



INTEGRATED PEST MANAGEMENT

Unit 1 Lesson 2 A Weed By Any Other Name

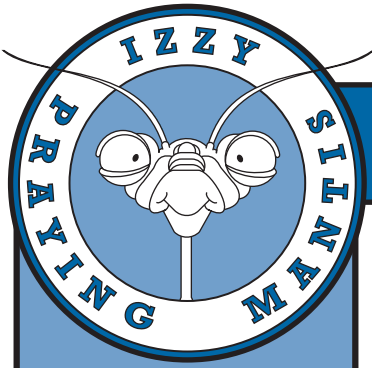
Focus Areas: Pest Identification; Science,
Social Studies

Focus Skills: Classification, field
investigation, creating a scientific
drawing and a map

Level of Involvement: AVERAGE

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*Dedicated
to Reducing
Pesticides*

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Focus Areas: Pest Identification; Science, Social Studies

Focus Skills: Classification, field investigation, creating a scientific drawing and a map

Level of Involvement: AVERAGE

Objective

To determine the biodiversity of plants (weeds) in a given area

Essential Questions

- * What characteristics of a weed enable it to be classified as a pest?
- * What weeds are common to this area?

Essential Understandings

- * Certain characteristics are associated with weeds and allow their survival:
 - a) abundant seed production;
 - b) rapid population establishment;
 - c) seed dormancy;
 - d) long-term survival of buried seed;
 - e) adaptation for spread;
 - f) presence of vegetative reproductive structures;
 - g) ability to occupy sites disturbed by human activities;
 - h) people breed plants
- * Of the approximately 250,000 species of plants worldwide, about 3% or 8,000 species behave as weeds.



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Background

Weeds are plants whose undesirable qualities outweigh their beneficial qualities in the opinion of human society. These characteristics include but are not limited to: a plant out of place and not intentionally sown, a plant growing where it is unwanted, plants that compete and interfere with desirable plants, plants whose worth have not yet been determined.



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Background (continued)

Weeds are naturally strong competitors and those that compete best survive in spite of man's efforts to control them. People breed plants for economical or aesthetic reasons. Nature breeds plants for survival.

(see **Understanding the Organism** for more information)



Vocabulary

| | |
|--------------------|--|
| cotyledon | seed leaf |
| dicot | plant having two seed leaves (cotyledons) |
| dormancy | inactive state (in animals called hibernation) |
| germination | process of beginning plant growth |
| monocot | plant having a single cotyledon |
| rhizome | underground root-like stem that sprouts leafy shoots above ground and roots from the lower surface |
| runner | slender horizontal branch that roots at the joints or ends and forms new plants |
| tap root | a fleshy primary root that grows vertically downward and sends off smaller lateral roots |



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Challenge

Determine the variety and survival adaptations of weeds in a designated area

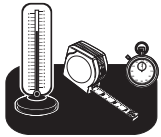
Logistics

Time: two 45 minute periods

Group size: 2 to 35

Space: an outside area to collect weeds; a work area to conduct follow up activities

Materials



Golden Guide for Weeds

weed keys *

Weed Fact Sheets *

tape measures

hand lenses

digging tools

plastic bags (eight per group)

paper for map and scientific drawings

pencils, rulers

Overheads of Connecticut weeds *

Money Matters Math Activity *

Computer with Internet access

K-W-L Chart *

Handout 1 Information for K-W-L Chart *

Handout 2 Field Study Directions *

Handout 3 Quadrat Data Sheet *

Assessment for a Scientific Drawing *

* single copy provided

Preparations

1. Collect plant guides or prepare multiple copies of plant key (1 copy for 2 to 4 participants)
2. Prepare multiple copies of directions and assessment sheets
3. Select area for field study and sample collection based on size of group
4. Gather other materials



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Activity

Introduction: Session 1

1. Begin a K-W-L chart using the following questions:
 - a. What is a weed?
 - b. What characteristics do weeds share?
 - c. How do weeds help ecosystems?
 - d. How do weeds harm ecosystems?
 - e. Where are weeds found?
 - f. Where are we?
2. Display all responses.
3. Allow time for participants to review materials on weed identification using supplements, Internet websites, and identification guides.
4. Add new information to the K section of the K-W-L chart.
5. Review vocabulary using format comfortable for the group.
6. Display overheads of common Connecticut weeds to familiarize group with what to look for in the field.

Involvement: Session 2

1. Divide the group into teams of two to four and distribute lab materials and directions.
 - a. tape measures
 - b. hand lenses
 - c. digging tools
 - d. paper for maps and sketches
 - e. writing tools



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Activity

Involvement: Session 2 (continued)

2. Take the group to field area and assign a section (10 square foot quadrat) for each group to study.
3. Each group will complete the following tasks:
 - a. observe and identify the plants in their quadrat
 - b. create a map of their area showing points at which samples will be taken
 - c. record points on a Quadrat Data Sheet
 - d. collect three to five samples of suspected weeds, including roots, along with a soil sample from their area.

Follow Up

1. Have a group discussion on observations made in the field.
2. Compare samples to determine similarities.
3. Discuss:
 - * where each sample was found
 - * the general appearance
 - * the root type
 - * the density of the sample type at the sight
 - * seeds, if any
 - * flowers, if any
4. Use source materials to classify samples.
5. Add to the L portion of the K-W-L chart.

See Assessment

Answer Key Answers will vary.





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Assessment

- * Each individual will complete a scientific drawing of at least two samples identifying each and labeling parts. (**Note:** this activity may require the use of source material)
- * Evaluate scientific drawings (See Assessment for a Scientific Drawing)

Follow Through

Complete Money Matters Math Activity and correct.

Focus Areas: Math

Focus Skills: Understanding statistics

Follow Through Answer Key

Follow Through Math Sheet:

1. 31.25%
2. 16 million
3. 58%
4. \$33 per acre \$52,290 47.6%
5. \$798.00
6. 6%
7. corn
8. soybeans
9. wheat
10. answer will vary - accept any that can be supported



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Resources



Internet Websites

See selected Weed Science Websites and Publications

<http://www.hort.uconn.edu/ipm/homegrnd/htms/lawnweeds.htm>





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Notes



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K-W-L Chart

| What we Know | What we Want to Know | What we Learned |
|---------------------|-----------------------------|------------------------|
| | | |



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Handout 1

Information for K-W-L Chart

A. The Nature of Weeds

Weeds have a controversial nature. To the agriculturist, they are plants that need to be controlled in an economical and practical way in order to produce food, feed, and fiber for humans and other animals. In this context, the negative impacts of weeds indirectly affect all living beings.

B. Negative Aspects of Weeds

Weeds are troublesome in many ways. Primarily, they reduce crop yield by competing for water, light, soil nutrients, and space. Other problems associated with weeds in agriculture include:

- * reduced crop quality by contaminating the commodity
- * interference with harvest
- * serve as hosts for crop diseases or provide shelter for insects to overwinter
- * limit the choice of crop rotation sequences and cultural practices
- * production of chemical substances that are toxic to crop plants (**allelopathy**), animals, or humans

C. Positive Aspects of Weeds

Despite the negative impacts of weeds, some plants usually thought of as weeds may actually provide some benefits. Some attributes include:

- * soil stabilization
- * habitat and feed for wildlife
- * nectar for bees
- * aesthetic qualities
- * add organic matter
- * provide genetic reservoir
- * human consumption
- * provide employment opportunities



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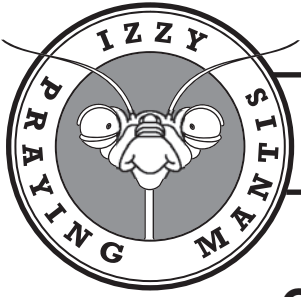
Handout 2

Field Study Directions

1. Collect the materials you will need in the field.
2. Go quietly to the field site in an orderly manner.
3. Using the tape measure, mark out a 10-foot square area to conduct your investigation.
4. Draw a map of your area to include a directional arrow, scale and enough detail to allow someone else to locate this area using your map.
5. Survey the area noting probable weeds and placing their location correctly on the map.
6. Collect 3 to 5 samples of suspected weeds using the digging tool and the plastic bags to store samples. Be sure to dig deep and wide enough to include roots.
7. Make a sketch of each weed collected.
8. Collect a soil sample from your area, if directed to do so by your adult supervisor.

To consider in data report/observation...

- * What weeds are present?
- * Is there evidence of a drainage problem, such as puddles that remain after a rain?
- * Where is the turf thin or damaged?
- * Are there trees and shrubs competing with turf for water and sunlight?
- * Are there compacted areas, such as footpaths, where a brick or stone walkway could be placed?



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Handout 3

General Weed Sampling

Quadrat Data Sheet

Date: _____

Location: _____

Habitat: _____

Map of sampling pattern within overall area (sketch on back)

| Sampling Point # | Species Found | % Cover by Each | Distribution Pattern | Other Comment: |
|------------------|---------------|-----------------|----------------------|----------------|
|------------------|---------------|-----------------|----------------------|----------------|



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Heading _____

Money Matters Math Activity

Compute the answers to problems to determine the cost of weed control in corn, soybean and wheat crops.

1. Of the 250,000 species of plants, 8,000 are considered weeds. What percentage of the Plant Kingdom are weeds? _____
2. Economic loss in field crops caused by weeds was 82% of the \$19.6 billion estimated. What was the dollar amount of loss attributed to weeds? _____
3. Farmers spend \$3.6 billion on herbicides annually and \$2.6 billion on other methods to control weeds. What percentage of the money spent on weed control is spent on herbicides? _____
4. Herbicide application for soybeans costs \$30.00 per acre. Other economic costs bring the total input cost to \$63.00 per acre. What is the dollar amount spent on seed, fertilizer, fuel, water and pesticides per acre? _____ What is the input cost for an 830 acre crop of soybeans? _____ What percent of the total input cost is spent on herbicides? _____
5. For corn, the herbicide cost is 28% of the total \$114.00 per acre. What is the dollar amount spent on herbicides for a 25 acre field of corn? _____
6. Wheat input cost is \$96.00 per acre. \$6.00 of the \$96.00 is spent on herbicide application. What percentage of the total input cost is spent on herbicide application? _____
7. Which of these three crops requires the highest percentage of herbicide use? _____
8. Which of the three crops requires the highest economic input per acre? _____
9. Which of the three crops would seem to represent the most cost effective choice for minimal use of herbicides? _____
10. Formulate two hypotheses to explain the varying percentages of herbicide cost among these three crops.



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Assessment for a Scientific Drawing

| Criteria | Possible Points | Points Earned |
|--|-----------------|---------------|
| 1. There is an explanatory main title. | _____ | _____ |
| 2. All elements of the drawing use the same scale. | _____ | _____ |
| 3. Appropriate details are shown accurately. | _____ | _____ |
| 4. The drawing is correctly labeled, including magnification if appropriate. | _____ | _____ |
| 5. The drawing is easily understood. | _____ | _____ |
| 6. Space is used well. | _____ | _____ |
| 7. The drawing is neatly done. | _____ | _____ |

Comments:

Assessment for a Scientific Drawing

| Criteria | Possible Points | Points Earned |
|--|-----------------|---------------|
| 1. There is an explanatory main title. | _____ | _____ |
| 2. All elements of the drawing use the same scale. | _____ | _____ |
| 3. Appropriate details are shown accurately. | _____ | _____ |
| 4. The drawing is correctly labeled, including magnification if appropriate. | _____ | _____ |
| 5. The drawing is easily understood. | _____ | _____ |
| 6. Space is used well. | _____ | _____ |
| 7. The drawing is neatly done. | _____ | _____ |

Comments:

Broadleaf Plantain: *Plantago major*

Weed Description: Perennial from a basal rosette with broad oval leaves. Found throughout the United States, primarily a weed of turfgrass.

Seedling: Cotyledons are spatula-shaped and joined at the base. Young leaves oval to elliptic with leaves that encircle the stem.

Roots: Taproot with fibrous roots.



Leaves: Smooth or slightly hairy, oval to elliptic, with a waxy surface and veins that are parallel to the margins. Margins are untoothed and sometimes wavy.

Fruit: A 2-celled oval capsule, 3-5 mm long, that opens by a lid around the middle.

Flowers: Flowers produced on unbranched stalks (scapes) that arise from the rosette. Flowering stems are 5-15 inches long, clustered with small flowers that have whitish petals and bracts surrounding the flowers.



Identifying Characteristics: This weed may be confused with **Blackseed Plantain** (*Plantago rugelli*) that is also found in the eastern United States. Blackseed plantain has a red or purple coloration at the base of the petioles that is less often found in broadleaf plantain. Additionally, the capsules of blackseed plantain are cylindrical and split below the middle, while the capsules of broadleaf plantain are egg-shaped and open by splitting around the middle.



Common Chickweed: *Stellaria media*



Weed Description: Prostrate, winter annual that is found throughout North America except for in the far west. Common chickweed is primarily a weed of turfgrass, lawns and winter small grains.

Seedling: Cotyledons are ovate, 1-12 mm long by 0.25-2 mm wide, with a slender reddish hypocotyl that is sparsely hairy.

Leaves: Arranged oppositely, oval or elliptic in outline. Leaves range from 1/2 to 1 1/4 inches in length, are light green in color and smooth or possibly hairy toward base and on the petioles. Upper leaves are without petioles (sessile), while lower leaves are long petiolated.

Roots: A shallow, fibrous root system.



Stems: Usually running prostrate along the ground, rooting at the nodes, with the upper portion erect or ascending and freely branching. Stems are light green in color and with hairs in vertical rows.

Fruit: An oval, one-celled capsule, whitish in color, containing numerous seeds.

Flowers: Alone or in small clusters at the ends of stems. Flowers are small (3-6 mm wide) and consist of 5 white petals that are deeply lobed, giving the appearance of 10 petals.



Identifying Characteristics: The oppositely arranged small oval or elliptic leaves and stems with rows of hairs are both characteristics that help in the identification of common chickweed. **Mouseear Chickweed** (*Cerastium vulgatum*) is very similar in appearance and growth habit, however this species is densely covered with hairs unlike common chickweed.

Dandelion: *Taraxacum officinale*



Weed Description: A perennial from a basal rosette with yellow flowers and a 'puff-ball' seedhead. Dandelion is one of the most common and problematic weeds of turfgrass and lawns throughout the United States. Dandelion also occurs as a weed of container ornamentals, landscapes, nurseries, orchards, and occasionally agronomic crops.

Roots: Deep taproot up to 1/2 inch in diameter.

Seedlings:

Cotyledons are light-green, smooth, and oval to spatulate in shape. Young leaves form a basal rosette and are also oval to spatulate in shape, 2 to 6 inches in length.

Flowers: Large, bright yellow in color, approximately 1 1/4 to 2 inches in diameter. Flowers are solitary on the end of unbranched, leafless, hollow stalks (scape) that are 2 to 6 inches tall.



Leaves: Margins are noticeably wavy, especially on older leaves. All leaves are basal, ranging from 2 to 16 inches in length depending on the environment. Usually, leaves are more in the range of 2 to 8 inches in length. Leaves are oblong in outline, sometimes sparsely hairy, deeply indented with lobes that point toward the center of the rosette.

Stems: Erect, hollow flowering stems (scapes) occur that are approximately 2 to 6 inches in height.

Fruit: An achene that is brown, 3-5 mm long, with a feathery pappus attached that aids in wind dispersal of seed. Collectively, the achenes form a white seedhead that resembles a puff-ball.

Identifying Characteristics: The rosette growth habit, lobed leaves, yellow flowers, and characteristic 'puff-ball' seedheads are all features that help in the identification of dandelion. When in the rosette stage, **Chicory** (*Cichorium intybus*) and dandelion resemble one another. However, the lobes of chicory may point either toward the center of the rosette or away from the center of the rosette. Additionally, chicory has blue flowers and a flowering stem with alternately arranged leaves.

White Flowered Mazus (*Mazus japonicus*) also resembles dandelion in the rosette stage of growth, however the leaves of this weed are not as severely lobed as those of dandelion.



Large Crabgrass: *Digitaria sanguinalis*



Weed Description: Summer annual, having a prostrate or ascending growth habit with stems that root at the nodes. Major distribution in North America from Canada south to Virginia, Kentucky, and Texas, west to California. Usually not found in the lower south.

Stems: Prostrate, spreading, branched, and rooting at the nodes.

Seedling: Sheaths and blades usually densely hairy, with a jagged membranous ligule. Hairs on the blade and sheath are at a 90° angle to the plant surface. Seedlings are upright, leaves are rolled in the bud, and the first leaf blade is lanceolate to linear.

Roots: Fibrous root system.



Leaves: Blades 1 1/4 to 8 inches long, 3-10 mm wide, with hairs on both surfaces. Sheaths hairy and closed. Ligules are 1-2 mm long, membranous and appearing as if cut off straight across the end, with uneven teeth or margin. Leaves and sheaths may turn dark red or maroon with age.

Flowers: Seed head composed of 4-6 branches (spikes) at the top of stems, each approximately 1 1/2 to 7 inches long. Spikelets are elliptic and in two rows along the spike.

Seed: Shiny, yellowish-brown, 2-3 mm long.



Identifying

Characteristics: Densely hairy leaf and sheath and relatively large membranous ligule. Similar in appearance to **Smooth Crabgrass** (*Digitaria ischaemum*), but smooth crabgrass does not have hairs on leaves and sheaths, only a few hairs may be found in the collar region. Additionally, large crabgrass roots at the stem nodes while smooth crabgrass does not.



Yellow Nutsedge: *Cyperus esculentus*



Weed Description: A perennial from rhizomes and tubers that may reach 2 1/2 feet in height. The stems are 3-sided and triangular in cross section and the leaves are yellow to green in color with a distinct ridge. Found throughout North America as a common weed in agronomic and horticultural crops, nurseries, turfgrass, and landscapes.

Seedling: Seedlings rarely occur. Most plants arise from rhizomes and/or tubers. Leaves do not have ligules or auricles and have a distinct ridge along the midvein, but are nevertheless often mistaken for grasses.



Leaves: Yellow to green in color and have a distinctly shiny appearance. Leaves are 5 to 8 mm wide and have a distinct ridge along the midvein. Leaves are produced in groups of 3 from the base of the plant. Leaves are without hairs (glabrous) and no auricles or ligules are present. The leaves of yellow nutsedge taper gradually to a sharp point.

Stems: Erect, unbranched, and 3-sided and triangular in cross section. Stems are usually solitary and produce terminal spikelets.



Roots: Rhizomes and tubers occur on the same plants. Tubers are round, ridged, initially white in color, eventually turning brown or black, and are sweet to the taste. Yellow nutsedge produces solitary tubers that arise either from the basal bulb or from a rhizome. Several tubers do not arise along the entire rhizome, as in purple nutsedge.

Flowers: Spikelets occur at the ends of the solitary stems in a cluster where the flower stalks arise from a common point (umbel-like). Individual spikelets are yellow to brown in color.

Identifying Characteristics: **Purple Nutsedge** (*Cyperus rotundus*) is very similar in appearance and growth habit to yellow nutsedge, and the two are often confused. However, the leaves of purple nutsedge taper to a point abruptly whereas those of yellow nutsedge gradually taper to a point. Additionally, the seedhead of purple nutsedge is purple in color, while that of yellow nutsedge is yellow. Lastly, the tubers of purple nutsedge are often connected in chains and bitter to the taste, while those of yellow nutsedge are solitary and sweet to the taste. **Rice flatsedge** (*Cyperus iria*) and **Green Kyllinga** (*Kyllinga brevifolia*) are also similar when young, however rice flatsedge has a fibrous root system and green kyllinga has rhizomes that are usually red to purple in color.



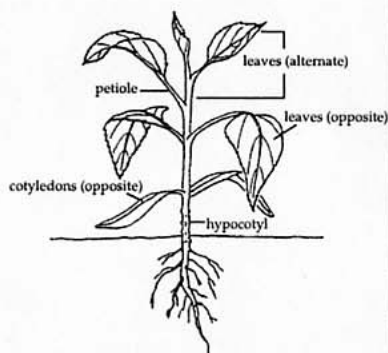
Broadleaf Weed Vegetative Key

Using this key. This key describes common broadleaf weed seedlings found in corn and soybeans in Illinois. It focuses primarily on characteristics of the true leaves, but in some cases the cotyledons are important (see figure below). Options A, B, and C describe weeds that have an alternate leaf arrangement. Option D contains weeds with an opposite leaf arrangement. The leaves of most weeds are either all alternate or all opposite. However, in some weeds, the early true leaves are opposite but later leaves are alternate. Note these exceptions given in the key. (Cotyledons are always opposite.) Once leaf arrangement has been determined, other characteristics of the leaves and cotyledons are needed to follow the key. It's very common when using a key to try more than one route before reaching the correct species. The sketches of many of the weeds are approximately life size. Others are roughly one-half as large as actual size and are indicated by 1/2X beside the sketch.

Prepared by C. Diane Anderson, William S. Curran, and other extension specialists in weed science, University of Illinois Extension, University of Illinois at Urbana-Champaign.

Available from ITCS Instructional Materials, Information Technology and Communication Services, College of Agricultural, Consumer and Environmental Sciences, 1917 S. Wright St., Champaign, Illinois 61820 (800) 345-6087 or FAX (217) 333-3917.

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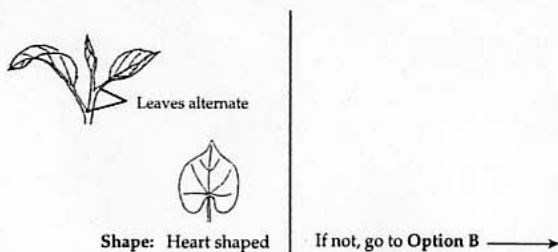


Plant Parts and Leaf Arrangement of Broadleaf Weeds

Ochrea of plants in the family Polygonaceae (Buckwheat or Smartweed family)

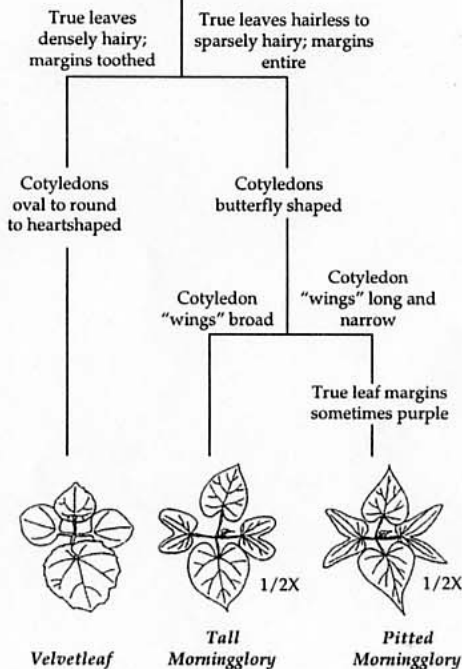


OPTION A. FIRST TRUE LEAVES Arrangement: ALTERNATE

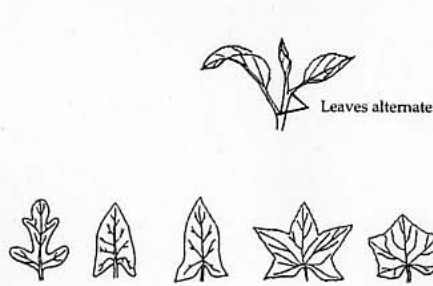


Shape: Heart shaped

If not, go to Option B →

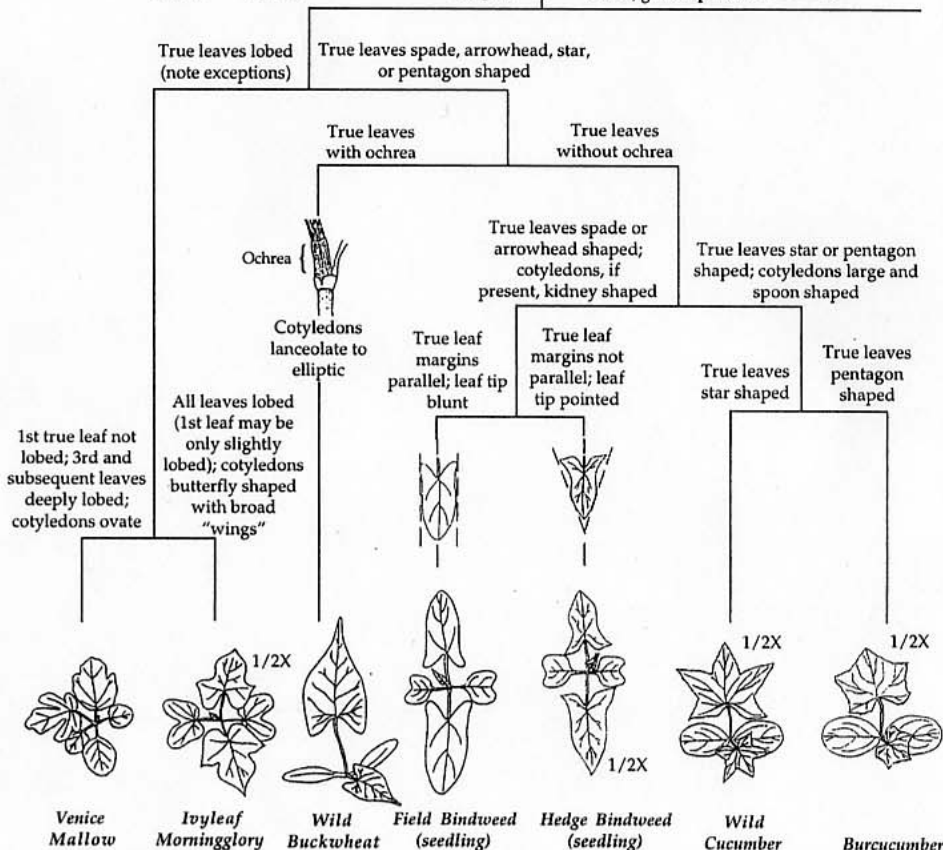


OPTION B. FIRST TRUE LEAVES Arrangement: ALTERNATE



Shape: Lobed Spade shaped Arrowhead shaped Star shaped Pentagon shaped

If not, go to Option C →



OPTION C.
FIRST TRUE LEAVES
Arrangement: ALTERNATE

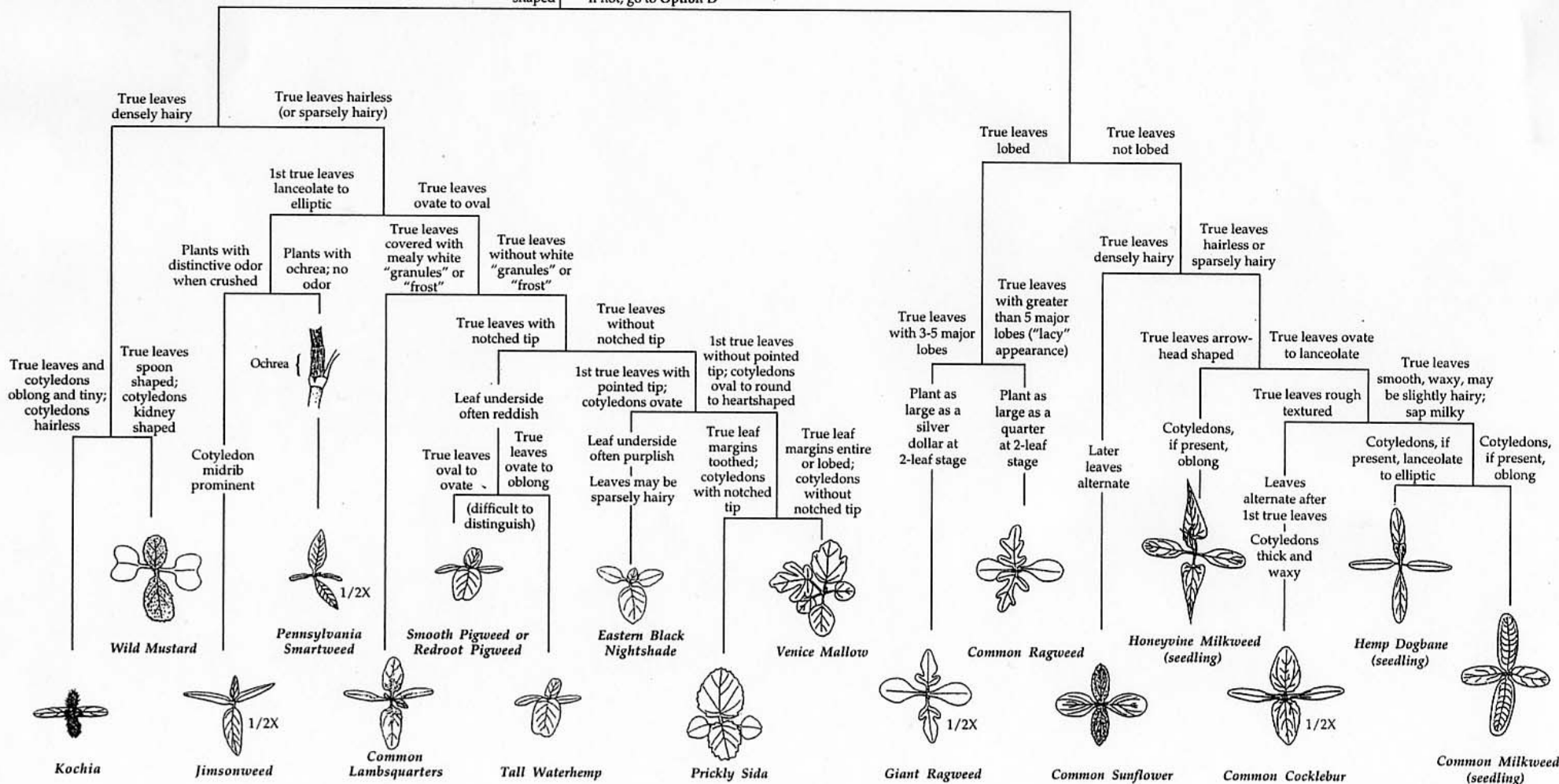


Shape: Oval Ovate Elliptic Lanceolate Oblong Spoon shaped

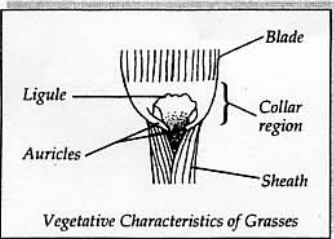
OPTION D.
FIRST TRUE LEAVES
Arrangement: OPPOSITE



If not, go to Option D →



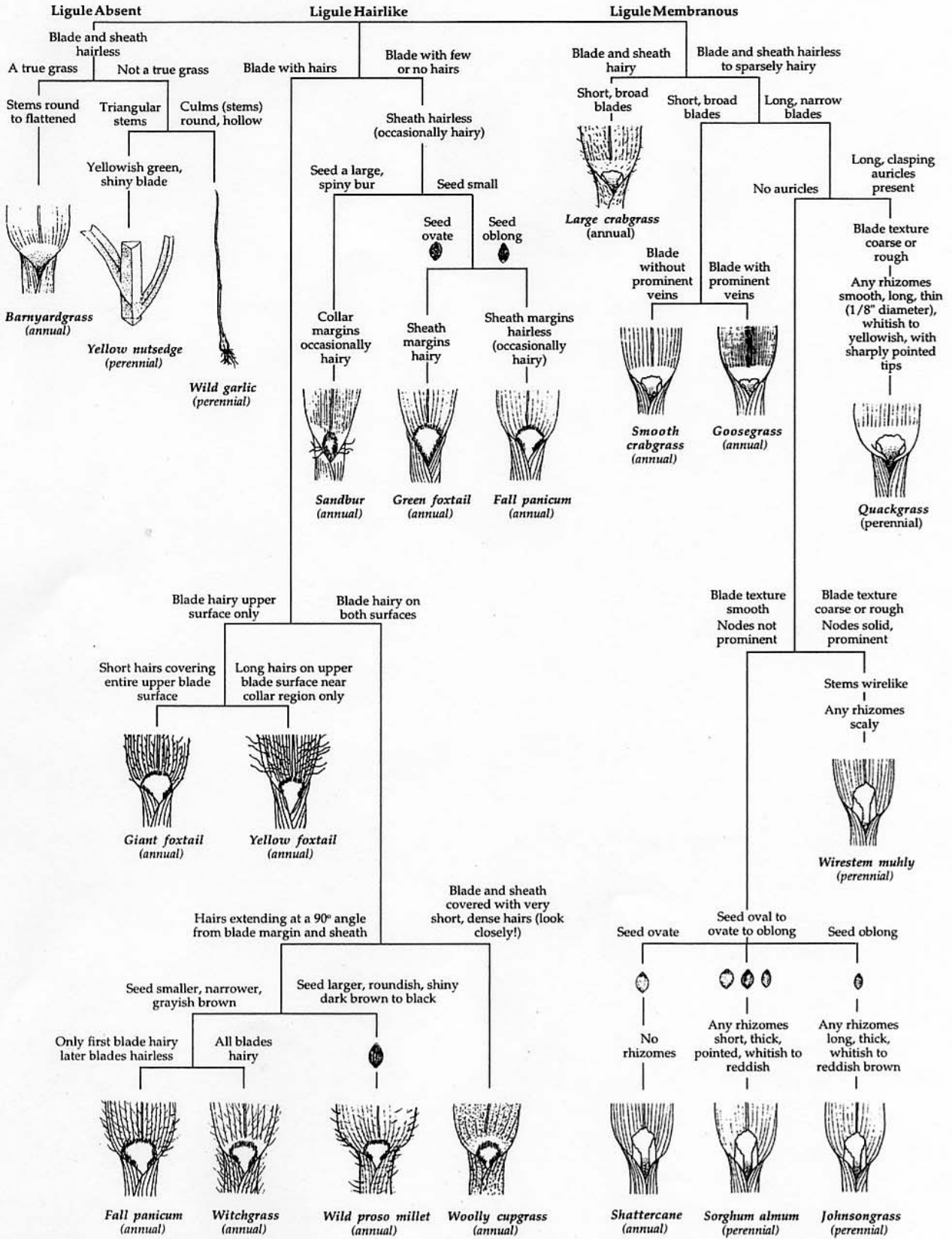
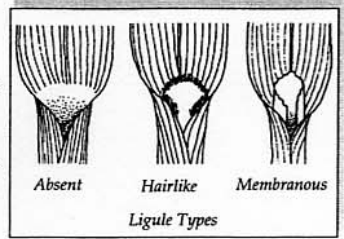
Grass and Grasslike Weed Vegetative Key



Prepared by C. Diane Anderson, and other Weed Science Extension Specialists, University of Illinois Extension, University of Illinois at Urbana-Champaign.

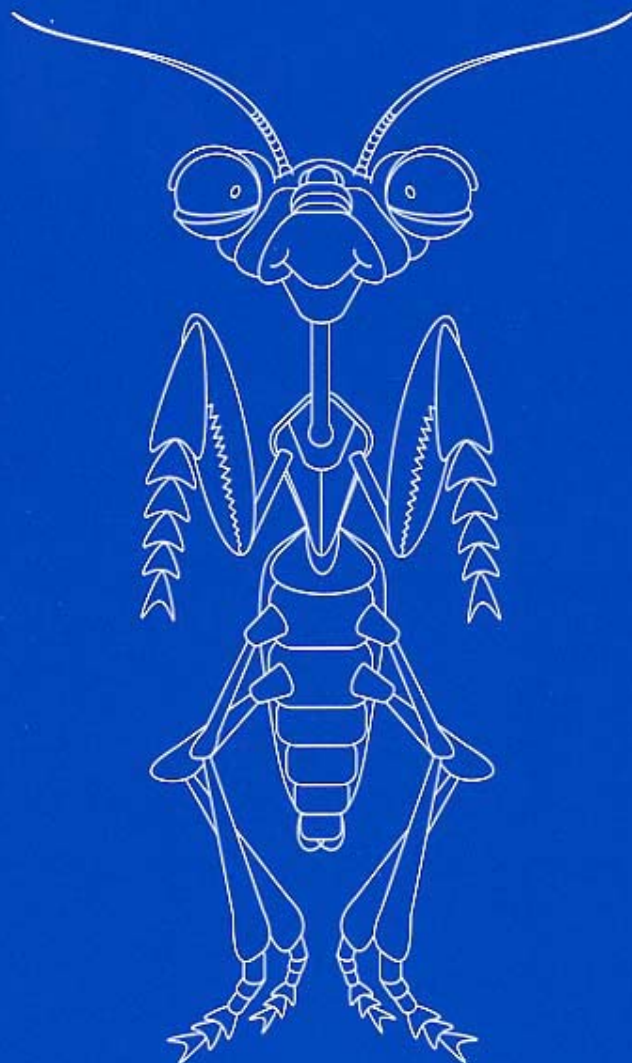
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"Broadleaf Weed Vegetative Key" and "Grass and Grasslike Weed Vegetative Key"

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