



Curses!!! Foiled by a Seed



Grade: 9 to 12

Length: variable

Subjects: life science

Topics: weed facts, forensic science

Objectives

Exercises in this lesson help students achieve the following objectives:

- Understand basic growth characteristics of specific weeds
- Understand how forensic scientists use information to solve crimes
- Solve an imaginary crime

Introduction

Botany plays a part in the process scientists use to solve crimes. Scientists often use plants, especially weed seeds, to help solve crimes. Students will be introduced to the science of forensic botany. Students will solve an imaginary crime by identifying weed seeds, determining the environmental conditions the seed requires, and identifying those environmental conditions on a map that shows the potential crime scenes. Before teaching this lesson, read the entire lesson and make sure all materials are available.

Background

Weeds need certain resources to thrive, and weeds grow in environments that are most suitable to their needs. Water is one of the most limiting environmental factors. Some weeds have developed the ability to live in very dry climates; others require moist conditions. Some weeds are able to live in dry or moist conditions. Forensic botany is the ap-

plication of botanical knowledge to criminal law. For scientists who practice forensic botany, knowing which weeds grow in certain environments can be very important.

Preparation

Materials

- videotaped segment from a forensic television show, especially one that involves botany
- 1 Show students a segment from a forensic television show.
 - 2 Discuss forensic science and how a forensic botanist can apply his or her knowledge to help solve a crime.

Activity

Materials

- copies of the *It's Elementary, My Dear Watson* worksheet - Have available one copy for each student.
 - Weed Seed Image Library (See *Weed Seed Image Library.ppt* on the CD that accompanies this curriculum.)
 - Weed Seeds From the Crime Scene (See *Weed Seeds From the Crime Scene.ppt* on the CD that accompanies this curriculum.)
- 1 Give each student a copy of the *It's Elementary, My Dear Watson* worksheet. Discuss the crime scene scenario.
 - 2 Using the PowerPoint presentation *Weed Seeds From the Crime Scene.ppt*, show students images of the seeds collected from the crime scene. Do not identify the seeds for students.
 - 3 Make available the PowerPoint presentation *Weed Seed Image Library.ppt*. Challenge students

to first identify the seeds collected from the crime scene. Then, students should use the weed descriptions on the worksheet to determine where to look for the governor's son.

- 4 Have students fill out the *Forensic Lab Report* after they have solved the crime.



The seeds from the crime scene are curly dock, hound's tongue, quack grass, Canada thistle, and water hemlock. Hound's tongue, quack grass, and Canada thistle tend to grow near water. Curly dock is almost always found near water, and water hemlock grows in wet conditions. These clues would indicate that the governor's son is found near water. As it turns out, the governor's son has been hidden in a remote spot near campground #6.

Conclusion and Evaluation

- Conclude the lesson when students have finished filling out the *Forensic Lab Report*.
- Evaluate students based on the lab report. After students have turned in all reports, select some students to present their recommendations to the entire class.

Independent Practice and Related Activities

- Create different crime scenes with varying degrees of complexity. Use the *Activity* in conjunction with investigations involving DNA testing, blood work, and other forensic tests.

Vocabulary

aggressive, alkaline, allelopathic, annual, biennial, inconspicuous, mechanical means, perennial, rhizomes

Resources

Whitson, Tom, ed., Larry C. Burrill, Steven A. Dewey, David W. Cudney, B.E. Nelson, Richard D. Lee, and Robert Parker. *Weeds of the West*. 5th ed., Jackson: Pioneer of Jackson Hole, 1999.

Weed Seed Library Images courtesy of Doug Pals, secondary ag instructor from Culdesac, Idaho and Terry Crawford, Department of Agriculture and Extension Education, University of Idaho.

National Science Education Standards

As a result of activities in grades 9 to 12, students should develop abilities in and an understanding of the following areas:

Life Science – Content Standard C: interdependence of organisms

Science in Personal and Social Perspectives - Content standard F: science and technology in local, national, and global challenges

Weed Warrior Worksheet

It's Elementary, My Dear Watson Page 1 of 4

Crime Scenario

The governor's son has been kidnapped. The kidnapper is inept and sets up a foolish plan to receive the ransom. When it is time for the governor to pay the ransom, the kidnapper realizes his mistakes, panics, and takes an overdose of drugs. The police find the kidnapper and his rented vehicle, but the kidnapper is in a coma. Time is of the essence. The governor's son must be located quickly. Where should the police begin their search? Using rental records, the police determine that the governor's son is hidden within a 20-mile radius of where they found the vehicle. The police know they lack the resources to perform an exhaustive search. The kidnapper's vehicle has weed seeds embedded in the tire treads. Knowing that you are a botanical wizard, the police come to you for help. By looking at the seeds, identifying them, and looking at a map of the area, try to determine where the police should focus their search.

1 Using the Weed Seed Image Library, identify the seeds found at the crime scene.

2 Read the Weed Descriptions and use the information to determine where to search for the governor's son.

Hint: What type of environment do the seeds found at the crime scene prefer? Where do the seeds typically grow?

Using the scale shown on the map, draw a circle with a 20-mile radius around the kidnapper's vehicle.

Weed Descriptions

- 1. Russian Knapweed** – Probably introduced to North America sometime during the late 1800s from Eurasia. Russian knapweed is a **perennial** that grows mainly in cultivated fields, pastures, and roadsides. The plant grows to a height of 2 to 3 feet and has cone-shaped flowering heads with purple to pink flowers.
- 2. Leafy Spurge** – Probably introduced to North America around 1820 from Eurasia. Leafy spurge is a perennial that grows mainly in pastures and grazing lands. The seeds are often carried by water, so the plant is usually found along waterways. Leafy spurge grows to a height of 3 feet and propagates from seed or root stalk. It contains a milky juice, which has been reported to cause severe irritation of the mouth and digestive tract in cattle.
- 3. Wild Oat** – Native to Europe, wild oat is an **annual** that grows 1 to 4 feet in height. It closely resembles domestic oats and grows in cultivated fields and pastures and along roadways. The seeds can remain dormant for up to 10 years.
- 4. Burdock** – Native to Europe, burdock is now found throughout most of North America. Burdock is a **biennial** and grows to a height of 3 to 10 feet. It grows along roadsides and ditch banks and in pastures and grazing areas. Burdock produces burs that can become entangled in the hair of animals. Animals spread the plant to new areas by carrying the burs.
- 5. Lambsquarters** – Native to Europe, lambsquarters is an annual and grows to a height of 1 to 6

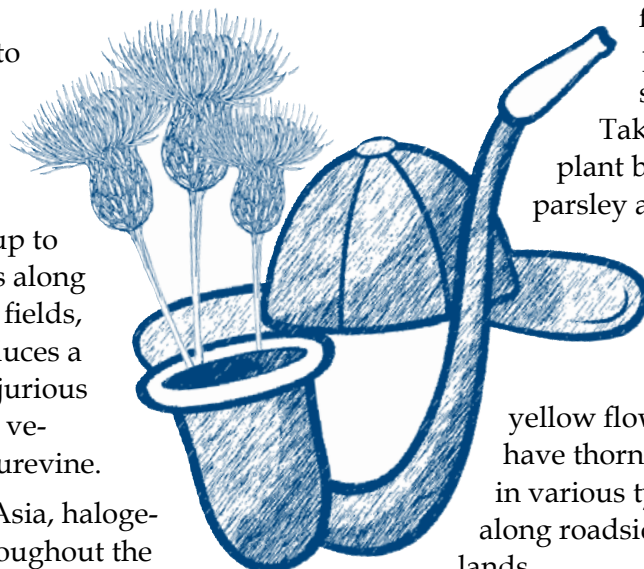


feet. It grows in cultivated fields, gardens, and waste areas. The flowers are **inconspicuous**. Lambsquarters produces numerous seeds.

6. **Quackgrass** – Native to the Mediterranean area, quackgrass is a perennial grass, reproducing from seed or root. It grows to a height of 1 to 3 feet. Quackgrass grows in lawns, pastures, and rangeland, especially along ditch banks. Broken **rhizomes** have the ability to grow, so it is very difficult to control using **mechanical means**. Quackgrass might be **allelopathic**.
7. **Canada Thistle** – Native to Eurasia, it is a perennial that was introduced to North America possibly as early as the late 1700s. Canada thistle grows to a height of 1 to 4 feet and is very **aggressive**. It reproduces from seed or roots. It can be found in pastures, rangeland, and waste areas. Canada thistle tends to grow in wet areas more frequently than other types of thistle.
8. **Field Bindweed** – Native to Europe, field bindweed is a low-growing perennial that can entwine around other plants or objects, or it can form a dense mat. It reproduces from seed or roots. Its roots can reach a depth of 10 feet. Seeds can lie dormant in the soil for up to 50 years. It can be found in cultivated pastures, gardens, or in waste places. It produces a trumpet-shaped flower.
9. **Puncturevine** – Native to southern Europe, puncturevine is now found throughout much of the United States. Its horizontal stems grow up to 5 feet in length. It grows along roadways, in cultivated fields, and waste areas. It produces a spiny bur that can be injurious to livestock. Animals or vehicles can spread puncturevine.
10. **Halogeton** – Native to Asia, halogeton is now common throughout the

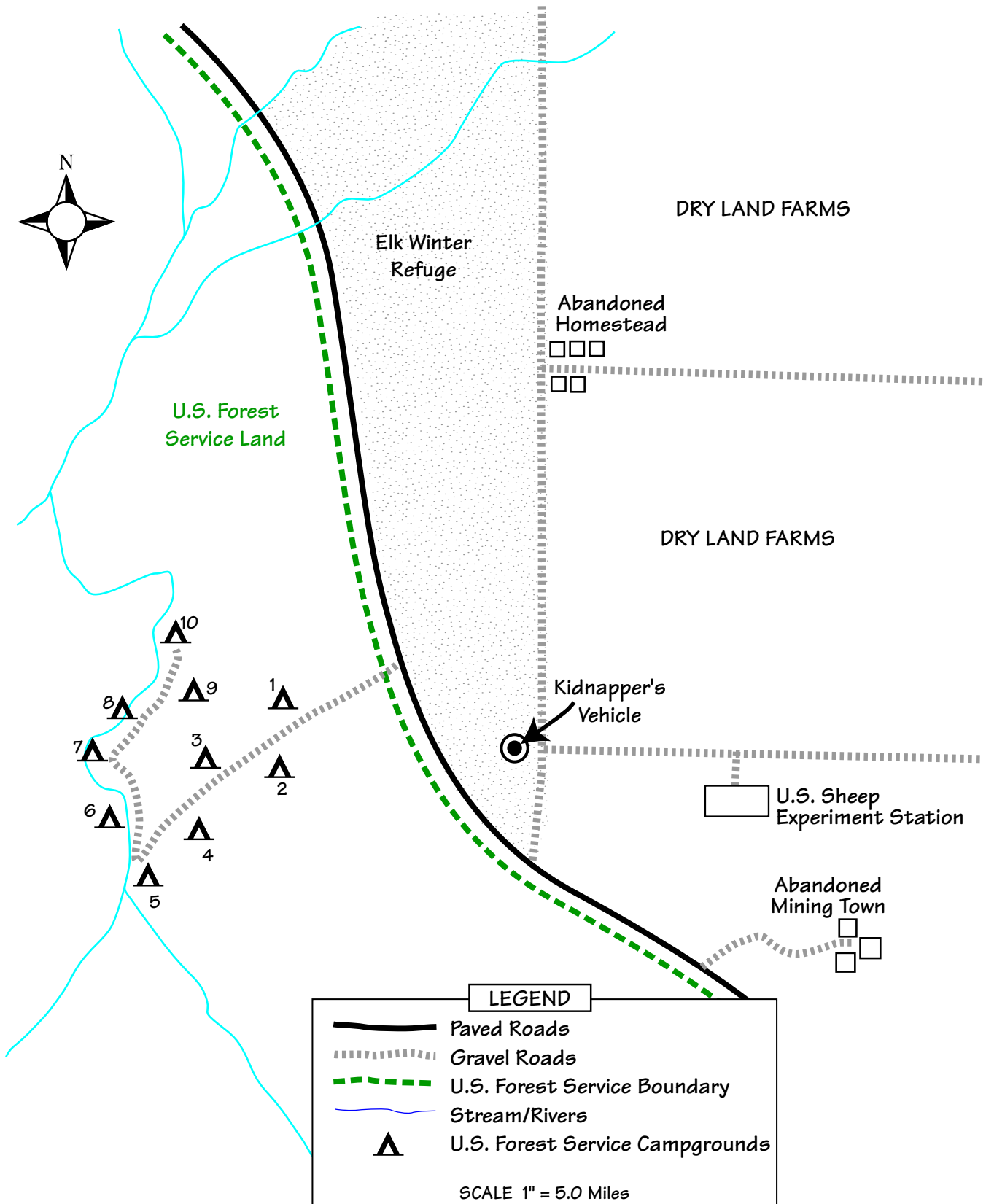
western United States. It is an annual, ranging in height from a few inches to 18 inches. It grows in highly **alkaline**, semi-arid soils. It produces substances that are poisonous to sheep and cattle.

11. **Curly Dock** – Native to Eurasia, curly dock is a deep-rooted perennial, growing from 2 to 5 feet tall. Flowers are inconspicuous, and it produces many seeds. It tends to grow in wet meadows and along ditch banks.
12. **Downy Brome Grass** – Native to the Mediterranean region, downy brome grass is now found throughout the western United States. It is a winter annual that out-competes native grasses for spring moisture. It grows along roads, in misused pastures, and in rangelands and crop lands. After it matures, it can become a serious fire threat.
13. **Houndstongue** – Native to Europe, this biennial grows from 1 to 4 feet high. It can grow in pastures or rangelands. It is often found along waterways. It produces substances that can be lethal to cattle and horses. The plant produces seeds that cling to clothing or fur.
14. **Water Hemlock** – Native to the intermountain region, it is a perennial and highly poisonous. Water hemlock grows from 3 to 7 feet high. It is a wetland plant that thrives along streams and irrigation canals. Take care when identifying this plant because it closely resembles parsley and other edible plants.
15. **Yellow Starthistle** – Native to Europe, it is an annual that grows from 2 to 3 feet high. It produces yellow flowers, and the flower heads have thorns up to 3/4-inch long. It grows in various types of soil and can be found along roadsides, waste areas, and rangelands.



It's Elementary, My Dear Watson Page 3 of 4

Crime Scene Map



It's Elementary, My Dear Watson Page 4 of 4

Forensic Lab Report

Investigator's name: _____

Date: _____

Write one or two paragraphs summarizing the problem.

Describe the procedure you used.

What conclusion did you draw and why?

Investigator's signature: _____



Weed Warrior Worksheet

Weedy Definitions

aggressive - vigorous, fast-growing

alkaline - having the properties of or containing an alkali (an acid neutralizing chemical substance); Alkaline substances have a pH greater than 7.0

allelopathy - the process through which some weeds out-compete other species by poisoning the soil with a chemical that inhibits the growth of other plants

annual - a plant that flowers, produces seed, and dies in one growing season

biennial - a plant that lives for two years and produces flowers and fruit in the second year

inconspicuous - not easily seen or noticed

mechanical control - pulling weeds by hand; removing them with weedeaters, chainsaws, or mowing; or using fire to control weeds

perennial - a plant that lives for more than two growing seasons

rhizomes - thick underground horizontal stems that produce roots and have shoots that develop into new plants



Weed Warrior Worksheet

Weedy Word Find

Find the following words:

alkaline biennial inconspicuous aggressive
mechanical rhizomes perennial allelopathic
annual

M	E	N	I	L	A	K	L	A	C	P	S	S	E	G
E	M	K	Y	R	J	G	M	A	E	O	U	O	T	N
C	J	S	U	C	P	F	G	R	I	O	U	U	T	N
H	Z	E	A	R	U	H	E	R	U	N	I	V	F	J
A	G	C	S	M	K	N	J	C	E	X	N	Y	A	V
N	A	O	T	G	N	L	I	D	G	S	U	E	Y	A
I	B	D	P	I	A	P	A	F	H	R	S	J	I	M
C	X	Y	A	U	S	M	V	S	B	B	T	I	L	B
A	J	L	N	N	V	L	R	E	V	G	B	O	V	K
L	E	N	O	O	K	F	B	M	F	R	W	Y	N	E
F	A	C	A	L	L	E	L	O	P	A	T	H	I	C
Z	N	Q	L	N	C	L	U	Z	L	R	T	Y	C	N
I	B	W	Z	E	J	G	I	I	A	N	Y	U	C	E
U	J	O	O	J	K	G	B	H	J	F	O	K	A	M
I	Q	T	G	L	D	C	E	R	F	S	Z	Q	F	I