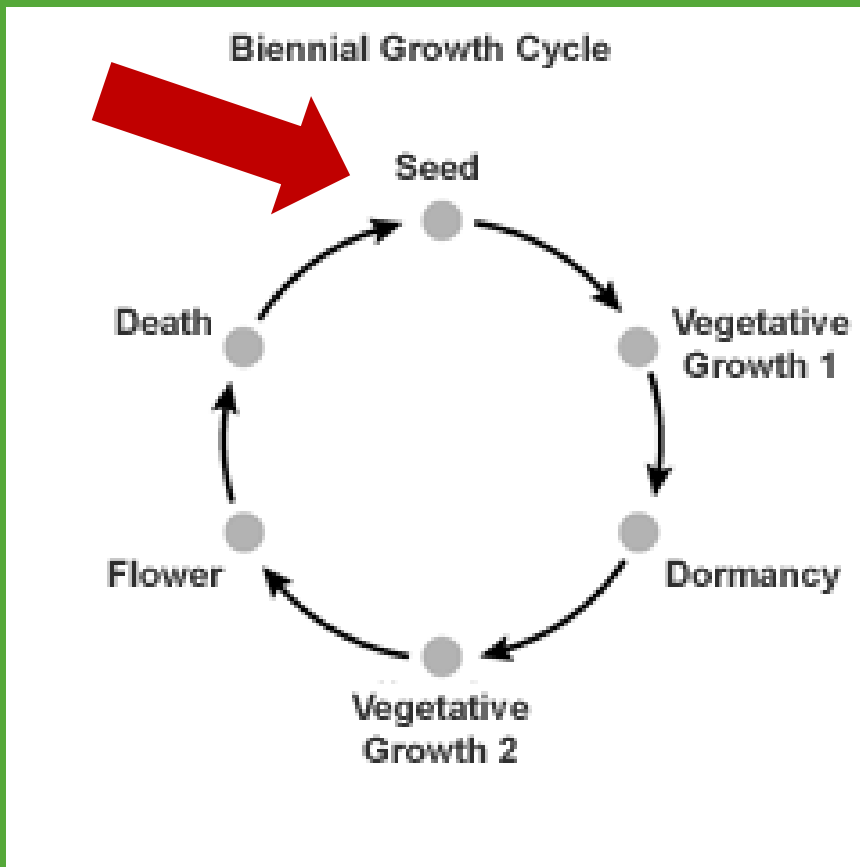
Pigweeds, Jimsonweed,  
Ragweed, Morningglories



Foxtail, Crabgrass, Barnyardgrass,  
Shattercane, Fall panicum

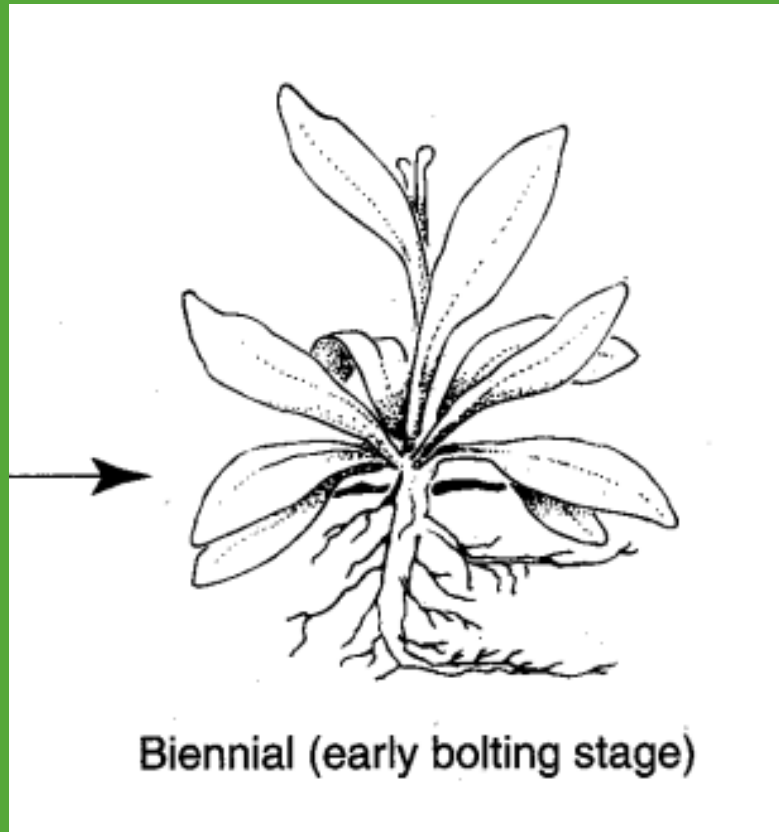
# Biennial Life Cycle

- **Herbaceous Plants** (non-woody aerial stems)
  - Biennials (require two growing seasons)



# Biennial Life Cycle

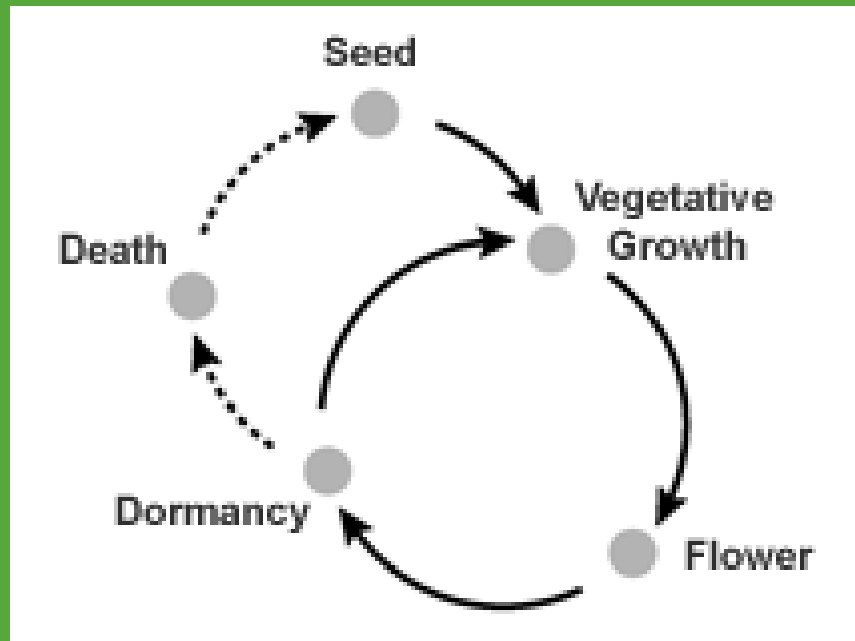
- **Herbaceous Plants** (non-woody aerial stems)
  - Biennials



Common mullein, Musk thistle,  
Wild carrot, Wild parsnip

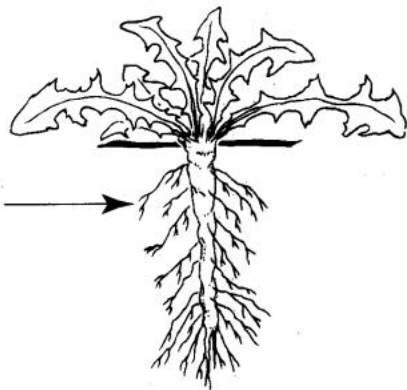
# Perennial Life Cycle

- **Herbaceous Plants** (non-woody aerial stems)
  - Perennials (live indefinitely)

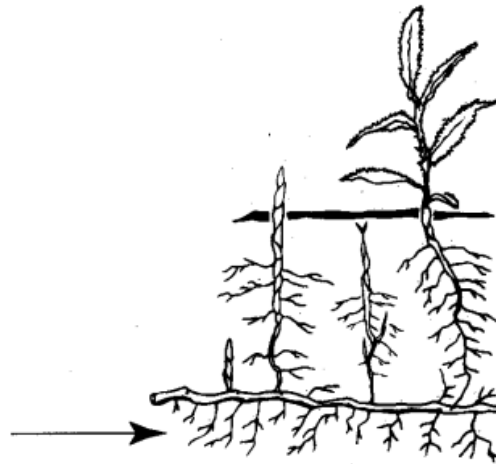


# Perennial Life Cycle

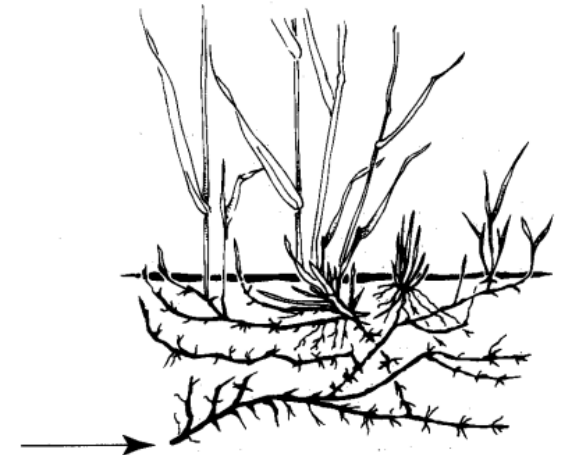
- **Herbaceous Plants** (non-woody aerial stems)
  - Two types perennials
    - Simple (reproduce by seed & seed dispersal)
    - Creeping (reproduce by both seed and vegetative structures) *[More in the next few slides...]*



Simple perennial



Creeping perennial  
(broadleaf with creeping roots)



Creeping perennial  
(a rhizomatous grass)

Dandelion, Plantain,  
Pokeweed, Chickory

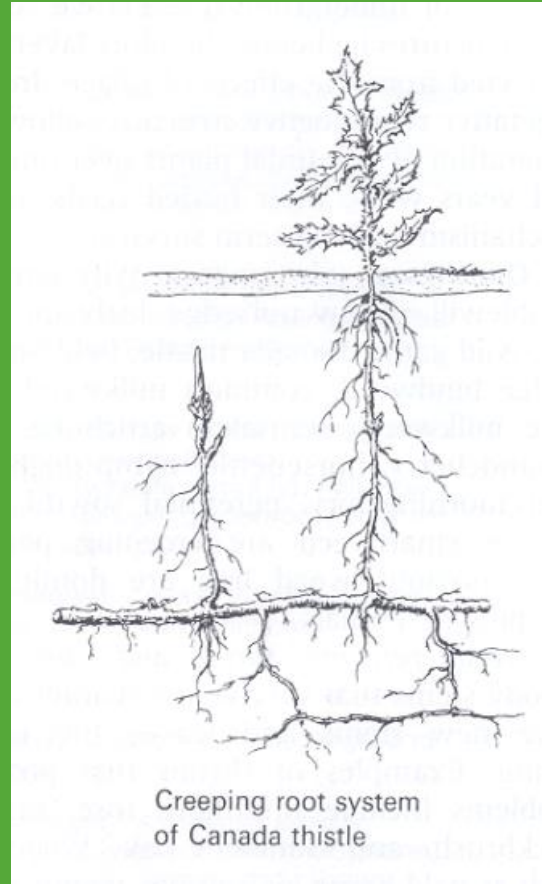
# Perennial Life Cycle

- **Creeping Perennials**

- Creeping root systems (Canada thistle, kudzu)
- Bulbs (Wild garlic)



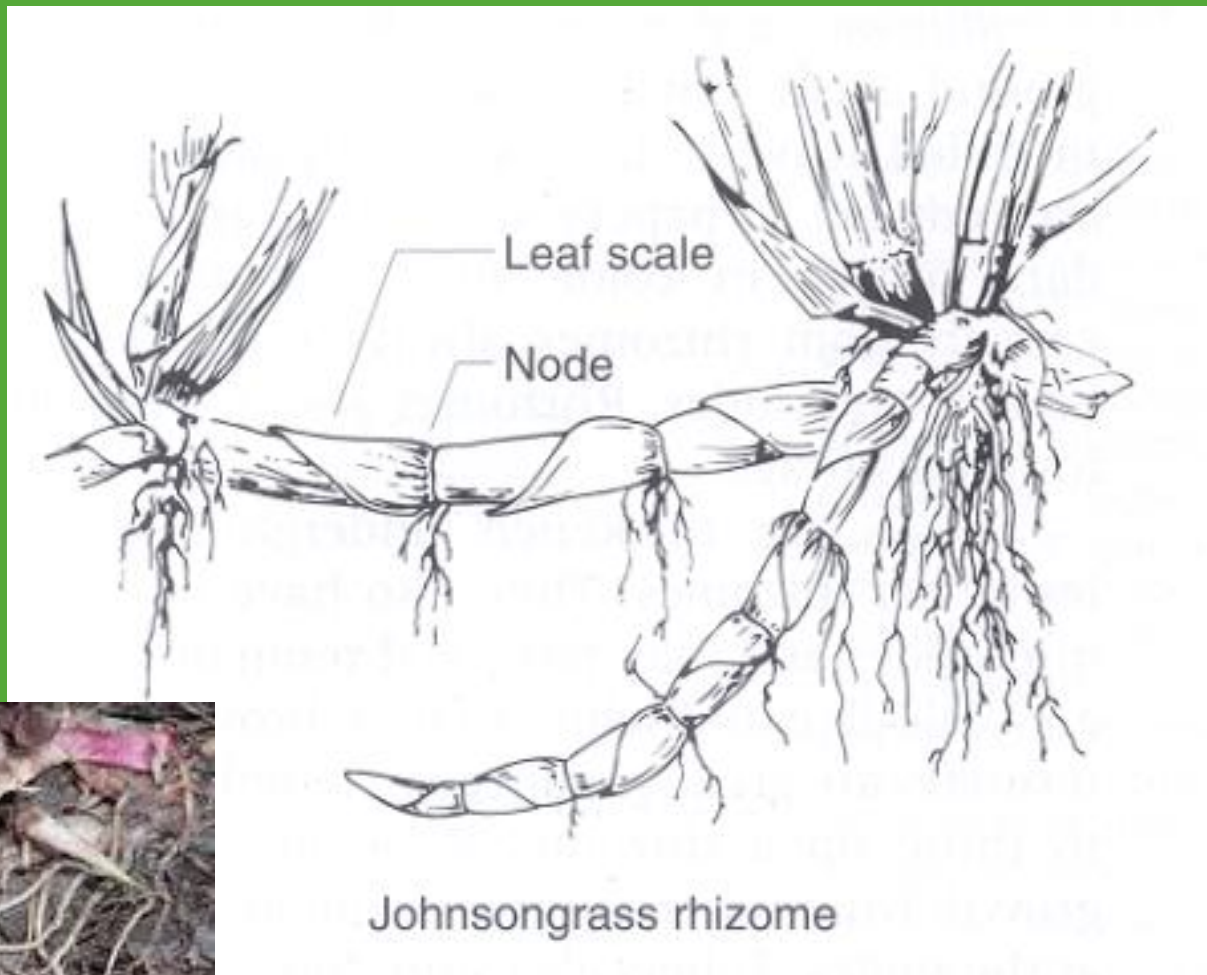
Wild garlic bulb





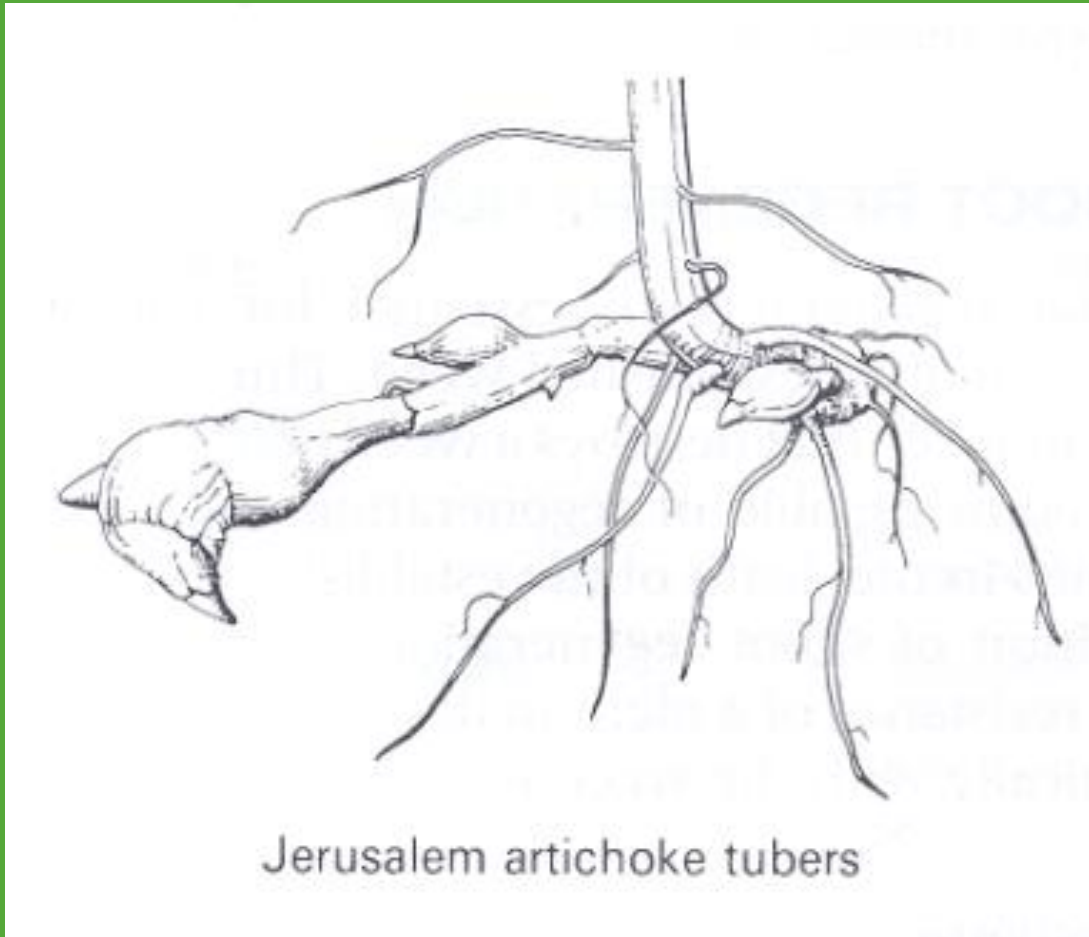
# Perennial Life Cycle

- **Creeping Perennial Structures**
  - Rhizomes (Johnsongrass)



# Perennial Life Cycle

- **Creeping Perennials**
  - Tubers (nutsedge)



# Perennial Life Cycle

- **Creeping Perennial Structures**
  - Stolons (Bermudagrass)



# Perennial Life Cycle

- **Woody Plants** (woody aerial stems)
  - Trees (perennials w/ single main stem/trunk)
  - Shrubs (perennials w/ more than one principal stem)



**Tree of heaven**

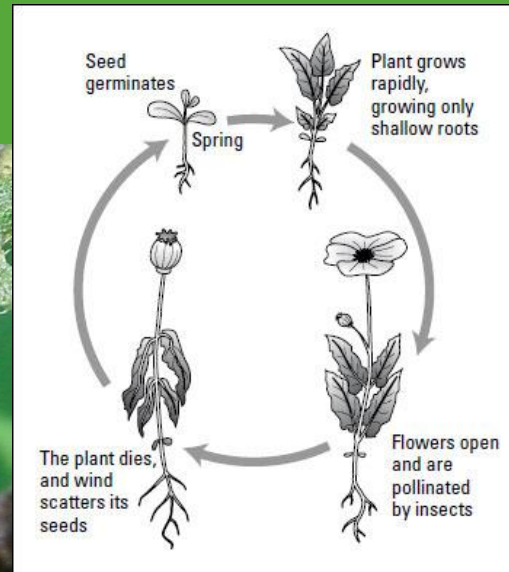
**Multiflora rose**



**Japanese honeysuckle**

# **Brief Look at Weed Control Strategies & Techniques**

**To find effective weed control,  
you must take biological,  
morphological, and life cycle  
characteristics into account!!**



# STEPS

- **Proper Weed Identification**

- *Weeds of the Northeast*
- VT Weed Identification website

<http://www.ppws.vt.edu/weedindex.htm>

- **Determine Biological and Morphological Characteristics and their influence on resistance to control methods**

- Plant life cycle
- Seasonality → Spring annual or summer annual?
- Growth habit?
- Does weed spread by seed? Vegetative structures? Both?
- Optimal times to use control methods → rosette stage, before seeding, active growth time, any time?

# Weed Control Strategies & Techniques

- **Use this knowledge base to strategize best course of action**
- **Cultural Methods**
  - **Weed Suppression**
    - Fast growing crop plants and close plant spacing
  - **Timely Rotations**
  - **High-seeded Cover crops**
    - Over winter (hairy vetch, rye w/ oats)
    - Pre-season full bed technique (to smother weeds)
    - Summer (buckwheat)
  - **Physical Barriers to prevent weed germination**
    - Thick mulches in pathways and common areas
      - Organic mulches like straw, wood bark/chips, newspaper
      - Landscape fabric (breathes), plastic (does not breathe)



# Weed Control Strategies & Techniques

## ■ Mechanical Methods

- Rapid removal of emerging weed seedlings
- TIMELY cultivating and hoeing to remove weeds (check out Johnny's Seeds) <http://www.johnnyseeds.com>
- Hand weeding
- Flame weeders



**Remember weeds w/ creeping root systems may be exacerbated by chopping and breaking them up!**

## ■ Chemical Methods

- Herbicides (refer to *Home and Grounds PMG* for control recommendations)

***Girdled with this  
knowledge, you will never  
look at weeds  
the same way!!!***

