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Weed Identification

Description:	Learn the basic biology and how to identify ten weeds common to the northeastern United States
Subject:	Weed Identification
Duration:	2 periods 40 minutes in length
Grade Level:	Introduction to Advance 12th grade classes
Pennsylvania Academic Standards/Pennsylvania Ag Education:	4.4.12. A.1 Define the component of an agriculture system that would result in a minimal waste of resources.
Objective:	1. Students will be able to identify ten weeds commonly found throughout the northeastern United States 2. Students will describe the basic biology of the ten identified weeds.
Focus:	Write on the chalkboard, "what is a weed?" How is a weed different then a flower in a flower garden and a corn plant in a corn field. Ask students to share their first impressions that come to their minds. Discuss their responses. Have students explain why weeds can be viewed as a threat in agricultural and nonagricultural systems (i.e. natural areas, lawns, gardens, parks). Mention the loss of crop yield, quality, and economic effects.
Teach:	1. Ask students why is it important to properly identify weeds? Discuss their responses. Are their reasons mostly related to weed control? Discuss how there are specific control methods for specific weeds and how misidentification of weeds can result in no weed control. Do they mention economic effect? Applying the wrong herbicide to control weeds can result in the application of additional herbicides. 2. Show students the two example weed species. Point out the unique characteristics of the weeds and explain their basic biology. 3. Have students examine each of the ten weeds, making drawings of each and filling in the Weed Identification Activity Sheet provided. 4. At the end of the time period get students to think about what they have just learned. Ask them: o Which weed do they think would be the easiest to control with tillage? (broadleaves, leaves catch on tines of tillage equipment, easier to hand weed. etc.) o Which weeds are spread via seeds and underground tubers? (Yellow nutsedge) o What weeds are most likely to "hitch a ride" on animals and humans and why? (Burdock because of the burs)
Assessment:	1. Have students group weeds based on plant lifecycles, reproduction,

and plant type (study sheets for exam).

2. Administer a Weed Identification exam. Set up ten stations throughout the room. Each station should consist of one of the ten weeds and one or two questions on the Weed Identification Activity Sheet that correspond to that specific weed.

Resources:

Uva. R. H., J. C. Neal and J. M. DiTomoaso. 1997. Weeds of the Northeast. Cornell University Press. Ithaca. NY.

Liebman, M., C. L. Mohler. And C. P. Staver. 2001. Ecological Management of Agricultural Weeds. Cambridge University Press.

Westbrook, F. E. and L. C. Gibbs. 1978. Common Weed Seedlings of the United States and Canada. University of Georgia Press.

Davis, A., K. Renner, C. Sprague, L Dyer, and D. Mutch. 2005. Integrated Weed Management “One Year’s Seedling..”. Michigan State University Extension Bulletin E-2931.

Hartwig, N. L. 1996. Introduction to Weeds and Herbicides. Pennsylvania State University Extension Circular 365.

Lanin, T. and M. Wertz. 2001. Weed Management. Pennsylvania State University. http://weeds.cas.psu.edu/psuweedfactsheets.html.

Teacher Sheet

Name:

Date:

Class:

Weed Identification Lab

Weeds are defined as any plant growing where it is not wanted. Virtually any plant depending on location is considered a weed. Weeds are naturally strong competitors. There are approximately 8,000 species of plants that behave as weeds; of those only 200 to 250 are major problems in cropping systems world wide. Weeds must have a unique biology in order for them to become a major pest. Most agricultural weeds have been found to possess one or more of the following characteristics: abundant seed production, presence of vegetative reproductive structures, and the ability to become spread easily and in large numbers.

Weed management in cropping systems is a constant challenge faced by farmers. Competition between weeds and crops for limited resources causes an overall yield loss of about 12% annually. In the United States this yield loss costs producers over $15 billion. Proper weed identification is essential for maximum weed control. There are many different forms of weed control from chemical herbicides to tillage and the use of invertebrate weed seed predators. No matter which weed control tactic you choose, correct weed identification is needed. Some chemical herbicides that kill grassy weeds, for example, Poast (sethoxydim) will not control yellow nutsedge which is often mistaken for a grass.

Materials:

- 36 pots (three plants per weed species)
- Potting soil
- Water
- Print out fact sheets for 10 weed species
- Seeds from each of the 10 weed species
    - Yellow nutsedge
    - Giant foxtail
    - Large crabgrass
    - Velvetleaf
    - Common lambsquarters
    - Common cocklebur
    - Common ragweed
    - Wild carrot
    - Common burdock
    - Sheperd’s-purse

Procedure:

1. Show the students the two example weed species provided. Point out unique characteristics of each that students should use to identify these weeds.

2. One station will be setup for each of the weed species. Students will be able to examine vegetative, reproduction and flowering plant parts. Each station will also have a basic biology information card that will assist the students in answering the Weed Identification Activity Sheet.

3. Students will move from station to station examining each weed species identifying unique characteristics and making drawings of important characteristics.

Analyzing Results:

Students should complete the Weed Identification Activity Sheet

Student Sheet

Name:

Date:

Class:

Weed Identification Lab

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Materials:

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- Seeds from each of the 10 weed species
    - Yellow nutsedge
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    - Common lambsquarters
    - Common cocklebur
    - Common ragweed
    - Wild carrot
    - Common burdock
    - Sheperd’s-purse

Procedure:

1. One station is setup for each of the 10 weed species being observed. Examine vegetative, reproduction and flowering organs for each weed.
2. Make individual drawings of each weed, noting unique characteristics that will aid in proper identification later on.
3. Each station also has a basic biology information card, use this information card to fill in the appropriate boxes on the Weed Identification Activity Sheet.

Analyzing Results:

Students should complete the Weed Identification Activity Sheet

Weed Identification Activity Sheet

Name:

Date:

Class:

Common Name	**Scientific Name**	**Unique Characteristics**	**Origin**	**Life Cycle** (annual, biennial or perennial)	**Plant Type** (broadleaf or grass)	**Method of Reproduction** (seed, underground roots or shoots, both)	**Spread** (vehicles, animal, wind, water, birds, foot traffic, or manure, other)	**Problems to Agriculture**
1. Yellow Nutsedge (Pull one plant up so students can see nutlets)	*Cyperus esculentus*	• Triangular shaped stem • V-shaped leaf blades • Shiny or waxy upper surface • Yellow spiky flower	Native to North America and Eurasia	Perennial	Grass-like	• Produces up to 90,000 seeds • Underground tubers: nutlets (most important)	• Rhizome growth from tubers • Seeds: spread by animals, foot traffic, vehicles	Rice, peanuts, corn, cotton, soybeans, and potatoes
2. Giant Foxtail (Point out fringed ligule and small hairs on upper surface of blades)	*Setaria faberii*	• Ligule is fringed • Upper surface covered with fine hairs • Large, fuzzy arching panicle (Spike)	China	Summer Annual	Grass	Seeds	Animals, water, foot traffic, vehicles	Row crops: soybean, corn,
Common Name	**Scientific Name**	**Unique Characteristics**	**Origin**	**Life Cycle** (annual, biennial or	**Plant Type** (broadleaf	**Method of Reproduction** (seed,	**Spread** (vehicles, animal, wind,	**Problems to Agriculture**

				perennial)	or grass)	underground roots or shoots, both)	water, birds, foot traffic, or manure, other)	
3. Large Crabgrass (Point out large number of hairs)	*Digitaria sanguinalis*	• Leaf sheath tinted purple and covered with long hairs • Ligule membranous • Flowers look like segmented fingers from a hand	Native to Southern Europe	Summer Annual	Grass	Tillers and seeds (up to 150,000)	Animals, water, foot traffic, vehicles	Sorghum and soybean
4. Velvetleaf (Point out heart shaped leaves and taproot)	*Abutilon theophrasti*	• Heart shaped velvety leaves • Yellow flower • Heart shaped seeds • Taproot	India	Summer Annual	Broadleaf	Seeds (up to 8,000)	Animals, water, manure	Row crops especially corn and soybeans
5. Common lambsquarters (Point out white coating on leaves)	*Chenopodium album*	• Leaves have white coating • Triangular shaped leaves • Older leaves have toothed margins • Flower clusters located towards end of stems/branches	Native to North America however may also be from Europe or Asia	Summer Annual	Broadleaf	Seeds	Drops off parent plant and form patches around parent plant, dispersal by manure and harvesting equipment	Row crops
Common Name	**Scientific Name**	**Unique Characteristics**	**Origin**	**Life Cycle** (annual, biennial or perennial)	**Plant Type** (broadleaf or grass)	**Method of Reproduction** (seed, underground roots or shoots, both)	**Spread** (vehicles, animal, wind, water, birds, foot traffic, or manure, other)	**Problems to Agriculture**

6. Common Cocklebur (Point out sharply toothed leaves and rosette)	*Xanthium pensylvanicum*	• Leaves are alternate and toothed with 3-5 lobes • Upper surface of leaves is darker then lower surfaces • Visible midvien • Stiff short hair on leaves • Seed pods are burs	Germany	Summer Annual	Broadleaf	Seeds	Wind, water, animals, birds, foot traffic, vehicles	Competitive with soybeans and other field crops
7. Common Ragweed (Point out deeply lobed leaves with rounded edges)	*Ambrosia artemisiifolia*	• Deep clefts in margin, forming lobes that are rounded and slightly pointed at the ends • Dense hairs on lower surfaces of leaves	Native to North America	Summer Annual	Broadleaf	Seeds (up to 62,000)	Water, birds, animals, foot traffic	Row crops and cereals

Common Name	**Scientific Name**	**Unique Characteristics**	**Origin**	**Life Cycle** (annual, biennial or perennial)	**Plant Type** (broadleaf or grass)	**Method of Reproduction** (seed, underground roots or shoots, both)	**Spread** (vehicles, animal, wind, water, birds, foot traffic, or manure, other)	**Problems to Agriculture**
9. Common Burdock (point out fleshy leaves with stiff hairs on top and whitish wooly hairs on bottom)	*Arctium minus*	• Leaves: rosette, triangular or oval, fleshy, coarsely veined, notched at tip • Stiff hairs on surface and lower surfaces are whitish and woolly • 2nd year: flower (burs) stalk emerges from center of rosette	Europe	Biennial	Broadleaf	Seeds (up to 15,000)	Animals, birds, human traffic	Not a crop weed problem in tilled field growth, mostly found in old fields along borders and fence rows. No till problem.
10. Sheperd's Purse (point out deeply indented leaves)	*Capsella bura-pastoris*	• Rosette • Leaf margins are toothed or wavy • Older leaves are indented more than halfway to the midvein • 2nd year: tiny white flowers, seed pods heart-shaped	Europe	Winter Annual or Biennial	Broadleaf	Seeds (up to 50,000)	Wind	Problem of vegetable crops and winter cereals can be alternative host for diseases and can harbor viruses

Weed Identification Activity Sheet

Name:

Date:

Class:

Common Name	**Scientific Name**	**Unique Characteristics**	**Life Cycle** (annual, biennial or perennial)	**Plant Type** (broadleaf or grass)	**Method of Reproduction** (seed, underground roots or shoots, both)	**Problems to Agriculture**
1.						
2.						
3.						
Common Name	**Scientific Name**	**Unique Characteristics**	**Life Cycle** (annual, biennial or perennial)	**Plant Type** (broadleaf or grass)	**Method of Reproduction** (seed, underground roots or shoots, both)	**Problems to Agriculture**

4.						
5.						
6.						
7.						
Common Name	**Scientific Name**	**Unique Characteristics**	**Life Cycle** (annual, biennial or perennial)	**Plant Type** (broadleaf or grass)	**Method of Reproduction** (seed, underground roots or shoots, both)	**Problems to Agriculture**
8.						

9.						
10.						

Mechanical Weed Control: White Thread Stage

Description:	Learn about early weed control's affect on weed vitality
Subject:	Mechanical Weed Management
Duration:	o Plant weed seeds - 30 minutes o Rake trays (after 5 days, 10 days and 15 days) - 10 minutes o Take observations 30 days after planting - 20 minutes
Grade Level:	Introduction to Advance 12th grade classes
Pennsylvania Academic Standards/Pennsylvania Ag Education:	4.4.12. A.1 Define the component of an agriculture system that would result in a minimal waste of resources.
Objectives:	1. Identify plant life stages. 2. Discuss mechanical weed control practices and susceptibility of seedlings to control. 3. Discuss timing of mechanical weed control.
Focus	Write on the chalk board timing of weed control. Ask students why they think timing of control practices is important to weed control. Discuss their answers. Do they mention the amount of plant death, repeated control practices, economics.
Teach:	1. Discuss the plant life stages. Mention the white thread stag of seedlings. 2. Discuss tillage as a form of weed control. Ask students to make a list of benefits and downfalls of tillage. 3. Have students observe the effect of tillage timing on plant vitality. 4. At the end of the lesson ask students the following questions: o When is it most beneficial time to till a field? When the weeds are in the white tread stage (the earliest time possible). o Why are the plants vulnerable at this stage? Used most of their stored energy (seed) to germinate and begin growth.cDamage to plant structures has a higher mortality rate. o If tillage after 20 days did not have a high mortality rate what can you do to manage the remaining weeds? Till again or use herbicides.
Assessment:	1. Students will be evaluated based their completion of the weed control lab exercise. 2. Observations from this lab will be incorporated into a lab exam.
Resources:	Davis, A., K. Renner, C. Sprague, L Dyer, and D. Mutch. 2005. Integrated Weed Management "One Year's Seedling..".

Michigan State University Extension Bulletin E-2931.

Liebman, M., C. L. Mohler. And C. P. Staver. 2001. Ecological Management of Agricultural Weeds. Cambridge University Press.

Taiz, L. and E. Zeiger. 2002. Plant physiology. Sinauer Associates, Inc. Sunderland. MA.

Teacher Sheet

Mechanical Weed Control: White Thread Stage

Name:

Date:

Class:

Properly timed tillage events can drastically suppress weed populations. Timing of tillage is based primarily on the weeds life cycle. The most effective time to control annual weeds is when they are at their most fragile life stage, the white thread stage. During this time, tillage can prevent weed problems by weakening the plants after they have invested a large amount of energy in germination, stem elongation, and leaf and root production.

A plant's life cycle describes how long a plant lives. There are four main life cycle stages: seed, growth, reproduction and death. Most plants start out as a seed. That seed develops using energy stored in the seed to germinate, push through the soil, and develop stems, roots and leaves becoming a young seedling. The seedling continues growing; however, instead of using the stored energy in the seed, the young plant can now perform photosynthesis to make food using the sun’s energy. As the plant matures it starts putting more energy into reproduction, either by creating flowers and seeds or vegetative structures (i.e. stolons, rhizomes and tubers). Once these plants have produced seed and completed reproduction annual plants die and the white thread stage will begin again with the germination and development of the next generation.

Materials:

- Seeds
- Soil
- Planting Trays
- Water
- Hand Rake

Possible Annual Broadleaf Seeds

Weeds

Common Lambsquarters, Redroot Pigweed, Velvetleaf

Crops

Buckwheat, Soybean, Canola

Possible Annual Grass Seeds

Weeds

Procedure:

1. Separate students into 4 groups.

2. Choose one annual broadleaf seed and one annual grass seed. Assign each group a seed type, two groups using the same broadleaf seed and the other two groups using the same grass seed.

3. Direct the students to plant 100 seeds randomly throughout the planting trays.

4. Water planting trays when needed.

5. Five days after planting direct the students to select one planting tray and use the hand rake to rake the entire planting tray once. Show the students the small developing white thread plants that are exposed with the tillage (photo 1).

6. Have students make observations 30 days later, counting the number of thriving plants. Record results on lab exercise.

7. Direct students to repeat numbers five and six. The second plating tray should be raked ten days after planting and observed 30 days later. The third planting tray should be raked 20 days after planting and observed 30 days later.

8. Have students write their results on the chalk board and compare results with the rest of the class. From the results students will determine when the highest mortality occurred for each plant species thereby, determining the best time to control each weed species.

Photo 1. White thread stage.

Results:

Data Table1: Annual Broadleaf

Tillage Time After Planting	Group #1 Number of Thriving Plants	Group # 2 Number of Thriving Plants	Average Number of Thriving Plants
5 days			
10 days			
20 days			

Date Table 2: Annual Grasses

Tillage Time After Planting	Group #3 Number of Thriving Plants	Group # 4 Number of Thriving Plants	Average Number of Thriving Plants
5 days			
10 days			
20 days			

1. What tillage timing had the largest amount of broadleaf mortality and why?

Based on student results. – small seeded broadleaves will be impacted the most (pigweed vs. ragweed). Broadleaf weeds or dicots are generally more susceptible to this mechanical control because the growing point or meristem is above ground at the apex of the plant.

2. What tillage timing had the largest amount of grass mortality and why?

Based on student results. – grasses are less effectively controlled at this time. The development of grasses allows the growing point to remain below the soil surface helping them to survive.

3. When would be the best time for a farmer to till his fields if he/she had a combination of all weed types and why?

"Blind" weeding is used within the first two or three weeks of planting crops and is generally first used within the first week after planting. Farmers should till as soon as the white thread stage of weeds can be seen and repeated until the weeds are visible above the surface of the soil. Weed seedlings in the white thread stage have used up a majority of energy reserves and have a higher mortality rate when injured.

4. If a tillage event had a low weed mortality rate due to poor timing of tillage what could the farmer do to reduce the weed infestation?

The farmer could use a different type of tillage such as row cultivation or consider using a rescue herbicide if allowed in their farming operation.

Student Sheet

Mechanical Weed Control: White Thread Stage

Name:

Date:

Class:

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A plant's life cycle describes how long a plant lives. There are four main life cycle stages: seed, growth, reproduction and death. Most plants start out as a seed. That seed develops using energy stored in the seed to germinate, push through the soil, and develop stems, roots and leaves becoming a young seedling. The seedling continues growing; however, instead of using the stored energy in the seed, the young plant can now perform photosynthesis to make food using the sun’s energy. As the plant matures it starts putting more energy into reproduction, either by creating flowers and seeds or vegetative structures (i.e. stolons, rhizomes and tubers). Once these plants have produced seed and completed reproduction, annual plants die and the white thread stage will begin again with the germination and development of the next generation.

Materials:

- Seeds
- Soil
- Planting Trays
- Water
- Hand Rake

Procedure:

1. Plant all of the assigned weed seeds in the planting tray.

2. Water planting trays as necessary.

3. Five days after planting select a planting tray and hand rake the entire planting tray once or twice.

4. Repeat number 3 at 10 and 15 days after seeding in separate trays. The second plating tray should be raked ten days after planting – again observe and the impact on the developing seedlings and the third planting tray should be raked 15 days after planting and again evaluated for the impact on the seedling weeds. On all trays, make observations 30 days after seeding by counting the number of surviving thriving plants. Record results on lab exercise.

5. Write your group's results on the chalk board and compare your results with those of your class. Determine when the highest mortality rate occurred for each plant species thereby, determining the best time to control each annual weed species.

Photo 1. White thread stage.

Results:

Data Table1: Annual Broadleaf

Tillage Time After Planting	Group #1 Number of Thriving Plants	Group # 2 Number of Thriving Plants	Average Number of Thriving Plants
5 days			
10 days			
15 days			

Date Table 2: Annual Grasses

Tillage Time After Planting	Group #3 Number of Thriving Plants	Group # 4 Number of Thriving Plants	Average Number of Thriving Plants
5 days			

10 days			
15 days			

1. What tillage timing had the largest amount of broadleaf mortality and why?

2. What tillage timing had the largest amount of grass mortality and why?

3. When would be the best time for a farmer to mow his fields if he/she had a combination of all weed types and why?

4. If a tillage event had a low weed mortality rate due to poor timing of tillage what could the farmer do to reduce the weed infestation?