

Weed ID and Management

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Weed ID and Management

Outline:

- 1. Weed identification**
- 2. 5-minute break**
- 3. Weed management**
- 4. Brief case study**
- 5. Wrap-up**

What is a weed?

Any plant that you *don't* want

...but it's not always straightforward

Why bother?

Competition for:

Nutrients + Water

Space

Sunlight

Reservoir for pests + pathogens

Why ID necessary?

Friend/foe

Different control methods



Plant anatomy and biology

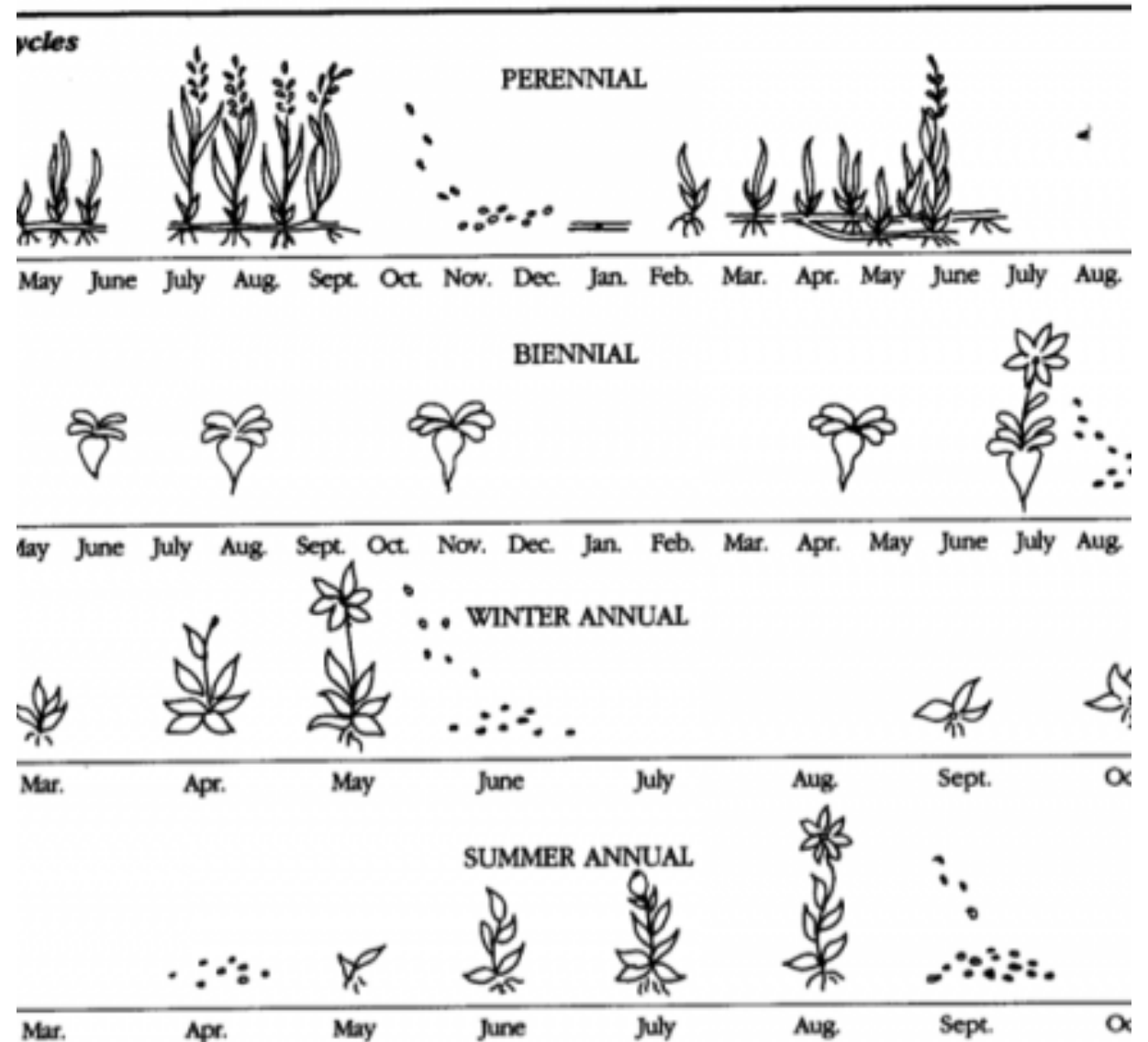
Weed biology:

Perennial

Biennial

Winter annual

Summer annual



Weed ID

By:
 Taxa (Family)
 Morphology and Habit (rosette, stolon/rhizome, etc)
 Season

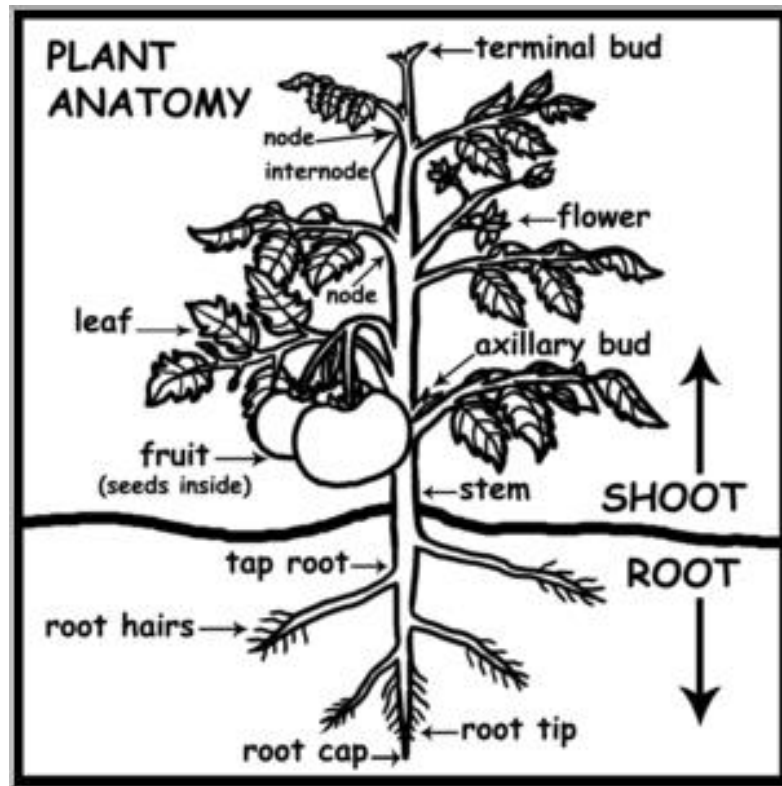
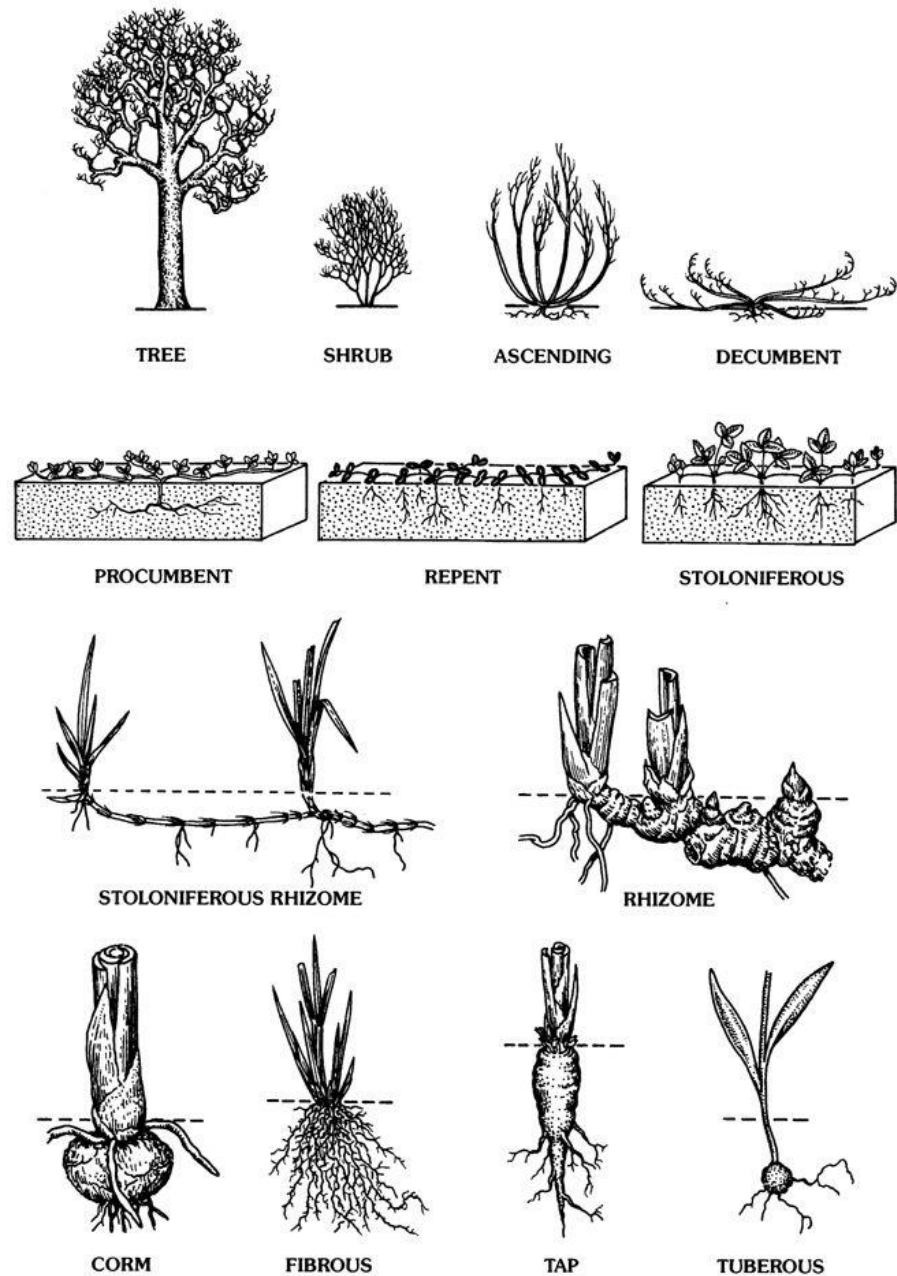
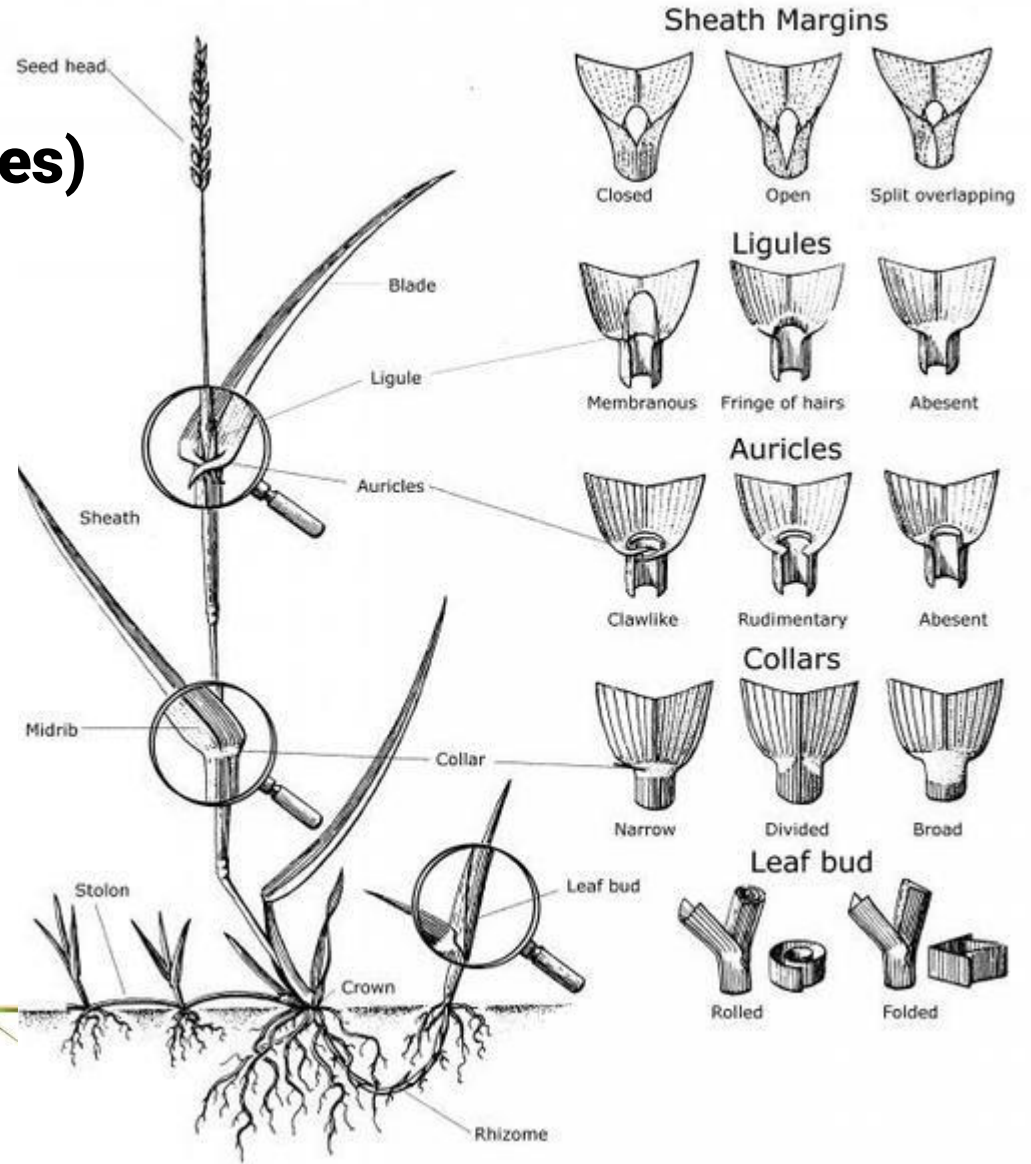


PLATE 1: STEM AND ROOT TYPES



Weed ID

Family: **Cyperaceae (sedges)** and **Poaceae (grasses)**



Weed ID

Family: Poaceae (grasses)

Species: crabgrass (large and smooth)



← **Large crabgrass**

Smooth crabgrass →

Summer annual

Weed ID

Family: Poaceae (grasses)

Species: barnyardgrass, orchardgrass, timothy



Summer annual



Perennial (bunch)

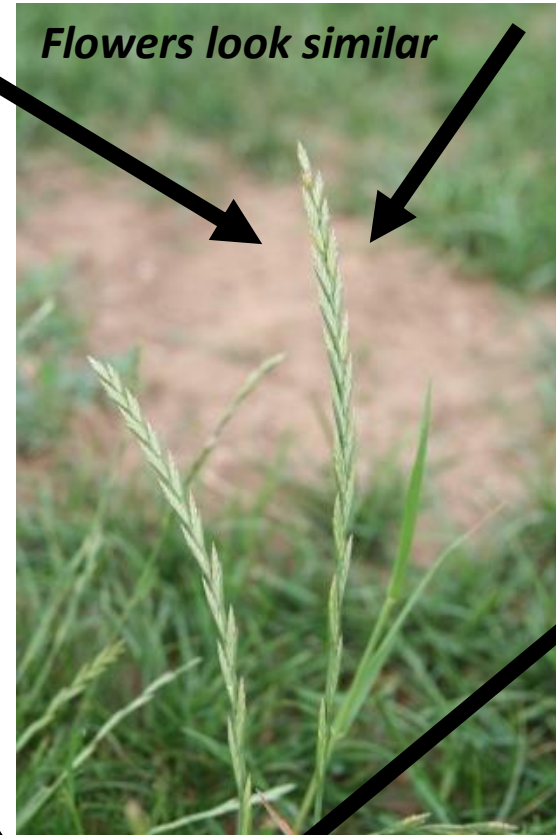
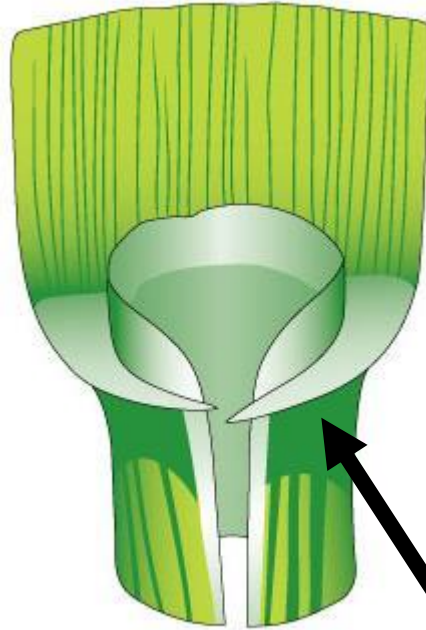
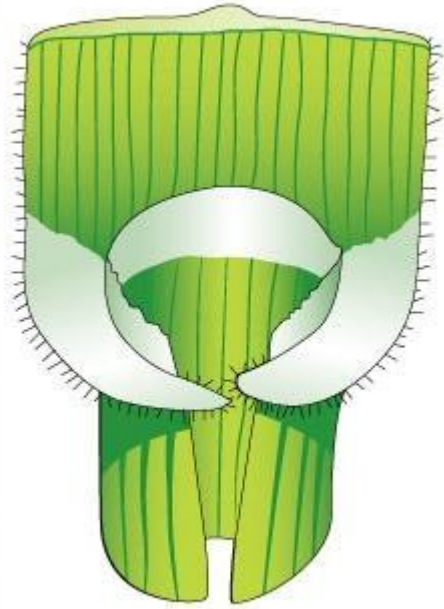


Perennial (bunch)

Weed ID

Family: Poaceae (grasses)

Genera: *Festuca* (tall fescue, perennial ryegrass) and *Elymus* (quackgrass)



Perennial (bunch)

Different!

Perennial (rhizome)

Weed ID

Family: Poaceae (grasses)

Genus: *Poa* (bluegrass)

Roughstalk bluegrass →

Annual bluegrass ↓



Perennial (rhizome)



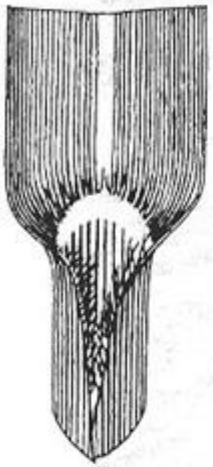
Summer annual



Weed ID

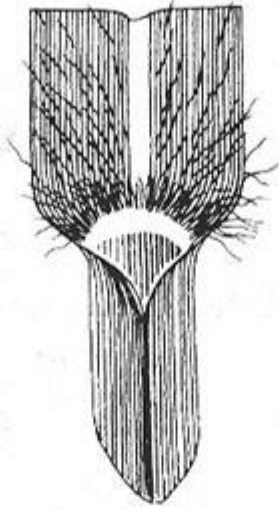
Family: Poaceae (grasses)

Genus: *Setaria* (foxtail)



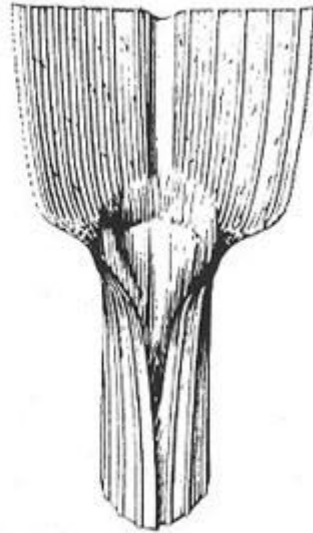
Green foxtail
collar region

Ciba-Geigy Corporation



Yellow foxtail
collar region

Ciba-Geigy Corporation



Giant foxtail
collar region

Ciba-Geigy Corporation



Green foxtail
seedhead

Ciba-Geigy Corporation



Yellow foxtail
seedhead

Ciba-Geigy Corporation



Giant foxtail
seedhead

Ciba-Geigy Corporation

Summer annual

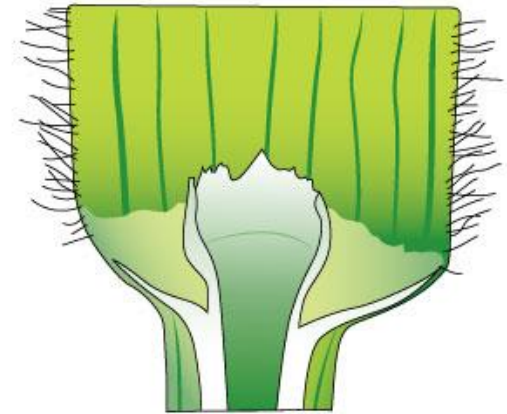
Weed ID

Family: Poaceae (grasses)

Genus: *Bromus* (downy brome, rye brome)



Winter annual



Summer annual

Weed ID

Family: Poaceae (grasses)

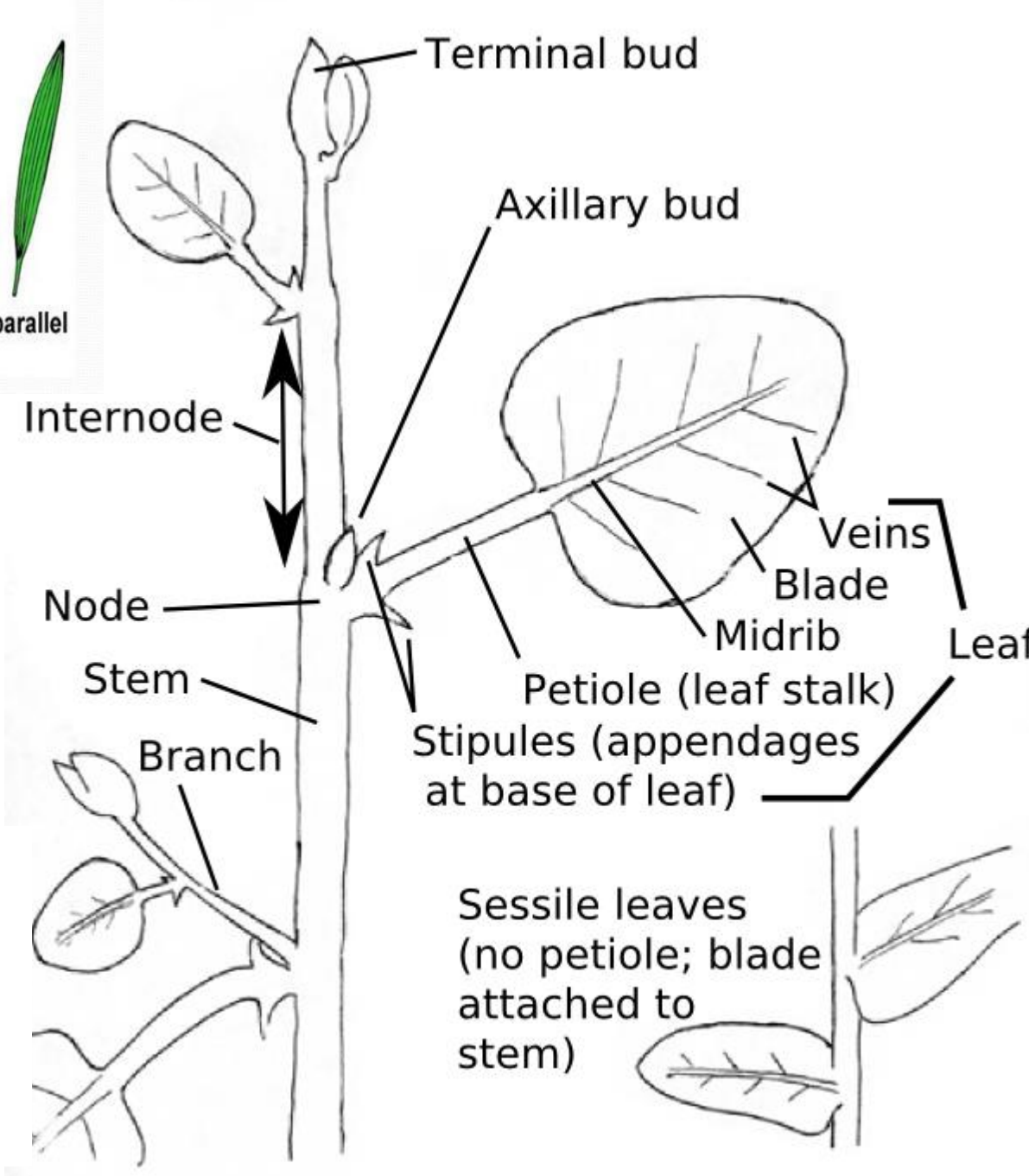
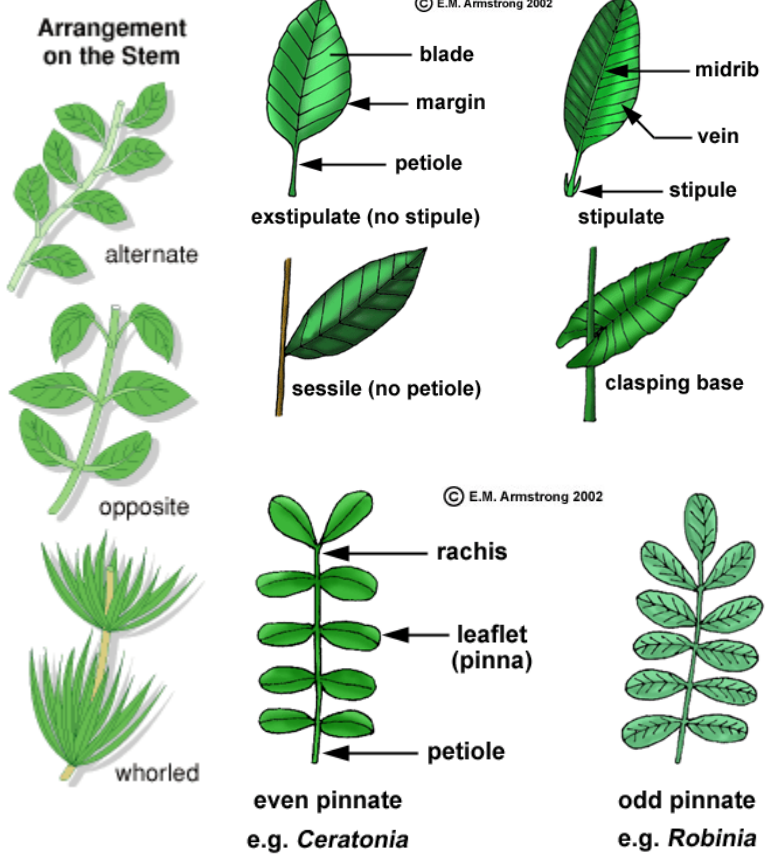
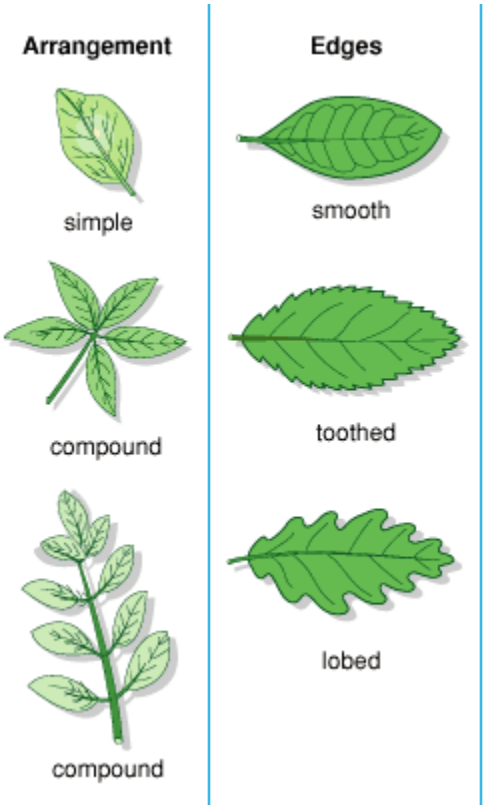
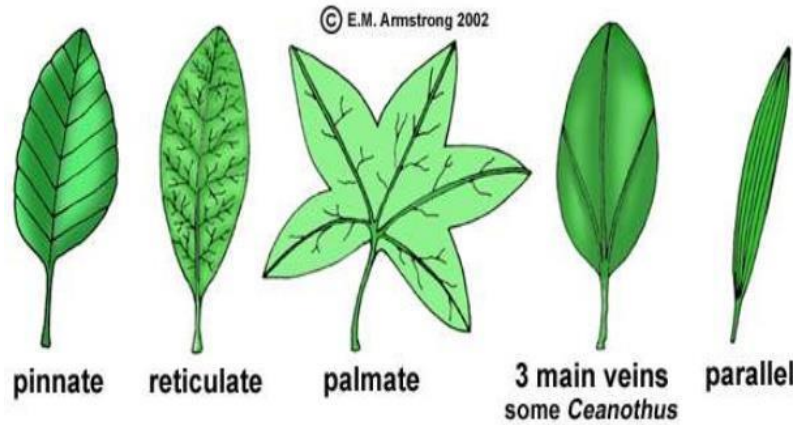
Genus: *Panicum* (witchgrass, fall panicum, wild proso millet)



Summer annual

Weed ID

Broadleaf anatomy:



Weed ID

Family: Asteraceae (lettuce)

Species: dandelion, chicory, and hawkweed



Perennial (taproot)

Weed ID

Family: Asteraceae (lettuce)

Species: dandelion, chicory, and hawkweed



Perennial (taproot)

Weed ID

Family: Asteraceae (lettuce)

Species: dandelion, chicory, and hawkweed



Perennial (taproot)

Weed ID

Family: Asteraceae (lettuce)

Species: Sowthistle (annual, perennial, spiny)



Summer annual



Perennial (rhizome)



Summer annual

Weed ID

Family: Asteraceae (lettuce)

Species: Sowthistle (annual, perennial, spiny)



Summer annual



Perennial (rhizome)



Summer annual

Weed ID

Family: Asteraceae (lettuce)

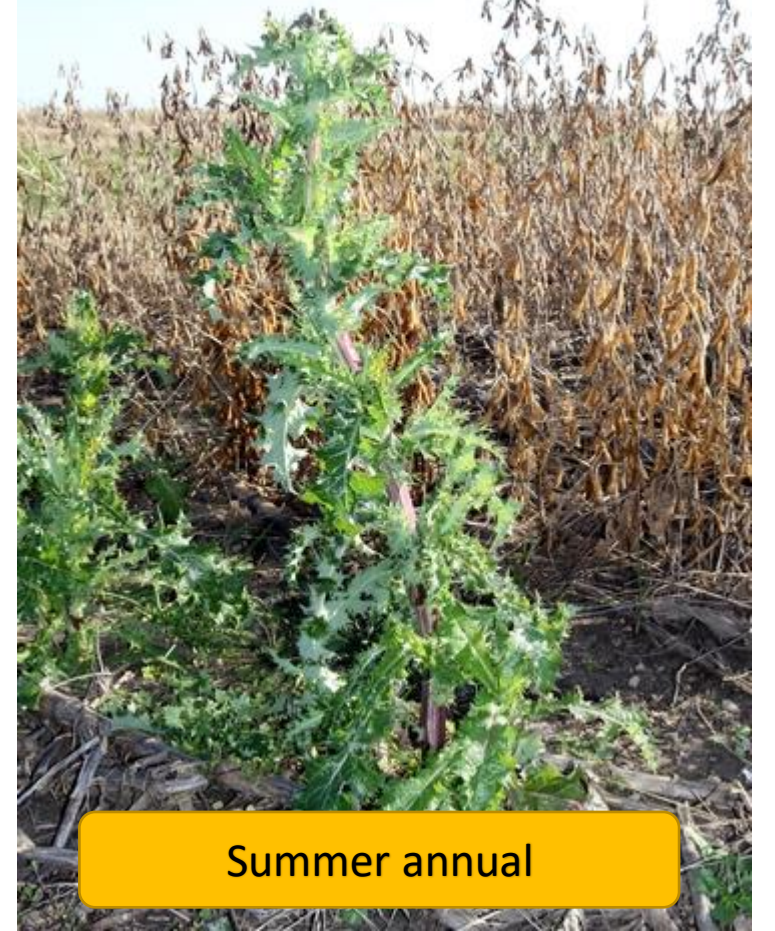
Species: Sowthistle (annual, perennial, spiny)



Summer annual



Perennial (rhizome)



Summer annual

Weed ID

Family: Asteraceae (lettuce)

Species: prickly lettuce



Summer annual

Weed ID

Family: Asteraceae (lettuce)

Species: thistle (bull, Canada, musk)



Biennial

Perennial (rhizome)

Biennial

Weed ID

Family: Asteraceae (lettuce)

Species: thistle (bull, Canada, musk)



Biennial



Perennial (rhizome)



Biennial

Weed ID

Family: Asteraceae (lettuce)

Species: thistle (bull, Canada, musk)



Biennial



Perennial (rhizome)



Biennial

Weed ID

Family: Asteraceae (lettuce)

Species: thistle (bull, Canada, musk)



Biennial



Perennial (rhizome)



Biennial

Weed ID

Family: Asteraceae (lettuce)
Genus: *Centaurea* (knapweed)



Perennial

Key to the Knapweed Species

(Adapted from Roché and Roché 1993)

A1. Bracts that surround the flower head are spine-tipped, biennial or short-lived perennial

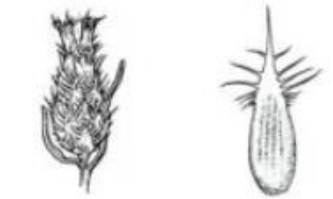
B1. Central, terminal bract bent backwards (curved)

Squarrose knapweed
(Centaurea virgata ssp. squarrosa)



B2. Central, terminal bract recurved

Diffuse knapweed
(Centaurea diffusa)

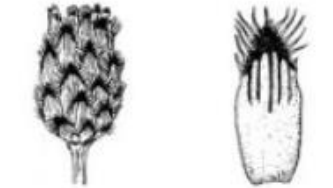


A2. Flower heads without spine-tipped bracts

C1. Edge of bract is comb-like fringe

D1. Fringes of bracts short, drawn out and rigid, bract with brown triangular tip

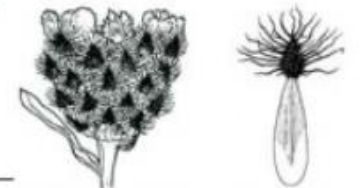
Spotted knapweed
(Centaurea stoebi)



D2. Fringes on bracts as long or longer than the width of the bract, not rigid

E1. Fringe on bract black

Black knapweed
(Centaurea nigra)



E2. Fringe on bract tan to brown

Meadow knapweed
(Centaurea pratensis)



C2. Bracts without comblike fringe, having a brown, papery, translucent tip

Brown knapweed
(Centaurea jacea)



Weed ID

Family: Asteraceae (lettuce)

Species: daisy (horseweed, asters)



Summer annual



Perennial

Weed ID

Family: Asteraceae (lettuce)

Species: daisy (horseweed, asters)



Summer annual



Perennial (rhizome)

Weed ID

Family: Asteraceae (lettuce)

Species: daisy (horseweed, asters)



Summer annual



Perennial (rhizome)

Weed ID

Family: Asteraceae (lettuce)
Species: common ragweed

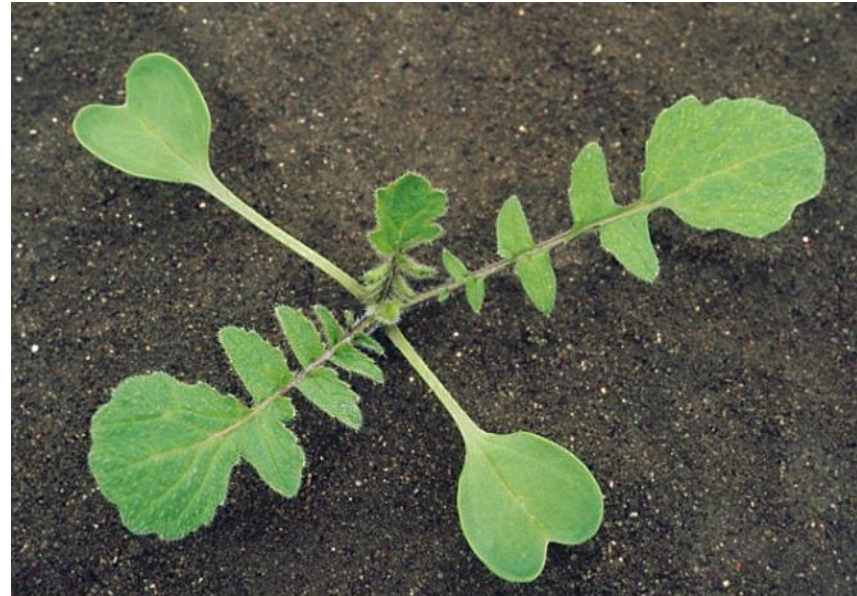
Summer annual



Weed ID

Family: Brassicaceae (mustard)

Species: wild mustard, wild radish, yellow rocket



Winter annual

Weed ID

Family: Brassicaceae (mustard)

Species: wild mustard, wild radish, yellow rocket



Winter annual

Weed ID

Family: Brassicaceae (mustard)

Species: wild mustard, wild radish, yellow rocket



Winter annual

Weed ID

Family: Brassicaceae (mustard)

Species: wild mustard, wild radish, yellow rocket



Winter annual

Weed ID

Family: Brassicaceae (mustard)

Species: shepherd's purse, field pennycress



Winter annual

Weed ID

Family: Brassicaceae (mustard)

Species: shepherd's purse, field pennycress



Winter annual

Weed ID

Family: Brassicaceae (mustard)

Species: pepperweed (field, virginia)



Winter annual

Weed ID

Family: Brassicaceae (mustard)

Species: pepperweed (field, virginia)



Winter annual

Weed ID

Family: Amaranthaceae (pigweed, lambsquarter)

Species: redroot pigweed (*Amaranthus retroflexus*)



Redroot pigweed leaves can be rounded while young, becoming more pointed when older. Margins are wavy. Stems and petioles are hairy. Leaf veins may also be hairy. Flower spikes are thick and compact. Male and Female flowers are found on the same plant.

Summer annual

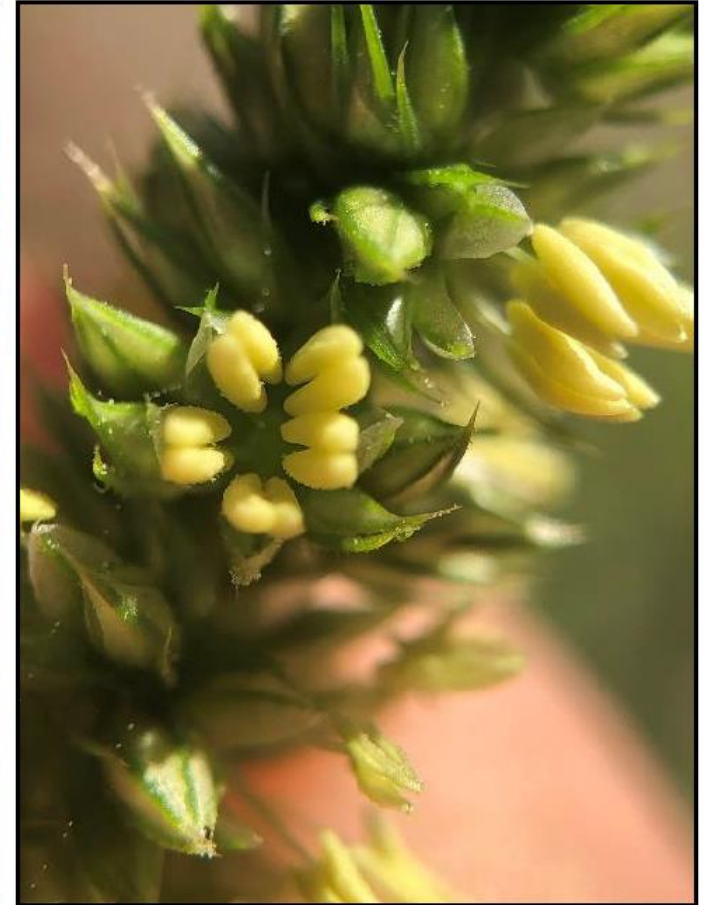
Weed ID



Smooth pigweed (left) and Powell amaranth (right). Smooth pigweed has leaves that start off round-, oval- or egg-shaped becoming more pointed with age. Leaf margins are wavy. Powell amaranth has diamond-shaped leaves without wavy margins

Summer annual

Weed ID: Palmer amaranth, *A. palmeri*



Palmer amaranth leaves presenting with a poinsettia-like appearance. Palmer amaranth leaves are diamond-shaped with petioles that can be much longer than the leaves (usually observed on older leaves). Male and female-flowers are held on separate plants; male flowers produce significant amounts of yellow pollen.

Summer annual

Weed ID: Palmer amaranth, *A. palmeri*



Palmer amaranth can grow very tall, rapidly. Flowers are tightly clustered on the flower spikes (inflorescences). Flower spikes can be highly branched and 2 to 3 feet in length. Female flowers are subtended by short, spiny bracts.

Summer annual

Weed ID: Palmer amaranth, *A. tuberculatus*



Waterhemp leaves and stems.

Leaves are linear and may be almost oval.

Petioles are shorter than leaf blade.

*Leaves may seem waxy in appearance.
Stems are smooth/hairless. Stems may be
red, green, or red and green striped.*

Summer annual

Weed ID



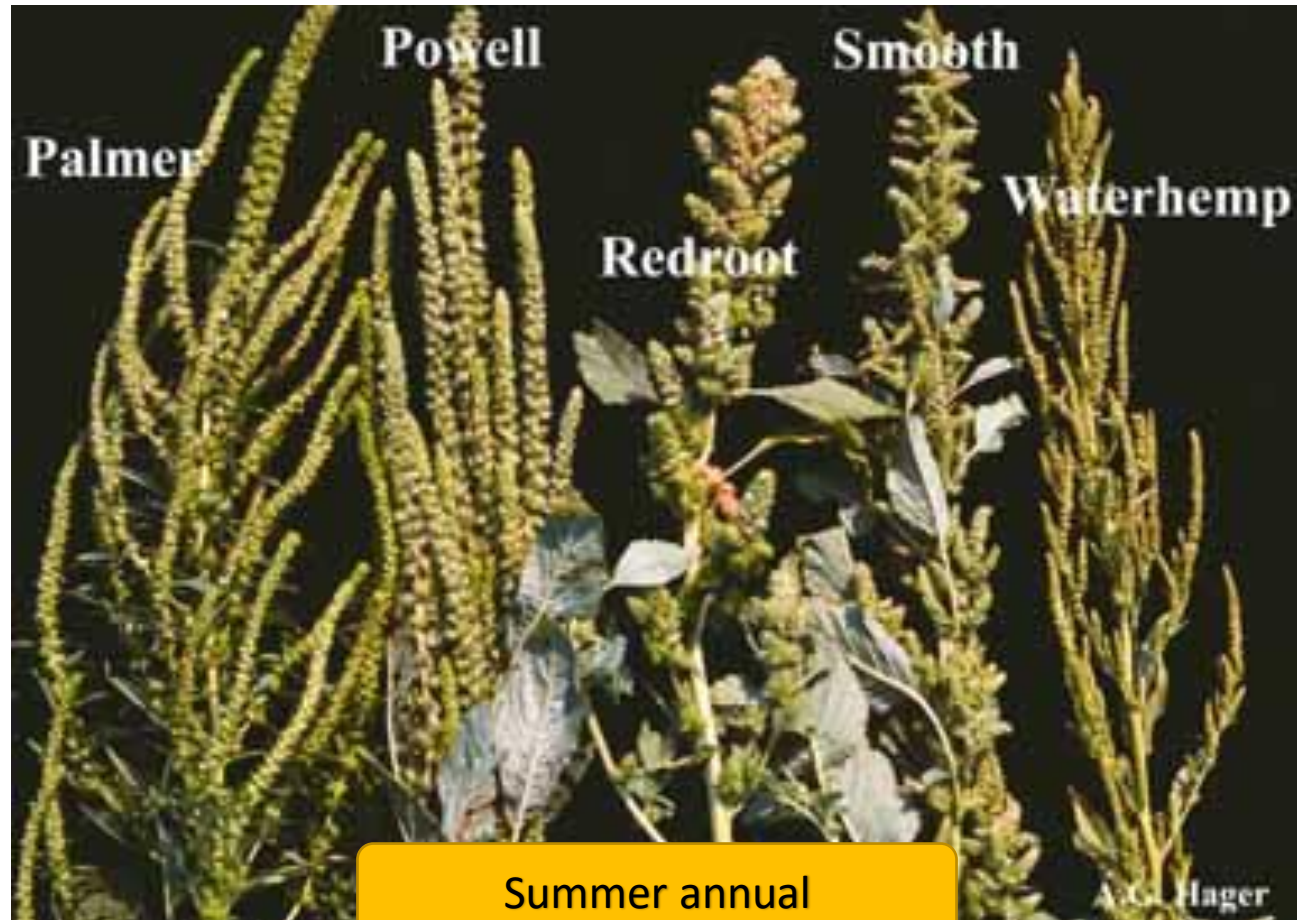
Smooth (left), Powell (center), and redroot (right) stems and flower spikes. Smooth and redroot pigweed are more densely hairy than Powell amaranth. Redroot pigweed flower branches are very tightly compact compared to smooth and Powell amaranths.

Summer annual

Weed ID

Family: Amaranthaceae (pigweed, lambsquarter)

Species: pigweed (powell amaranth, redroot pigweed, smooth pigweed)



Weed ID

Family: Amaranthaceae (pigweed, lambsquarter)

Species: lambsquarter



Summer annual



Weed ID

Family: Apiaceae (carrot)

Species: wild carrot, poison hemlock



Biennial

Weed ID

Family: Apiaceae (carrot)

Species: wild carrot, poison hemlock



Biennial

Weed ID

Family: Apiaceae (carrot)

Species: wild carrot, poison hemlock



Biennial

Weed ID

Family: Apiaceae (carrot)

Species: wild parsnip, giant hogweed



Biennial

Weed ID

Family: Apiaceae (carrot)

Species: wild parsnip, giant hogweed



Biennial



Perennial

Biennial

Weed ID

Family: Apocynaceae (hemp dogbane and milkweed)



Perennial (rhizome)

Weed ID

Family: Apocynaceae (hemp dogbane and milkweed)



Perennial (rhizome)

Weed ID

Family: Convolvulaceae (morning glory)

Species: bindweed (field, hedge)



Perennial (rhizome)

Weed ID

Family: Convolvulaceae (morning glory)

Species: bindweed (field, hedge)



UGA0021001

Perennial (rhizome)

Weed ID

Family: Fabaceae (legume)

Species: black medic, birdsfoot trefoil



Winter/Summer
Annual/Perennial



Perennial (tap/fibrous)

Weed ID

Family: Fabaceae (legume)

Species: black medic, birdsfoot trefoil



Winter/Summer
Annual/Perennial



Perennial (tap/fibrous)

Weed ID

Family: Lamiaceae (mint)

Species: purple deadnettle, henbit, ground ivy (creeping Charlie)



Winter annual



Winter annual



Perennial (stolon)

Weed ID

Family: Malvaceae (mallow)

Species: common mallow, velvetleaf



Winter annual



Summer annual

Weed ID

Family: Oxalidaceae (wood sorrel)

Species: *Oxalis stricta*, yellow wood sorrel



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Perennial (taproot)

Weed ID

Family: Plantaginaceae (plantain, broadleaf and buckhorn)



Perennial (fibrous)

Weed ID

Family: Polygonaceae (buckwheat)

Species: ladysthumb/redshank, prostrate knotweed, Pennsylvania smartweed



Summer annual

Weed ID

Family: Polygonaceae (buckwheat)

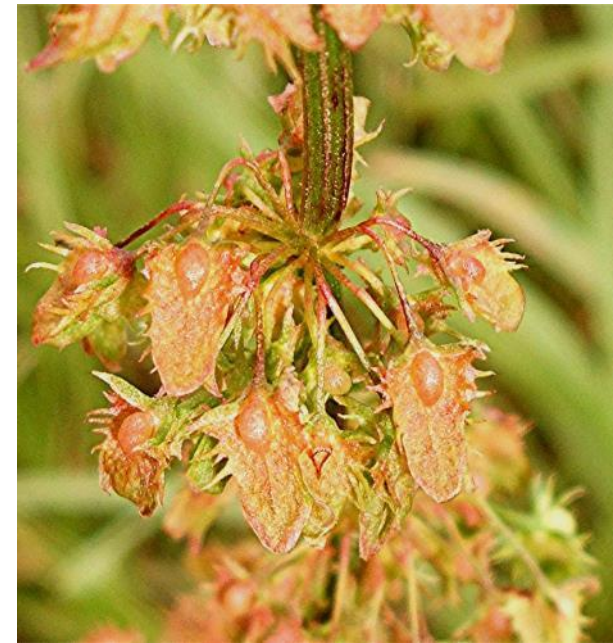
Species: ladythumb, prostrate knotweed, Pennsylvania smartweed



Summer annual

Weed ID

Family: Polygonaceae (buckwheat)
Species: dock (curly and broadleaf)



Perennial (taproot)

Weed ID

Family: Polygonaceae (buckwheat)

Species: wild buckwheat and mile-a-minute



Summer annual

Weed ID

Family: Portulacaceae (common purslane)



Summer annual

Weed ID

Family: Rubiaceae (bedstraw)

Genus: *Galium* (smooth bedstraw, catchweed bedstraw)



Winter annual



Summer annual

Weed ID

Family: Solanaceae (tomato)

Species: *Solanum ptycanthum* (eastern black nightshade)



Summer annual

Weed ID

Family: Vitaceae (grape) and Anacardiaceae (cashew)

Species: Virginia creeper and poison ivy



Perennial (repent)

Weed ID

Family: Vitaceae (grape) and Anacardiaceae (cashew)

Species: Virginia creeper and poison ivy



Perennial (repent)

Weed ID

Family: Vitaceae (grape) and Anacardiaceae (cashew)

Species: Virginia creeper and poison ivy



Perennial (repent)

Short break (~5-10 mins)

Weed Management

By:

Season

by cropping system

by cultural strategy

Set your garden up for success from the beginning. Hand-pick weeds as a next-to-last resort, not the first

Try chemical means in very specific situations (new ground, out of control rhizomatous weeds, etc)



Weed Management

Where to begin?

Integrated Weed Management

- 1. Prevention**
- 2. Cultural**
- 3. Biological**
- 4. Mechanical**
- 5. Chemical**



Integrated Weed Management

1. Prevention

Managing points of entry

Seed, soil, manure, compost

Clean equipment

Preventing reproduction



Integrated Weed Management

1. Prevention
2. Cultural
 - Transplanting
 - Row spacing
 - Crop rotation
 - Mulch, cover crops
 - Irrigation strategies
 - Solarization?
 - Reduced/no tillage



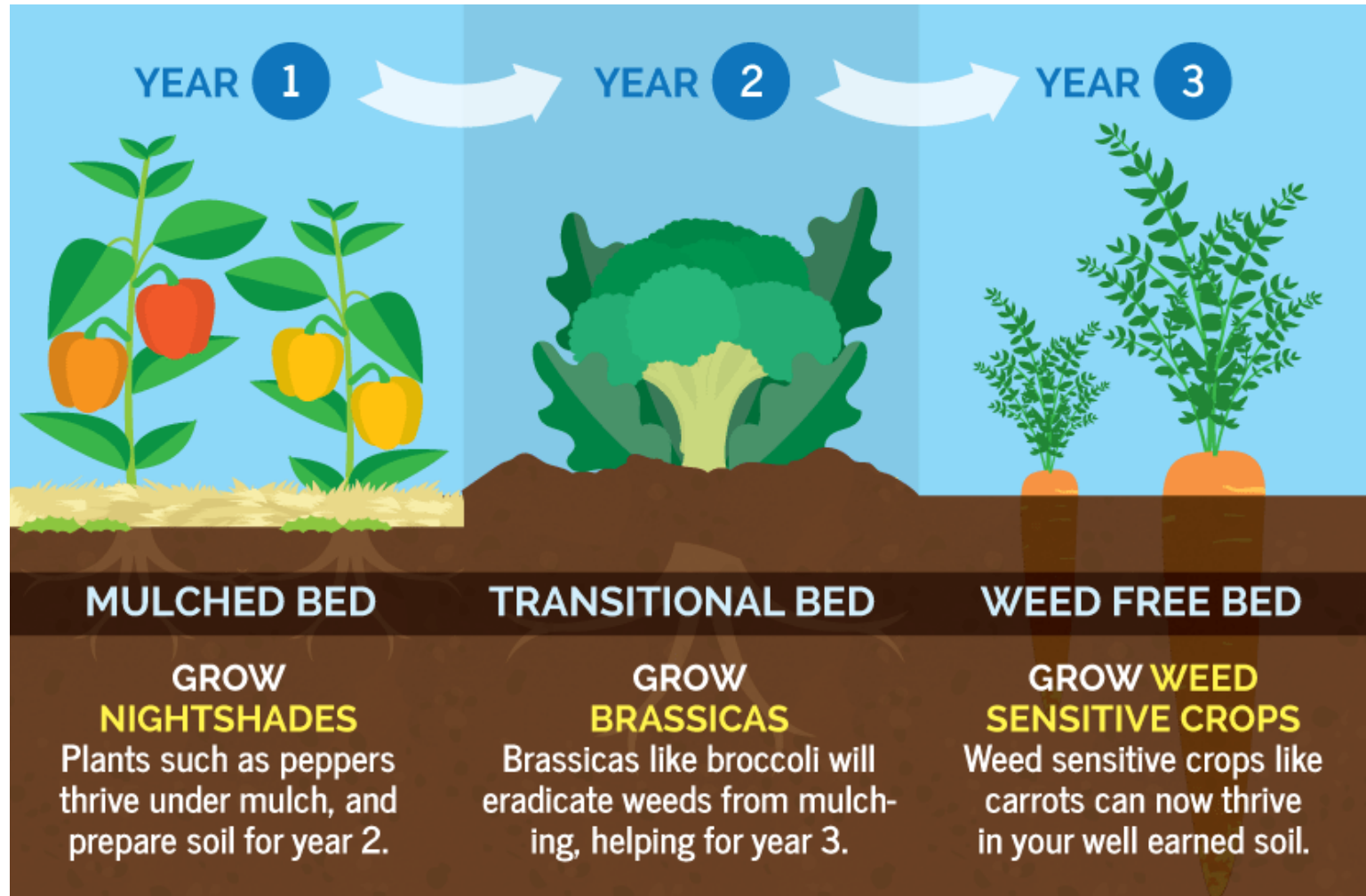
Integrated Weed Management

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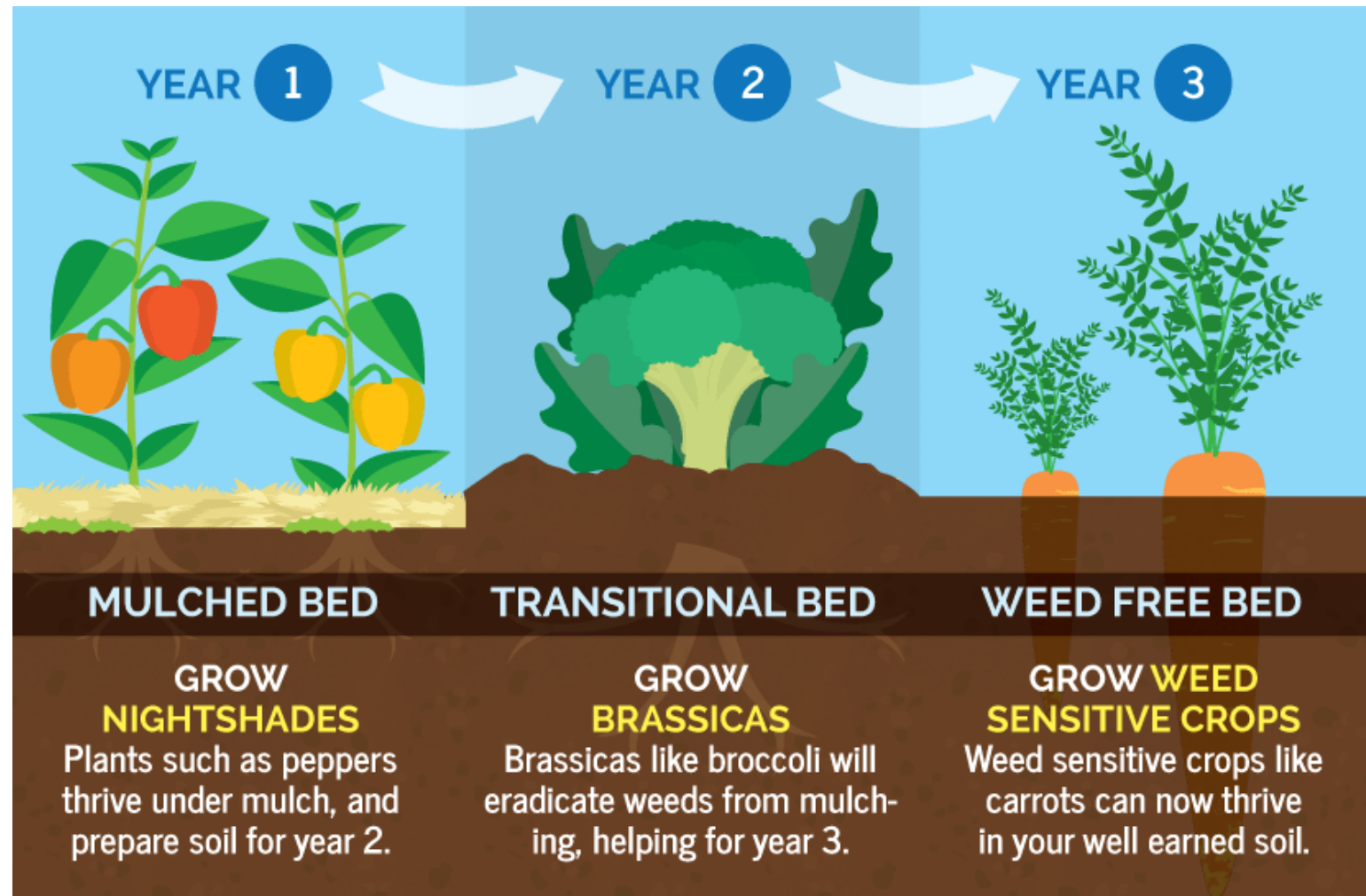
Integrated Weed Management

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Integrated Weed Management

1. Prevention
2. Cultural
 - Transplanting
 - Row spacing
 - Crop rotation
 - Mulch, cover crops
 - Irrigation strategies
 - Solarization?
 - Reduced/no tillage



Bush beans



Integrated Weed Management

1. Prevention
2. Cultural
 - Transplanting
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 - Irrigation strategies
 - Solarization?
 - Reduced/no tillage



Integrated Weed Management

1. Prevention
2. Cultural
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Integrated Weed Management

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Integrated Weed Management

1. Prevention
2. Cultural
 - Transplanting
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 - Solarization?
 - Reduced/no tillage



Integrated Weed Management

1. Prevention

2. Cultural

3. Biological

Insects

Pathogens/Bioherbicides



Montana State University

Cyphocleonus achates adult.



Montana State University

Larinus minutus adult on a knapweed seed head.



Integrated Weed Manage

1. Prevention

2. Cultural

3. Biological

Insects

Pathogens/Bioherbicides

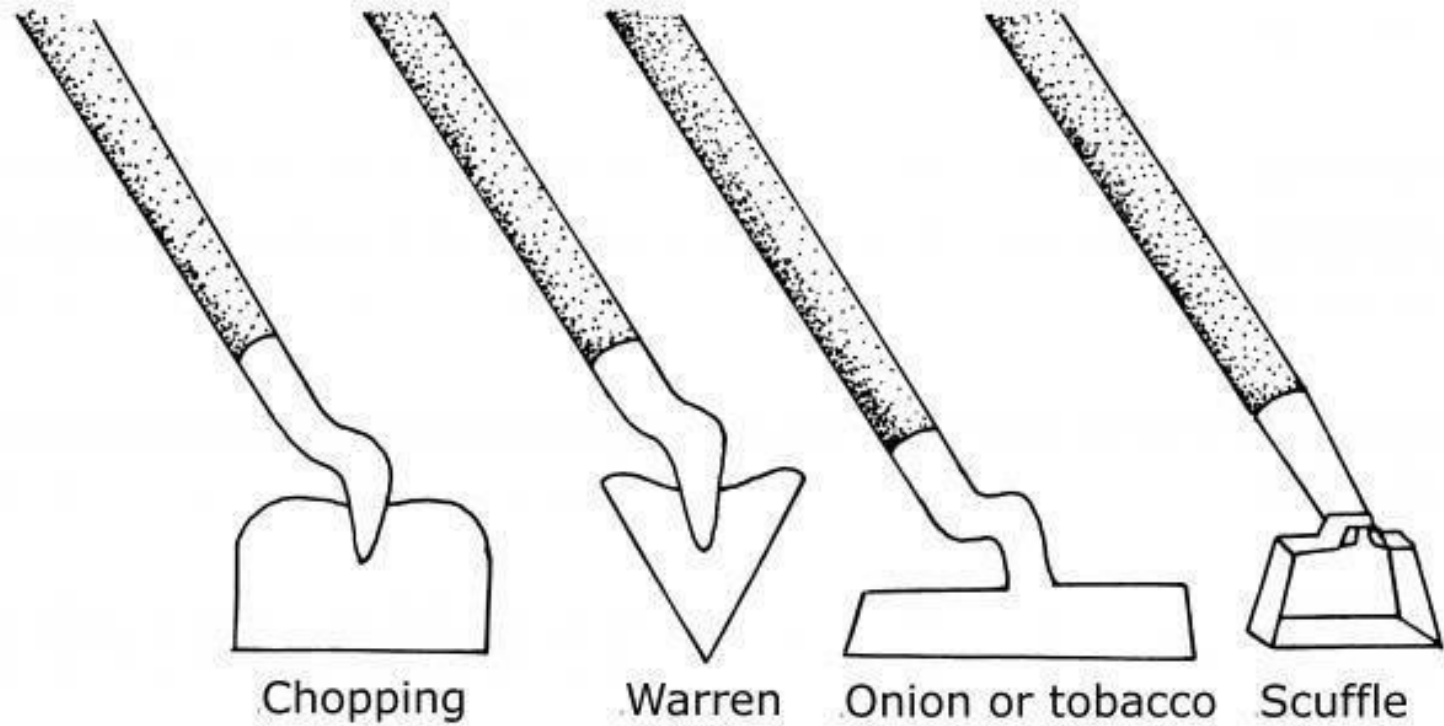
TABLE 1 Examples of Fungal Bioherbicides for Economically Important Terrestrial and Aquatic Weeds*

Weed	Pathogen	Reference
Velvetleaf	<i>Colletotrichum coccodes</i> <i>Fusarium lateritium</i>	Hodgson et al., 1988 Walker, 1981
Giant ragweed	<i>Fusarium lateritium</i>	Anonymous, 1989
Wild oat	<i>Septoria tritici</i> Desm. F. Sp. <i>Avenae</i>	Madariaga and Scharen, 1985
Common lambsquarters	<i>Ascochyta caulina</i> <i>Cercospora chenopodii</i> <i>C. dubia</i>	Scheepens and van Zon, 1982 Scheepens and van Zon, 1982 Scheepens and van Zon, 1982
Field bindweed	<i>Phomopsis convolvulus</i>	Anonymous, 1989; Vogelgsang et al., 1998
Yellow nutsedge	<i>Cercospora caricis</i>	Anonymous, 1989
Purple nutsedge	<i>Phyllachora cyperi</i>	Anonymous, 1989
Large crabgrass	<i>Pyricularia</i>	Anonymous, 1989
Barnyardgrass	<i>Cochliobolus lunatus</i>	Scheepens, 1987
Water hyacinth	<i>Alternaria eichhorniae</i>	Shabana, 1987
Goosegrass	<i>Bipolaris setariae</i>	Anonymous, 1989
Common purslane	<i>Dichotomophthora indica</i> <i>D. portulacae</i>	Evans and Ellison, 1988 Evans and Ellison, 1988
Itchgrass	<i>Curvularia</i> sp. <i>Phaeoseptoria</i> sp.	
Johnsongrass	<i>Sphacelotheca holci</i> <i>Bipolaris halepense</i> <i>B. sorghicola</i> <i>Colletotrichum</i> <i>graminicola</i> <i>Gloeocercospora sorghi</i>	Massion and Lindow, 1986 Chiang et al., 1989 Winder and Van Dyke, 1989 Anonymous, 1989 Anonymous, 1989
Sicklepod	<i>Pseudocercospora</i> <i>nigricans</i>	Hofmeister and Charudattan, 1987

*Modified from Charudattan 1990.

Integrated Weed Management

1. Prevention
2. Cultural
3. Biological
4. Mechanical



Integrated Weed Management

1. Prevention
2. Cultural
3. Biological
4. Mechanical



Integrated Weed Management

1. Prevention
2. Cultural
3. Biological
4. Mechanical



Integrated Weed Management

1. Prevention
2. Cultural
3. Biological
4. Mechanical
5. Chemical



Citrus oil (contact)



Sethoxydim



Glyphosate

- Contact, systemic
- Can seed veg after 3-7 days, tomato transplants 30 days



Vinegar (contact)

Integrated Weed Management

1. **Prevention**
2. **Cultural**
3. **Biological**
4. **Mechanical**
5. **Chemical**
6. **Acceptance!**



Case study:

Homeowner wants to grow:

Onions

Zucchini

String beans (bush)

Three plots:

One has known Canada thistle infestation

One has lots of grassy weeds

One has no particular issues

Pick one crop per plot. Which crop in which plot?

Do you have specific fall/spring/summer mgmt strategies?

Hint: Think about bed prep, think about the crop habit.

Weed *benefits?*

Pollinators (dandelion, chicory)

Harbor for beneficial insects



Weed *benefits?*

Pollinators (dandelion, chicory)

Harbor for beneficial insects

Trap crops

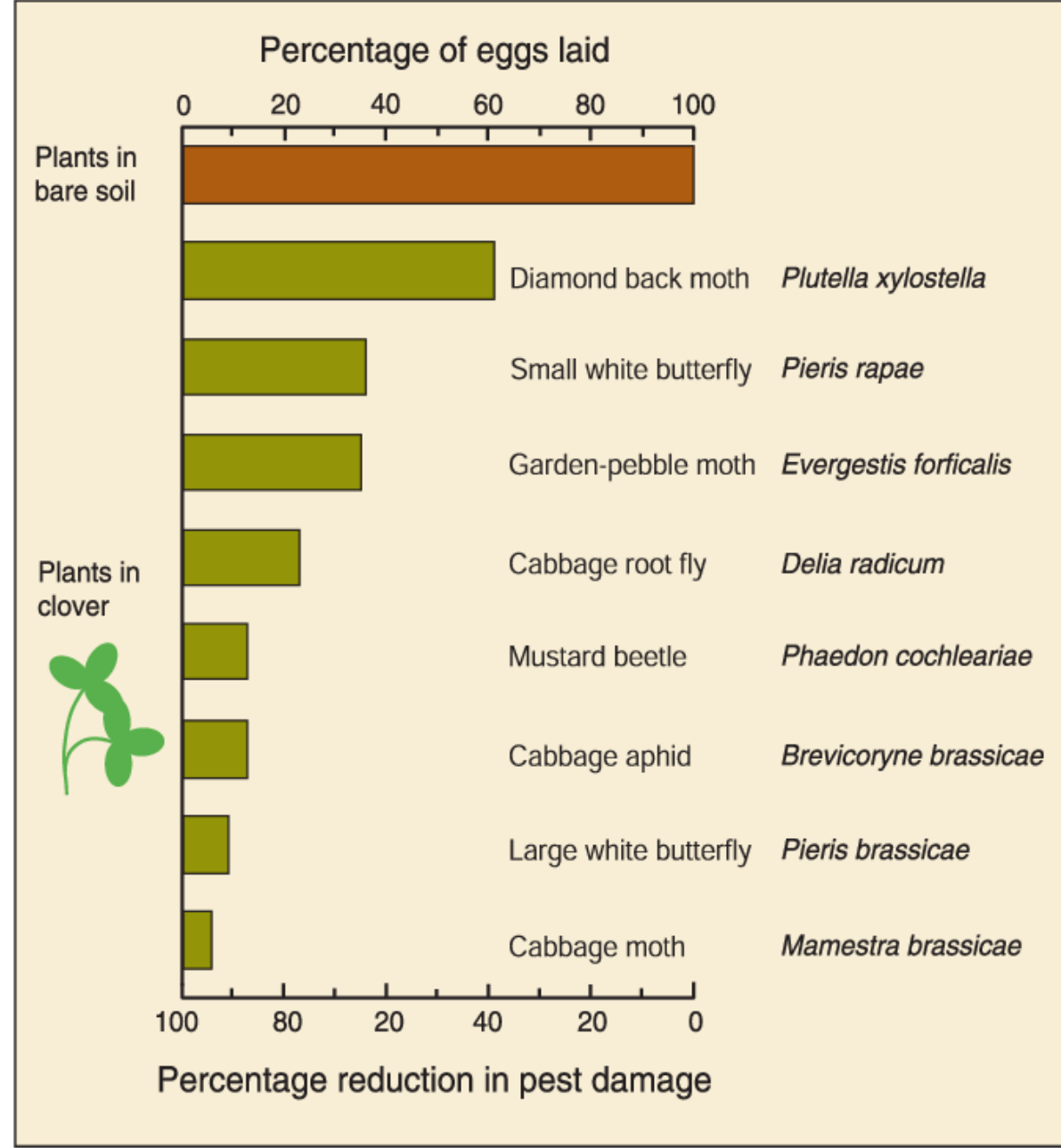
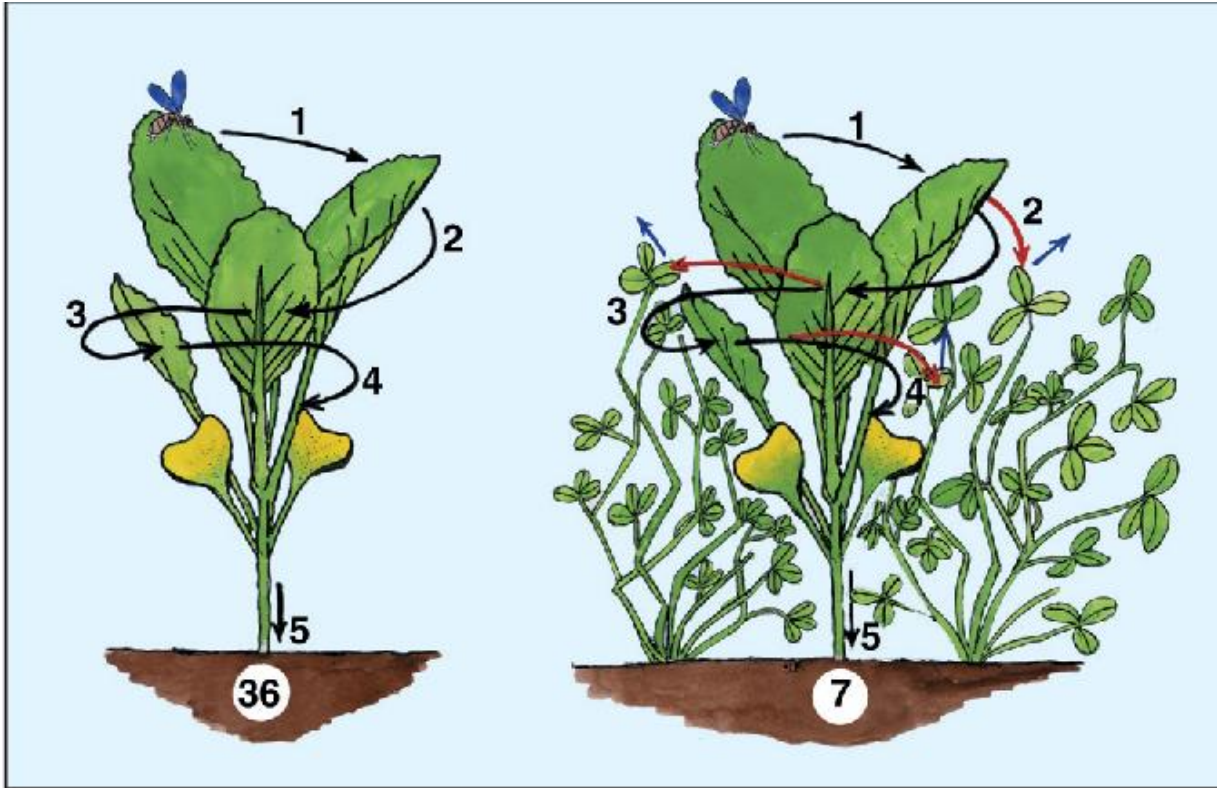


Figure 1. Numbers of eggs laid by eight insects on cabbage plants growing in clover (green columns) expressed as percentage of eggs laid on similar plants growing in bare soil (top brown column).

Weed *benefits?*

Pollinators (dandelion, chicory)

Harbor for beneficial insects

Trap crops

Indicators of fertility, soil type/issues



Plantain = low-fertility, compacted



Hawkweed = low soil pH



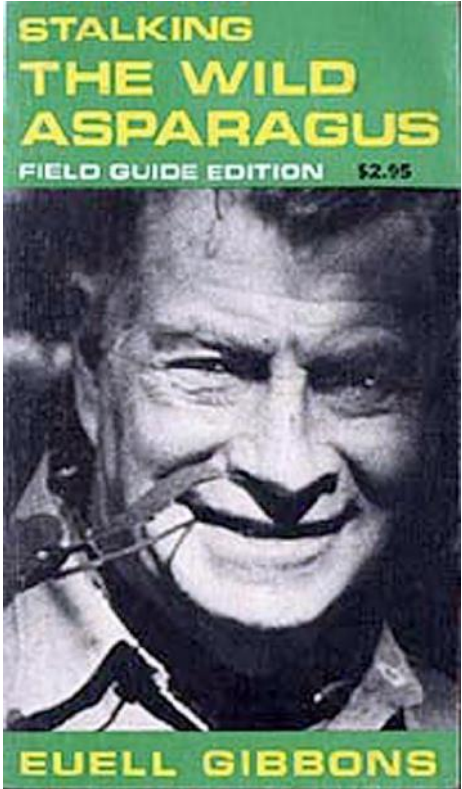
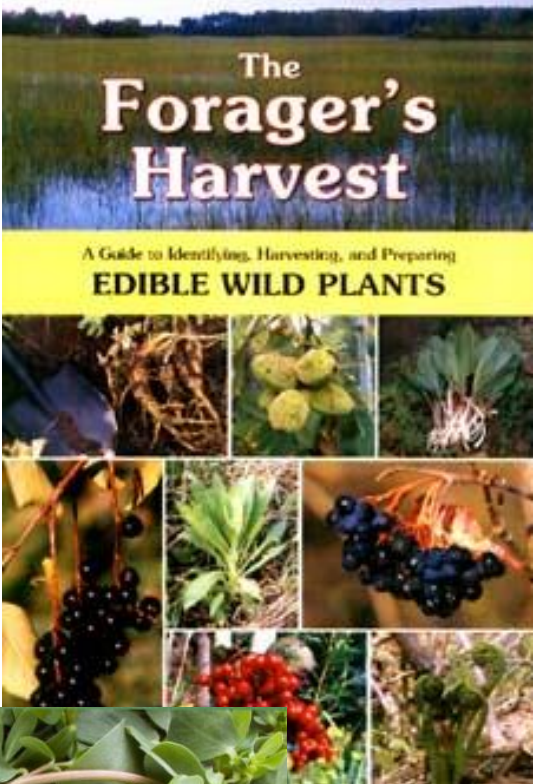
Redroot pigweed = healthy soil



Ground ivy = poor drainage, fertility, light

Weed *benefits?*

FOOD!



Recommended reading

