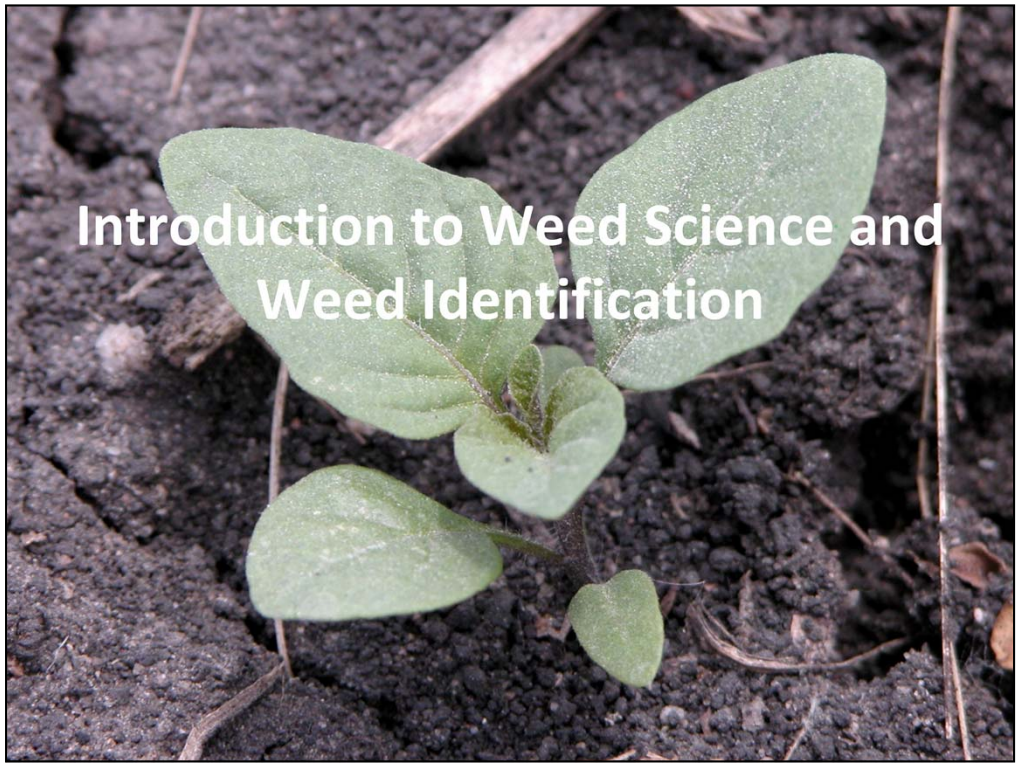


This presentation provides an introduction to weed science and weed identification.

Definition of a Weed

- A plant growing where it is not wanted (*Oxford Dictionary*)
- Any plant or vegetation, excluding fungi, interfering with the objectives or requirements of people (*European Weed Science Society*)
- A plant that is especially successful at colonizing and proliferating in disturbed sites

There are many different definitions of a weed. The same plant can be considered a weed in one setting and beneficial in another. Weed is a subjective term.

A simple definition is “a plant out of place.” A few others are listed here…..

[*Images from left: scouringrush* (page 20, Weed ID Guide) *in a soybean field as a weed and also as an ornamental in a planter outside of a shop*]

First Steps in Weed Management

- To effectively manage weeds you should know:
  - What weed you are dealing with – correct identification
  - Consider impact of the weed
  - Life cycle of the weed
- Weed biology influences methods and optimum time for management strategies

In order to manage weeds you will need to correctly identify the weed, consider the impact of the weed, and also know the life cycle. Many weed management techniques exploit the life cycles of weeds and use weed biology characteristics in the development of control strategies.

Weed Classification

- Morphology
  - Structure and form
- Life cycle
  - How it develops

Weeds may be classified by their structure and form such as grass species, sedges, or broadleaf weeds. Weeds are further characterized by their life cycles and how they develop and reproduce.

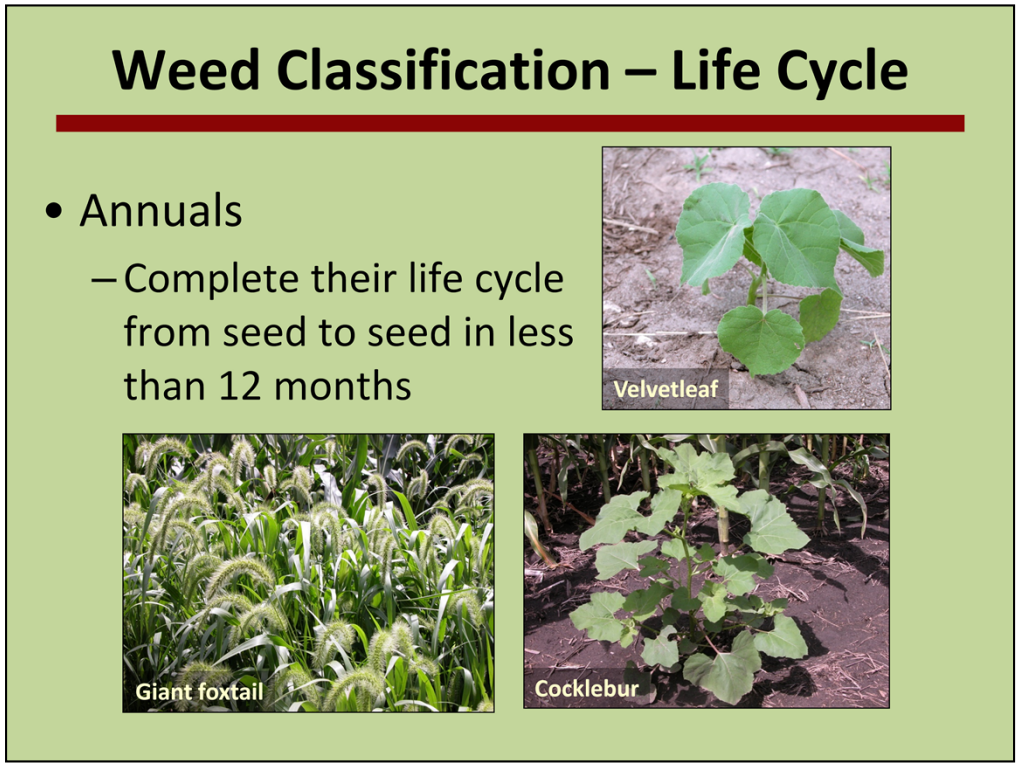
Yellow foxtail (page 34, Weed ID Guide), *yellow nutsedge* (page 18), *and ground ivy* (page 96)

Weed Classification – Morphology

- Monocotyledon – one cotyledon or one embryonic leaf
  - Grasses, sedges, rushes

- Dicotyledon - two cotyledons
  - "Broadleaf" plants

Monocotyledon weeds, or "monocots," have one cotyledon or first, embryonic leaf. Grasses, sedges, and rushes are examples of monocots. Dicotyledons, or "dicots," refers to two cotyledons (the first leaves that emerge from the soil). Broadleaf plants are often referred to as dicots.



Weeds typically fall into one of three life cycle classifications: annuals, biennials, or perennials. Some weeds may be classified into more than one life cycle. Weeds are usually best adapted to survive in a crop with a similar life cycle, germination time, or growth habit. The most effective control methods often are based on the life cycle of a weed.

Annuals are plants that grow and complete their life cycle in one year.

Velvetleaf (page 78, Weed ID Guide)*, cocklebur* (page 58)*, and giant foxtail* (page 33)

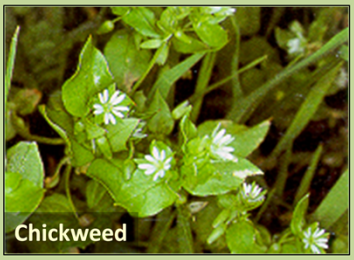
Summer Annuals

- Seeds germinate in spring
- Flower in mid to late summer
- Produce seed in late summer or fall, then die
- Similar growing season to corn and soybean
- E.g., lambsquarters, foxtails, crabgrass, purslane, waterhemp

Within the annual classification there are summer annuals that germinate in the spring, flower in summer, produce seed in late summer or fall, and then die. Summer annuals have a similar growing season to corn and soybean. They are the most common type of weed in annually tilled fields. Examples of a few common summer annual weeds include: common lambsquarters (page 67, Weed ID Guide), foxtail (pages 33-35), crabgrass (page 23), purslane, and common waterhemp (page 41).

Winter Annuals

- Germinate in late summer or fall
- Dormant over winter
- Flower and produce seed in mid to late spring
- Die in summer
- E.g., shepherd's purse, chickweed, pennycress, speedwells



Another type of annual weeds are the winter annuals. Winter annuals germinate in late summer or fall. They are dormant over the winter, then resume growth in the spring, flower and produce seed in mid to late spring, and die in the summer. Winter annual weeds can pose problems in fall-seeded crops, early spring grains, pastures, and no-till fields. A few examples of winter annuals include: shepherd's purse (page 60, Weed ID Guide), chickweed (page 66), pennycress (page 63), and corn speedwell (page 89).

Biennials

- Complete life cycle in <u>two</u> years
- Germinate and form basal rosette first year, remain vegetative and store food for winter

Biennial weeds require two years to complete their life cycle and, like annual weeds, only reproduce by seeds. Seeds germinate in the spring or summer and produce root systems and rosettes of leaves the first year. Some biennial weeds can also behave as annuals, completing their life cycle in a single growing season.

Musk thistle (page 51, Weed ID Guide)*, wild parsnip* (page 44), *and wild carrot* (page 43)

Biennials

- Flower, produce seed, and die during second growing season
- Need undisturbed soil for at least two years
- E.g., musk thistle, wild carrot, wild parsnip, garlic mustard


Musk thistle


Wild carrot


Wild parsnip

The following spring, biennial stems bolt (elongate) and plants flower, produce seeds, and die. Biennial weeds are typically a problem in no-till fields, pastures, and other areas undisturbed for at least two years. Some examples of biennial weeds include: musk thistle (page 51, Weed ID Guide), wild carrot (page 43), wild parsnip (page 44), and garlic mustard.

Perennials (herbaceous)

- Live for more than two years
  - Simple: produce a taproot, spread only by seed
    - E.g., Dandelion, broadleaf plantain
  - Creeping: can reproduce by buds, rhizomes, tubers, bulbs, and seed
    - E.g., Quackgrass, nutsedge, leafy spurge

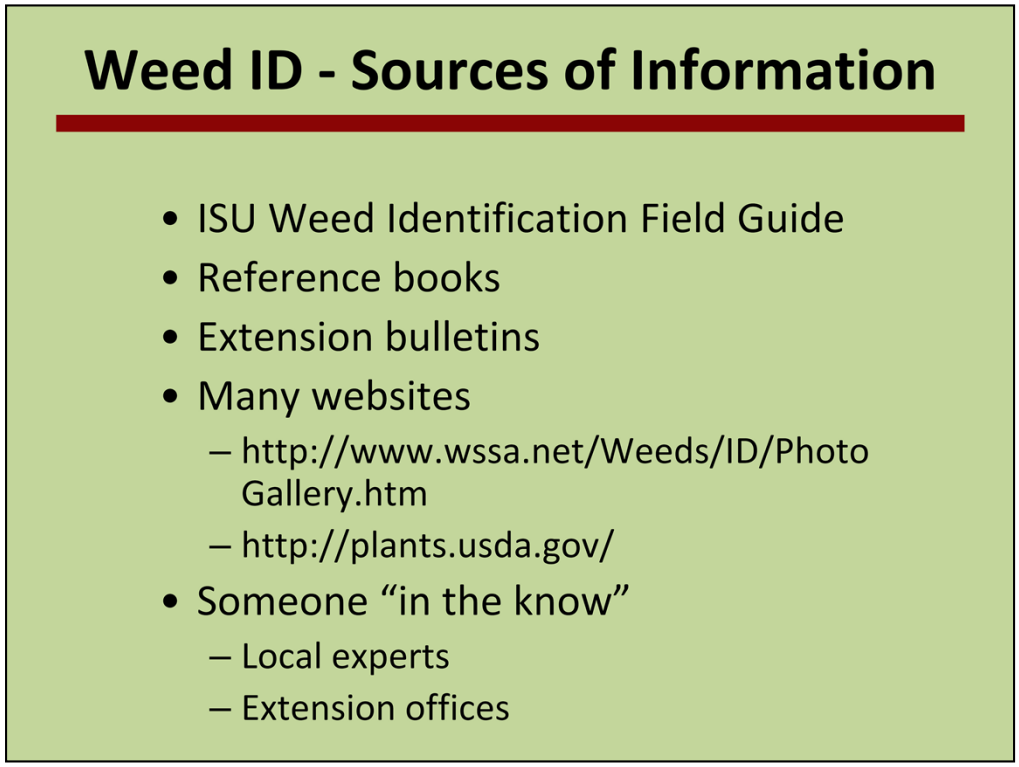
Perennial weeds live multiple years. Perennial plants may be classified as “herbaceous” or “woody.” Woody perennials typically have aboveground plant parts that can overwinter, whereas herbaceous perennials re-grow each season from underground overwintering structures. They reproduce vegetatively and/or by seeds. Perennials typically inhabit no-till fields, pastures, roadsides, and, occasionally, tilled fields. Most perennial weeds found in row crops regrow annually from underground overwintering structures.

Herbaceous perennials can be grouped into two classes, simple and creeping. Simple perennials usually have taproots and reproduce by seed. Creeping perennials can reproduce by seed and vegetatively by rhizomes, tubers, stolons, budding roots, and bulbs.

As tillage increases, incidence of perennials increases: Why?

Tillage breaks vegetative structures into pieces that can regenerate into new plants, potentially spreading the infestation within or between fields. Perennials may require either repeated efforts or a combination of management tactics to achieve adequate control.

Examples of simple perennials include dandelion (page 57, Weed ID Guide) and broadleaf plantain. Some creeping perennials include quackgrass (page 26, Weed ID Guide), yellow nutsedge (page 18), and Canada thistle (page 52).



For more information on weed identification consult one or more of the many resources available. Some sources include reference books and extension bulletins, and also there are several good sites on the internet. There are many websites that provide descriptions and photos of weed species that can help with identification.

What Makes a Weed Successful?

- Seed characteristics
- Ability to germinate and grow in many environments
- Rapid seedling growth
- Self-compatibility or easy cross-pollination
- Vigorous vegetative reproduction
- Ability to tolerate environmental stresses

Weeds seem to occur in an endless supply. Why are weeds so successful? A key reason is their different seed characteristics. We will discuss some of these seed characteristics in the following slides. Additional weed characteristics that allow them to grow and be competitive with desirable plant species include the ability to germinate and grow in many different environments, rapid seedling growth that allows them to be competitive quickly, ease of pollination, the ability to reproduce vegetatively, and the ability to tolerate adverse environmental conditions.

Prostrate spurge and Canada thistle (page 52, Weed ID Guide)

Seed Characteristics

- Longevity of seed
- Long period of seed production
- High seed output
- Ability to produce seed in adverse conditions
- Long and short seed dispersal

Often weed seeds can remain dormant in the soil for many years (the seeds of velvetleaf [page 78, Weed ID Guide] have been reported to remain viable for over 100 years). Then, when the right conditions occur, they germinate and grow. Some weedy species produce seed for an extended period of time, and many weed species can produce thousands of seeds on a single plant. Weeds can also find success by producing seeds even under adverse environmental conditions. And finally, weeds have developed various effective ways of spreading their seeds, with different species using different techniques to spread seeds either short or long distances.

Giant ragweed (page 49, Weed ID Guide) *and lambsquarters* (page 67)

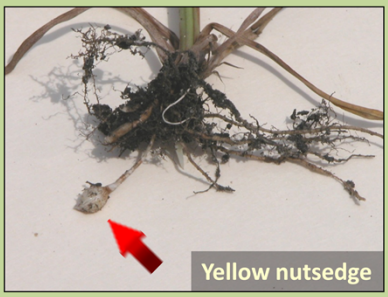
Vegetative Reproduction

- Rhizomes
  - Underground structures that produce new plants
    - E.g., canada thistle, quackgrass
- Stolons
  - Above-ground creeping stems that root at nodes and produce new plants
    - E.g., ground ivy (creeping charlie)

Weeds that can reproduce vegetatively have an advantage in areas that are not tilled regularly and often pose serious long-term problems. Rhizomes are underground stems that root at nodes and allow the plant to reproduce and spread vegetatively. Canada thistle (page 52, Weed ID Guide) and quackgrass (page 26) are two weed species that reproduce by growth of sturdy rhizomes. Stolons are aboveground creeping stems that can root at the nodes and produce new plants. Ground ivy (page 96, Weed ID Guide), also known as creeping charlie, is an example of a weed that reproduces effectively by stolons.

Vegetative Reproduction

- Bulbs, bulblets, tubers
  - Underground leaf tissue modified for food storage. Produces new plants
    - E.g., wild garlic, yellow nutsedge
  - Aerial bulblets (above ground)
    - E.g., wild onion, wild garlic



Some weed species reproduce vegetatively by bulbs, bulblets, or tubers. These are underground structures that are actually leaf or modified stem tissue where food (carbohydrates) is stored for later growth, overwintering, and production of new plants. Wild garlic and yellow nutsedge (page 18, Weed ID Guide) are examples of plants that have underground reproductive leaf tissue structures. Some plants also have aboveground bulblets that can produce new plants. Wild onion and wild garlic are two examples of weedy plants that produce aboveground bulblets.

Vegetative Reproduction

- Plant reproduction
  - Each plant part can regenerate another plant
  - When cultivating, the implement can redistribute them in the field
    - E.g., Asiatic dayflower, purslane


Asiatic dayflower


Purslane

Some weeds can produce new plants from parts broken off the original plant. Purslane and Asiatic dayflower (page 70, Weed ID Guide) are examples of plants that can regenerate another plant just from a section of the original plant. These species can often survive on the soil surface for several days without water, and will produce roots at the nodes to reestablish and reproduce.

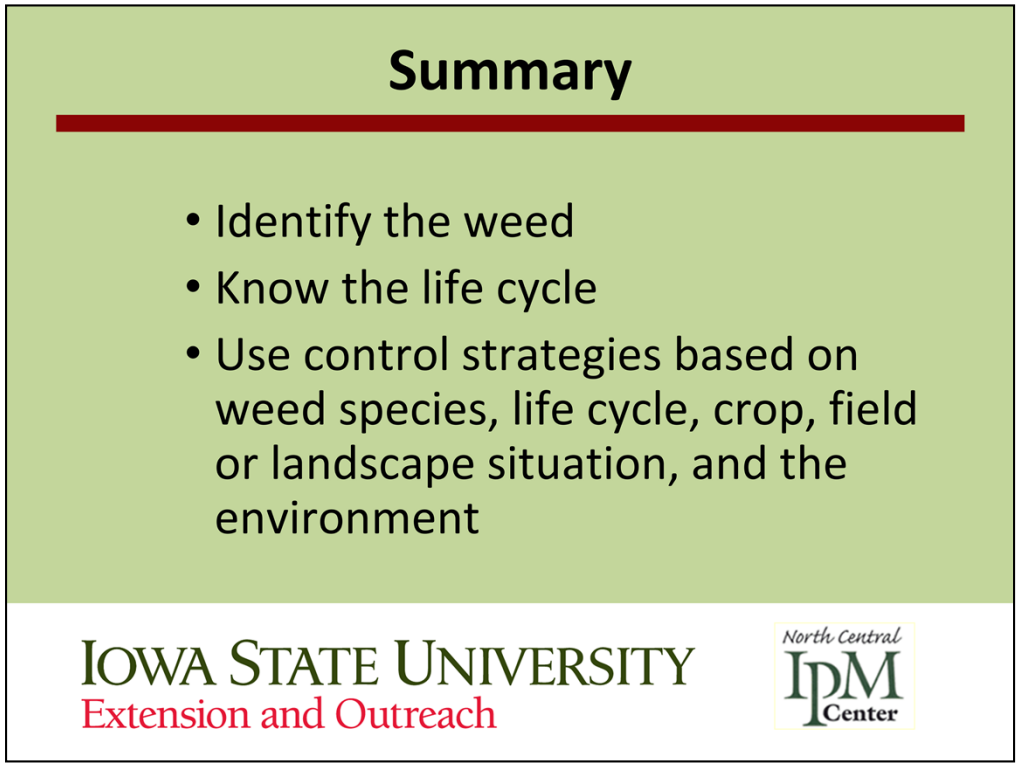
Dispersal

- Wind
- Attachment – burs, thorns, stickers
- Birds – digestion/excretion
- Artificial dispersal – "human dispersal"
  - Soil and compost
  - Equipment
  - Plants
  - Contaminated seed

A few methods of weed seed dispersal include: wind-blown seeds (dandelions [page 57, Weed ID Guide]), animals or humans moving burs (cockleburs [page 58] and burdock [page 50]), thorns or stickers transporting parts of plants to new locations (Canada thistle [page 52] and leafy spurge), and birds that ingest weed seeds and then excrete them in different places (Mulberries!!). Humans also do a lot to aid in weed dispersal by moving soil or compost, moving weed seeds or plant parts with tillage equipment, planting nonnative plants that become invasive weeds, and planting desirable plant seeds that are contaminated with weed seeds.

Different management strategies are necessary for different weed problems. Controlling Canada thistle (page 52, Weed ID Guide) in an evergreen shrub border will require a different approach than the other situations shown here - velvetleaf (page 78) control in field, poison ivy in a forest, or yellow nutsedge (page 18) in a lawn.

These different strategies are covered in the PowerPoint titled “Managing Weeds”.



In summary, it is important to correctly identify the weed species you target for control, understand their life cycles, and base your control strategies on all factors involved.

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