LESSON 45

Managing Invasive Plants

Grade level: 5-8
Subject Areas: Biology, writing, technology, social studies
Duration: Several class sessions, plus travel time to field sites.
Setting: Classroom and field site(s)
Season: Fall, Spring or Summer to observe field sites; anytime for classroom work.
Conceptual Framework Topics: Invasive plant management, weed management plans, career exploration, taking action

OBJECTIVES

Students will understand that weed management is a complex issue that may require many different kinds of actions. They will realize that different people have different viewpoints about how to manage weeds, and that appropriate management may differ depending on the desired outcomes and the place.

METHOD

Students brainstorm and discuss factors contributing to weed invasions and efforts that can help control weeds. They read about different perspectives on weeds and weed management, and may conduct their own interviews of people in their area. They develop their own weed management plan based on their knowledge of control methods and the desired outcomes for the area.

MATERIALS

- ✎ **Integrated Plant Management (IPM) flowchart worksheet**
- ✎ **Integrated Plant Management (IPM) Options Chart**
- ✎ **Weed Management Plan Template**

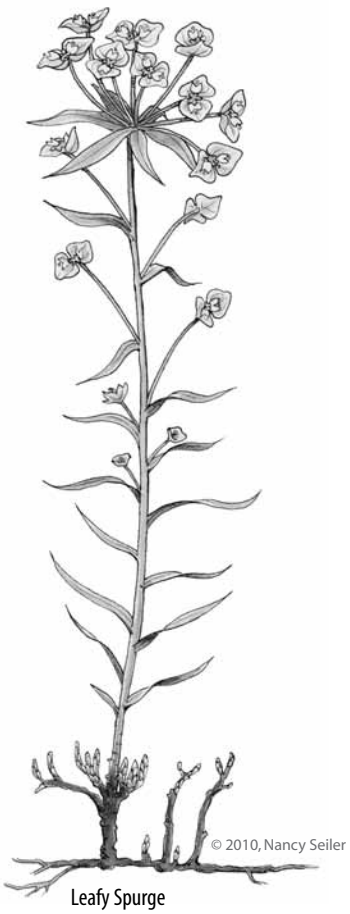
BACKGROUND

Why Are Weeds a Problem?

The spread of invasive non-native plants is a serious environmental problem in North America. Controlling them costs ranchers, farmers, conservation groups, utility companies, governments, and citizens millions of dollars each year. It has been estimated that the economic impact of leafy spurge in Montana, North and South Dakota, and Wyoming totals $129.5 million each year and may result in the loss of 1,433 jobs. In Montana alone, spotted knapweed is estimated to cost $42 million each year.

The list of problems weeds can cause is long:

- ***They can displace native plants,*** including rare and endangered species.
- ***Invasive plants can diminish wildlife habitat*** by reducing forage, cover, and water availability. These changes can affect a variety of fauna, from soil organisms, invertebrate and vertebrate pollinators, herbivores, and seed-eaters, to the predators which feed on all of these. For example, research shows decreased use by ungulates of areas with heavy infestations of knapweed and spurge. In Montana, rare plants threatened by invasive plants include Sapphire rockcress, Missoula phlox, and Ute ladies'-tresses.
- ***Invasive plants can reduce the yield and quality of agricultural crops.*** Grazing capacities for livestock can be reduced 65% to 90% by weed invasions. Weeds cost farmers in Montana over $100 million each year in expenses and reduced crop production.



Leafy Spurge
Euphorbia esula

• ***Invasive plants can increase soil erosion and stream sedimentation.*** In one study, runoff was 1.5-times higher and sediment was 3 times higher on spotted knapweed-dominated plots than on plots dominated by the native bluebunch wheatgrass (Montana's state grass). Increased runoff tends to result in greater loss of soil and increased sedimentation in streams.

• ***Some invasive plants are toxic to humans, pets, livestock, and wildlife.*** They may irritate the skin or cause sickness or death if eaten by animals.

• ***Invasive plants may lower recreational values.*** Many invasives cause unpleasant conditions for recreation, due to prickliness (thistles, knapweed), burrs (houndstongue), access for boating, fishing and swimming (Eurasian watermilfoil) and simply by displacing the native vegetation and fauna that enhance outdoor experiences.

• ***Invasive plants can alter the water table and impact riparian areas.*** Tamarisk (saltcedar), which has invaded riparian areas and wetlands throughout the country, including eastern Montana, uses much larger quantities of water than native species. This lowers water tables and, in some areas, has eliminated surface water and native vegetation. Saltcedar infestations can affect carrying capacities and flooding cycles of waterways.

Why are many weeds difficult to control?
Successfully invading species tend to have one or more of the following characteristics:

- They reproduce quickly by producing many seeds.
- Their seeds may remain viable for several years.
- They grow quickly.
- They are able to spread vegetatively (that is, through their roots or pieces of the plant).
- They have deep roots (leafy spurge roots can reach 20 feet in length!).
- They are not palatable to livestock and wildlife.
- They are not susceptible to local diseases, parasites, herbivores, etc.
- They are allelopathic – they give off chemicals that inhibit the germination or growth of other plants.

What is the best way to manage weeds?
The best weed management strategies to use depend on the weed species, the area, the goals for management, the resources, and many other factors. An ecologically-based, adaptive, integrated approach is usually most effective in the long run. This includes creating a management plan that assesses many aspects, and allows for monitoring the site and modification of the actions, if necessary.

It may include some or all of the following methods of weed control:
1. **Prevention:** Prevent weeds from entering an area by promoting weed-free forage, weed-free gravel, cleaning shoes and tires, minimizing disturbance to existing vegetation and soil, etc.

2. **Herbicides:** Apply chemicals such as herbicides to kill or retard the growth of weeds.

3. **Biological control:** Release or encourage natural enemies of weeds, such as insects or fungi, which kill or retard the growth or reproduction of the plants.

4. **Targeted grazing:** Use livestock under very controlled conditions to eat target plants.

5. **Mechanical:** Kill or remove plants through cutting, pulling, plowing, digging, etc.

6. **Prescribed burning:** Burn an area under controlled conditions to kill or check weeds.

7. **Revegetation:** Replant a disturbed site with desired species.

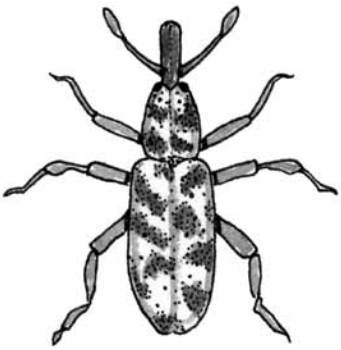
PROCEDURE
Students should be familiar with what weeds are and the basic problems associated with them, be able to identify some common Montana weeds, and create basic maps. Other lessons presented in the ***kNOweeds Curriculum Guide*** can help build this knowledge.

You might want to think ahead of time about possible sites for your students to select to create a weed management plan. This could be your own schoolyard, a nearby park or empty lot, an agricultural field, or an area of public land. You may want to have your students present their finished plan to those responsible for managing the area they select.

1. Begin the lesson by asking your students to brainstorm what problems invasive plants can cause. See if you can make a class list that covers all the issues listed above, plus any others they can come up with! Ask if they have any firsthand experience with weeds causing some of these problems. After your discussion, pass out page 1 of the **IPM Flowchart Worksheet** and ask each student to think about factors that they think might contribute to the spread of weeds where there are now native plants, crops, or other desired plants. After they fill in their page 1, discuss as a class what students come up with.

Spotted Knapweed BIOCONTROLS

Flower Weevil
Larinus minutus
x4



Root Weevil
Cyphocleonus achates
x3

Root Moth
Agapeta zoegana
x3

Dalmatian Toadflax
BIOCONTROL

Weevil
Mecinus janthinus
x4

Now ask them to think about ways to control or manage invasive plants, using page 2 of the worksheet, and discuss. Explain that many people who manage weeds may use many or all of the methods they have listed, depending on the circumstances. Discuss the reasons that some methods may work better than others in some areas, and have them do some research to fill out the **IPM Options Chart**.

2. At this point you may want to have them contact someone in your local community to "interview" them about weed management. If possible, try to get a variety of viewpoints. Some possible perspectives to consider are those of a farmer or rancher; government land manager; a manager for a conservation organization; utility company, or highway department; a small landowner; beekeeper; gardener; native plant enthusiast, etc. Some questions they might want to consider asking include:

1. How do invasive plants affect you?
2. Have you taken action to control them? If so, what have you done?
3. Have you been able to see a change as a result of your actions?
4. How did you decide what method(s) to use to control weeds?
5. Have you considered or are you considering trying any other kind of control method?
6. How long do you think you will have to try to control weeds?
7. How much time do you spend dealing with invasive plants?

When they have conducted their interview, have them report back to the rest of the class on what they found out. They could even role-play the person they interviewed, and allow other students to ask them questions. When all students have presented their "perspectives," discuss similarities and differences among these as a class.

3. Now they are ready to select a site for which to create a weed management plan. If this hasn't already come up in discussion, explain that many people who manage weeds create a plan so that they can go about it in an organized, well-thought-out way, considering all possibilities and assessing their results.

Brainstorm with them the kinds of elements they think a weed management plan might need to contain. Show them the template and brainstorm or ask them to list the kinds of information they need to collect to write their plan. You may want to decide as a class how much detail you want to go into and which parts, if any, of the plan template you don't want to use. For example, obviously they won't actually be using herbicides, but you may want them to fill in the

information to make them aware of the safety concerns and legal considerations involved in using chemical controls. Assign sections to different students or pairs of students, or let them figure out how to divide up the work. You may decide to have the entire class work on one plan, or have a few different plans.

4. When students have selected a site for which to write a plan, have them visit the site to collect the information they need. This may include mapping the site and any weed populations they have found (see lessons on mapping and weed surveys in this Guide). They may also need to talk to the landowner or manager to gather supplementary information about the site (use, history, etc.).

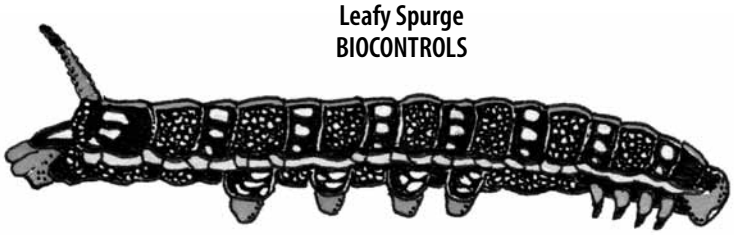
When they know which invasive plant species are present, they may want to use a resource such as the NRCS Noxious Weed Treatment Quick Reference (**http://www.weedawareness.org/weed_poster.pdf**) to determine which methods to use.

After they have finished their plan, they can present it to the rest of the class (if there is more than one group) or to you.

Extensions

Students may want to send a copy of the plan or present it to the landowner.

Leafy Spurge
BIOCONTROLS



Hawk Moth Caterpillar
Hyles euphorbiae

Hawk Moth
Hyles euphorbiae

Brown Flea Beetle
Aphthona nigriscutis
x4

Black Flea Beetle
Aphthona lacertosa
x4

Name _____

INTEGRATED PLANT MANAGEMENT (IPM) OPTIONS CHART

Type of Control	Features of control methods				
	Rapid Response	**Short-term Effectiveness**	**Long-term Effectiveness**	**Personal Safety**	**Environmental Effects**
Prevention					
Mechanical					
Herbicides					
Biological					
Grazing					
Controlled burning					
Revegetation					

SITE WEED MANAGEMENT PLAN

FOR

_____

site name, town/location

Date:_____

PREPARED BY: _____

_____

Authors, Teacher, School, Grade(s)

INTRODUCTION

A. Description and purpose of the site. Also list important plants or animals, human uses, and your management goals.

B. Description of how certain invasive plant species ("weeds") interfere with management goals of the site.

C. Inventory of plant species that you want to control.

SUMMARY OF ACTIONS PLANNED

Use the following table to guide your plan development. List species in order of priority.

Plant Species: Scientific name and common names
Location(s): Map and describe where it occurs on your site.
Area (acreage): Estimate or use GPS to determine the amount of area invaded.
Control Method(s): What methods should you use to control it?
Schedule: When will you do this? (Time of year, etc.)
Monitoring Plan: How will you monitor it to make sure your efforts are successful?
Estimated Cost: Estimate the hours and costs needed for the work you have planned.

Plant Species 1: _____

Location(s): _____

_____

_____

Area (acreage): _____

Control Method(s): _____

_____

Schedule: _____

Monitoring Plan: _____

_____

Estimated Cost: _____

Plant Species 2: _____

Location(s): _____

_____

_____

Area (acreage): _____

Control Method(s): _____

_____

Schedule: _____

Monitoring Plan: _____

_____

Estimated Cost: _____

Plant Species 3: _____

Location(s): _____

_____

_____

Area (acreage): _____

Control Method(s): _____

_____

Schedule: _____

Monitoring Plan: _____

_____

Estimated Cost: _____

Plant Species 4: _____

Location(s): _____

_____

_____

Area (acreage): _____

Control Method(s): _____

_____

Schedule: _____

Monitoring Plan: _____

_____

Estimated Cost: _____

Plant Species 5: _____

Location(s): _____

_____

_____

Area (acreage): _____

Control Method(s): _____

_____

Schedule: _____

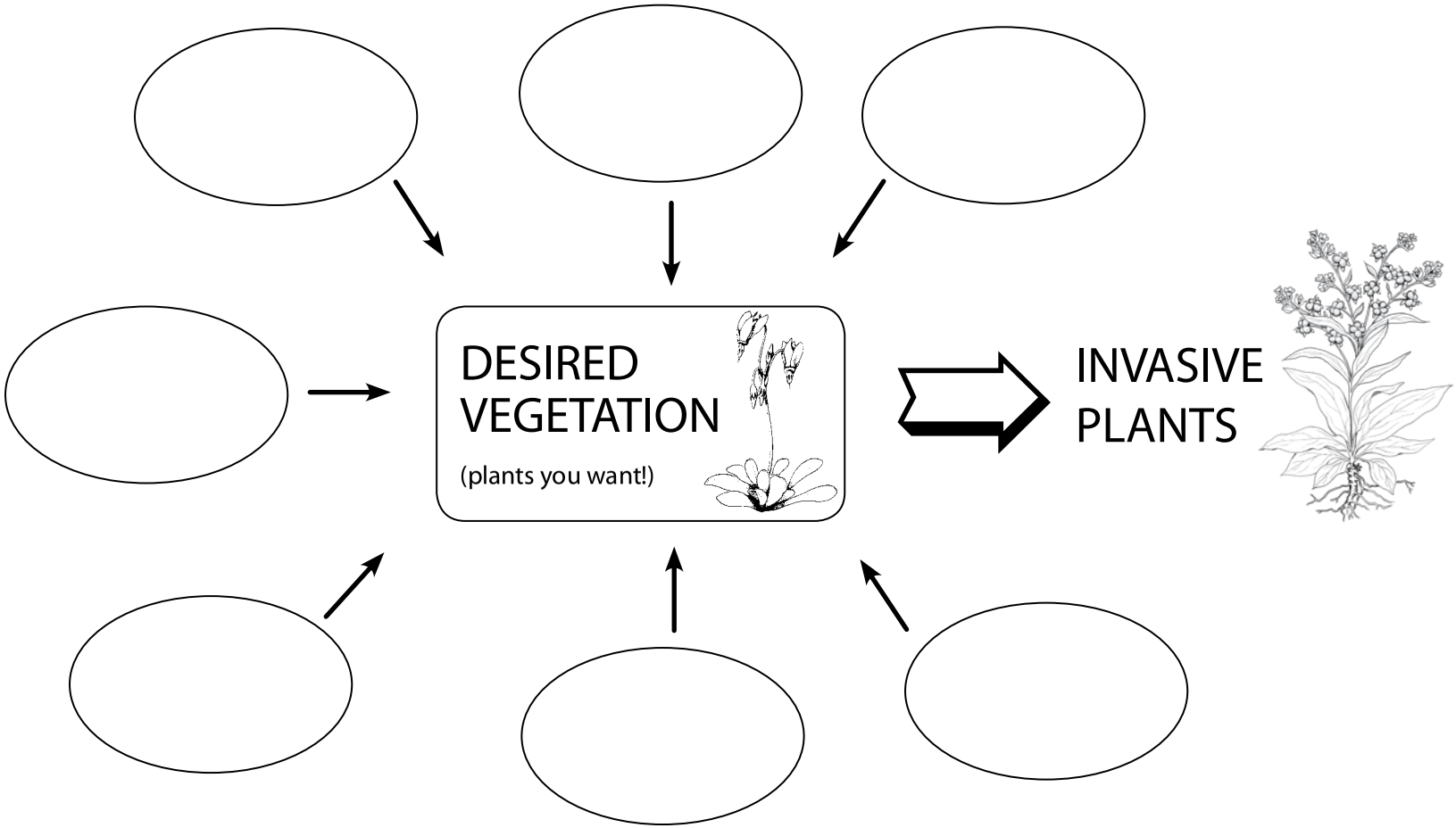
Monitoring Plan: _____

_____

Estimated Cost: _____

1

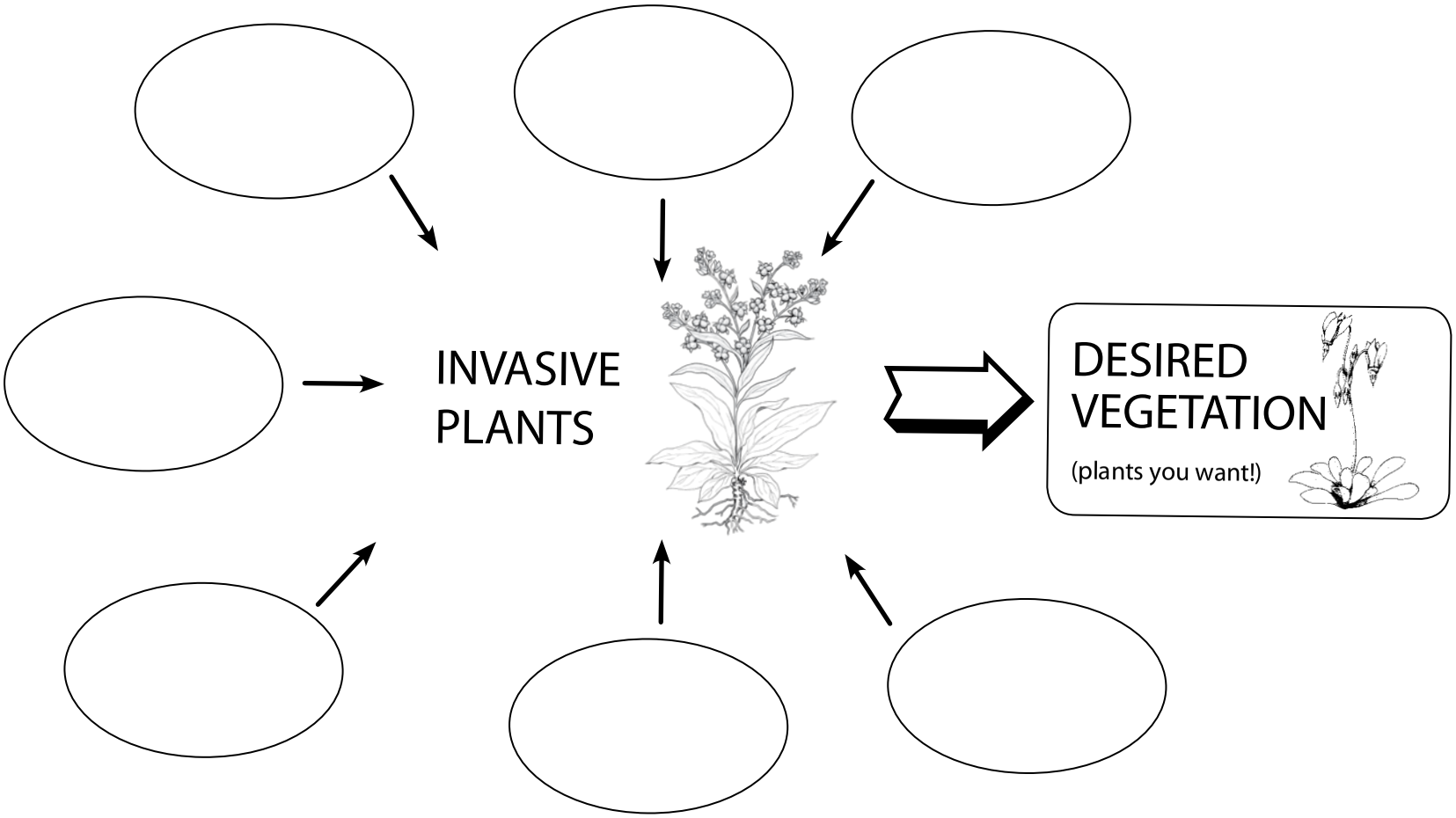
What kinds of things do you think might make it easier for non-native plants to invade an area and replace desired plants, such as native plants or agricultural plants? Can you think of human factors? Natural factors?



IPM Flowchart

2

What kinds of things might be done to decrease invasive weeds and help an area return to the desired vegetation?



IPM Flowchart