What is a weed?
- A plant out of place
- Any plant that is objectionable or interferes with the activities or welfare of man (WSSA)
  - Often objectionable because they interfere

Developing weed management strategy
- Determine the specific objectives of your area
- Identifying weed and desirable plant species
- Management
  - Knowledge of tools available to you
  - Keep the weeds ‘off balance’
- Evaluation of control methods
  - Impacts
  - Success
  - Integrated Weed Management

Weed Management Tools
- How do I achieve successful control?
  - Early bird catches the worm...or in this case, the weed!
    - The younger the plant the ‘easier’ the control
    - Young plants haven’t developed structures that make weed development and growth successful
      - Seed development
    - Develop weed management strategy

Integrated weed management (IWM)
- Multiple control options available
  - No single weed control option will be successful!
- Combinations of good management practices are required for effective control
  - Mechanical + cultural + herbicides
- Strategies should be specific to target weed
  - Accurate identification

Weed Management Tools
- How do I manage weeds?
  - Prevention
    - Plant certified seed, clean equipment, weed control prior to seed production
  - Mechanical/Physical
    - Tillage, hoeing, hand pulling, mowing, mulching, weed blankets, etc.
  - Cultural
    - Reduce weeds by managing desired plants
      - Irrigation, fertilization, mowing (benefit of lawn), planting timing
    - Biological
      - Insects or fungi that work negatively on weed
  - Chemical
    - The label is LAW!
    - Effective means of control when used according to the label
      - Resistance
      - Offsite damage
**Things to consider with Herbicides**

- Chemicals used to kill or suppress unwanted vegetation
  - Can be synthetic or organic
- Primary method of weed control in multiple cropping systems
  - Inexpensive (can help reduce production costs)
  - Greater flexibility in timing of weed control
  - Results are often quick and may offer extended control
- Helpful tool
  - Herbicides alone will not eradicate weeds
- Success is always dependent on...
  - Applications in accordance with the label
  - Weed identification

**Timing of application**

- Preemergence (PRE)
  - Applied before the weed emerges from soil
  - Can be applied either before or after desired crop
  - Read the label
  - Requires incorporation into the soil
    - Irrigation, shallow tillage
- Postemergence (POST)
  - Applied after weeds have emerged
  - Allow to dry, no soil incorporation

**Preemergence herbicides (PRE)**

PRE herbicides do not prevent the weed seed from germinating, they control weeds as they grow through the herbicide treated zone.

**Postemergence (POST) weed control**

- Treat only areas infested with weeds
  - POST – IWM approach
  - PRE – blanket application

- Used to control weeds that have already germinated
  - At this point most PRE herbicides are useless

**Other PRE options**

*pendimethalin (Pendulum Aquacap) is a broad spectrum PRE active ingredient

**Postemergence (POST) weed control**

- Sprays give better control than granules
- Avoid extreme temperatures. Apply when temperatures are between 40 and 85°F and sunny
- Typically need a rain free period of at least 6 hours
- Do not apply to stressed desirable plants
  - Also stressed weeds
- Check the label for instructions on replanting/reseeding application areas
- Multiple active ingredients available for use
  - Dependent on cropping system, site objectives, and accurate weed identification
Other POST options

Weed Control for the Garden and Landscape Extension Publication
Purdue University

**Organic Weed Control**

- Early detection (scouting)
- Dense vegetation, mulching, etc.
- Mechanical/physical removal
- Soil solarization
- Weed seed germination

---

**Organic Herbicides**

- Generally fall under 7 product categories
  - Natural acids
    - Vinegar (acetic acid), citric acids
  - Phytotoxic oils
    - d-limonene, clove oil, rosemary oil
  - Corn gluten meal
    - Preemergent
  - Herbicidal soaps
    - Pelargonic acids, ammoniated soap of fatty acids
  - Salt-based herbicides
    - Potassium or ammonium salts of fatty acids (aka soap salts)
  - Iron-based herbicides
    - Iron HEDTA
  - Combination products

---

**Organic Herbicides**

- Things to consider
  - You are still applying a herbicide
    - Must have a viable label with directions for safe and effective application
  - Generally considered to be contact herbicides
    - Injure the plant by burning plant cuticle or disrupting cell walls (plants lose too much water and die)
    - Chelated iron products are taken up by the plant
  - Non-selective
  - Not as effective as synthetic counterparts
    - Important to target young weeds
    - Must be combined with other IPM practices
  - Expensive
**Why identify?**

- Annuals vs. Perennials
  - Pre vs. Post control options vary
- Variation in response to management
  - Select the right tool for success
- Life cycle, flowering, seed production
  - Timing of management is essential

**Why are weeds successful?**

- Rapid colonization of disturbed areas
- Very rapid growth
- Self compatible
- Very high seed production
- Seed dormancy
- Vegetative reproductive structures
- Seed dispersal mechanisms

**Vegetative Reproductive Structures**

- Bulbs/tubers
- Tillers
- Creeping stems
  - Rhizomes
  - Stolons

**Broadleaf identification:**

- Key structures on a broadleaf weed
  - Node
  - Internode
  - Leaf stems
    - Petiole
    - Sessile
  - Leaf features
    - Shape
    - Veins
    - Edges (margin)

**Grass identification: Vernation**

- Folded
- Rolled

[Images of broadleaf and grass identification structures]
Grass identification: Ligule

- Collar
  - Found at junction between leaf blade and stem sheath
  - Essential ID characteristic
    - Absence of seedhead
  - Ligule (found at the back of the collar)
    - Membranous
    - Hairy
    - Absent

Zoysiagrass
Barnyardgrass
Cheatgrass

Weed ID is essential for effective management

Weeds are categorized into one of four lifecycles

1. **Summer annuals**
   - Summer annuals germinate in the spring when soil temperatures reach about 55-65°F, flower in the summer and die in the fall at first frost

2. **Winter annuals**
   - Winter annuals germinate in the fall (55-65°F), grow until spring and die during late spring or early summer

3. **Biennials**
   - Life cycle lasts two years. Few examples

4. **Perennials**
   - Perennial weeds are capable of living more than two years

Optimum control timings depends on weed lifecycle

- **Winter annuals**
  - Sept. – Nov. optimum control window
  - Should I apply a herbicide in the spring?
- **Summer annuals**
  - When at seedling stage (May-June)
- **Biennials**
  - When in first growing season (rosette stage)
    - Only reproduces by seed
- **Perennials**
  - Fall management works best!
  - Late Sept. through mid-Nov. is best
    - Depending on temperatures
  - Second best timing is mid-March through May

Annual weed management

- Prevent seeds from entering/forming
- Easier to manage weeds when they are young
- Competition from desirables can be VERY EFFECTIVE
  - Limit the amount of open space for germinating weeds
    - Turf, xeriscapes, garden mulch, etc.
- Wide range of tools available for management

Perennial weed management

- Prevent establishment
  - Seeds from forming
  - Continually reduce stored energy in perennial vegetative structures
    - Ex: digging up taproots
- **EARLY DETECTION AND RAPID RESPONSE!!**
- Thorough understanding of biology
  - Optimize management methods
- IWM is essential for adequate management
- Long-term management required if population is allowed to establish
Summer annuals include:

- Puncture vine
- Prostrate spurge

Puncture vine (Tribulus terrestris)

- Identifying features:
  - Prostrate, mat-forming growth habit
  - Leaves pinnately divided into 4-8 pairs of leaflets per stem
  - Leaves and stems are covered in hairs
  - Leaf stems arranged in a zig-zag pattern on main stem
  - Stems can be brown or reddish in color
  - Yellow, butter-cup like flowers
  - Produces strong, tack-like fruits (goatheads)
  - Leaves toxic to livestock

Prostrate spurge (Euphorbia maculate)

- Identifying features:
  - Mat-forming
  - Oval-shaped leaves
  - Opposite orientation on stem
  - Maroon splotch on upper surface
  - Stem exudes milky sap when broken
  - Small cluster of flowers
  - Produces viable seed within weeks of germination

Winter annuals include:

- Cheatgrass
- London rocket

London Rocket (Sisymbrium irio)

- Winter annual:
  - Young plants are a basal rosette
  - Smooth, spear-shaped leaves that are deeply lobed
  - Mature leaves can be spade-shaped
  - Upright flowering stems develop at maturity
  - Small clusters of pale yellow flowers
  - Fruits are long, thin tubular seed pods

Cheatgrass (Bromus teechtorum)

- Identifying features:
  - Aka: downy brome
  - All leaves and stems covered in soft, dense hair
  - Papery thin, ragged edged ligule
  - Inflorescence is dense, slender, and usually drooping
  - Can produce 300 seed per plant or more
  - Seed has awns that can be 3/8 to 5/8” long
  - Awns can turn purplish at maturity

- Identifying features:
  - Prostrate, mat-forming growth habit
  - Leaves pinnately divided into 4-8 pairs of leaflets per stem
  - Leaves and stems are covered in hairs
  - Leaf stems arranged in a zig-zag pattern on main stem
  - Stems can be brown or reddish in color
  - Yellow, butter-cup like flowers
  - Produces strong, tack-like fruits (goatheads)
  - Leaves toxic to livestock

Winter annuals include:

- Cheatgrass
- London rocket

London Rocket (Sisymbrium irio)

- Winter annual:
  - Young plants are a basal rosette
  - Smooth, spear-shaped leaves that are deeply lobed
  - Mature leaves can be spade-shaped
  - Upright flowering stems develop at maturity
  - Small clusters of pale yellow flowers
  - Fruits are long, thin tubular seed pods

Cheatgrass (Bromus teechtorum)

- Identifying features:
  - Aka: downy brome
  - All leaves and stems covered in soft, dense hair
  - Papery thin, ragged edged ligule
  - Inflorescence is dense, slender, and usually drooping
  - Can produce 300 seed per plant or more
  - Seed has awns that can be 3/8 to 5/8” long
  - Awns can turn purplish at maturity
Perennial weeds include:

- Dandelion
- Field bindweed

**Dandelion (Taraxacum officinale)**

- Identifying features:
  - Deeply toothed leaf margins
  - Older teeth point towards leaf base
  - Milky sap
  - Long, fleshy taproot
  - Bright yellow flowers on long stalks
  - White puff-ball seedhead

**Field bindweed (Convolvulus arvensis)**

- Identifying features:
  - Slender climbing viney growth
  - Spreads by rhizomes
  - Smooth stems grow along ground or climb vegetation/objects
  - Arrow-head shaped leaves
  - Funnel shaped flowers (white to pink)

Don’t be afraid to ask for help

The moral of the story:
In a world full of pansies, be a Dandelion!!!