

LESSON 46

Invasive Plant Management: Plan to 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 discuss factors contributing to weed invasions and efforts that can help control weeds, using their discussions to complete concept maps on these subjects. They conduct their own interviews of people in their area with different perspectives on weeds and weed management. They develop their own weed management plan based on their knowledge of control methods and the desired outcomes for the area.

MATERIALS

- 📎 *Invasive Plant Management* PowerPoint (available on *kNOweeds* CD or at http://missoulaeduplace.org/weeds_curriculum.shtml)
- 📎 **IPM flowchart worksheet**
- 📎 **IPM Options Chart**
- 📎 **Weed Management Plan Template** (electronic format or hard copy)
- 📎 **Weed Management Worksheet** (Excel; electronic format or hard copy)

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. Some studies have shown that where spotted knapweed, leafy spurge, and other species have invaded, some native species may be reduced or eliminated in a few years' time.

Grade level: 9-12

Subject Areas: Biology, writing, technology, social studies, math

Duration: Several class sessions, plus travel time to field sites.

Setting: Classroom and field site

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



Sulphur Cinquefoil
Potentilla recta

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- ***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 plant species threatened by invasive plants include Sapphire rockcress, Missoula phlox, and Ute ladies'-tresses. Invasives can deteriorate habitat for fish and other aquatic organisms as well.
- ***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.
- ***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), 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 factors help weeds invade?

1. Seed introduction by animals, humans, or vehicles such as bikes or cars moving from weedy to non-weedy areas, or seeds traveling in animal feed or with other seeds.
2. Removal or disturbance of existing vegetation and soil through trampling, driving, development, road-building.
3. Overgrazing by wildlife or livestock.

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 of 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 know how to create basic maps. Other lessons presented in the *kNOweeds Curriculum Guide* can help build this knowledge.

Think ahead of time about possible sites for your students to select for which to create a weed management plan. This could be your own school grounds, 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. Using either the *Invasive Plant Management* PowerPoint or a discussion format, begin the lesson by asking your students to think about the factors that may make it easier for invasive species to colonize an area and displace native or other desired plants. You may want to pass out page 1 of the **IPM Flowchart Worksheet**. After they fill in their page 1, discuss as a class what students came up with.
2. 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. Go through the rest of the PowerPoint on Integrated Plant Management. 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**.
3. 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:
 - How do invasive plants affect you?
 - Have you taken action to control them? If so, what have you done?
 - Have you been able to see a change as a result of your actions?
 - How did you decide what method(s) to use to control weeds?
 - Have you considered or are you considering trying any other kind of control method?
 - How long do you think you will have to try to control weeds?
 - How much time do you spend dealing with invasive plants?

4. 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.

5. 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 (see Appendices 4-6 in the template), 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.

6. When a site has been selected and it’s been decided what kind of information they need, have them visit the site to collect any pertinent information. This may include mapping and the site and any weed populations they have found (see other lessons in the *kNOweeds Curriculum Guide* for help with this). They may also need to talk to the landowner or manager to gather supplementary information about the site (use, history, etc.).

7. 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. Work with them to refine the plan and figure out if there are unworkable or impractical parts. If possible, have your students begin to implement it or work with those responsible for managing the site to do so!

Extensions

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

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)

1. INTRODUCTION

A. Description and purpose of the site

State what kind of site you want to manage (agricultural, park, schoolyard, recreation, etc.) Also briefly describe:

1. Distinctive biological communities (for example, Ponderosa Pine forest, grassland, alfalfa field, etc.)
2. Land-use histories (grazing, logging, recreation, etc.)
3. Important plants or animal in the management area
4. Management goals (remove invasives, restore native plants, create productive field, etc.)
5. Any major challenges to achieving those goals

B. Description of how certain plant species ("weeds") interfere with management goals of the site. Use this section explain why you want to eliminate or control certain plant species here.

Briefly describe what problems these plants cause, or could if allowed to flourish.

C. Inventory of plant species that you want to control

Inventory populations of weeds located on and near the site. Map these populations and estimate the area(s) they cover.

2. OVERVIEW OF WEED MANAGEMENT PLAN

A. General Management Philosophy

What main guidelines do you want to use in developing your plan? Some things to think about may include:

- What is your final goal for managing weeds at the site? Does it go beyond just removing unwanted plant species?
- What kinds of species will you focus on or set as priorities? How will you choose priority species?
- Will you consider the potential impacts of the control methods themselves? How will this factor into how you decide what methods to use?
- What other issues will you consider when choosing your management actions?
- Will you evaluate the success or failure of your plan? If so, how?
- How will you use any information you gather about how your plan is working?

Setting Priorities

The priority-setting process can be difficult, partly because you need to consider so many factors. Consider each of the following factors:

I. Current extent of the species: in the long run, it is usually most efficient to prevent problems and immediately address new invasions. Give priority to species that are present nearby or just starting to invade the site, especially if they are expanding rapidly.

II. Current and potential impacts of the species: Species that alter ecosystem processes such as fire frequency or sedimentation rates, invade undisturbed plant communities, or reduce resources such as food or nesting sites for animals should generally be given the highest priorities.

III. Value of the habitats/areas the species infests or could infest: Give priority to controlling infestations in important habitats, such as those used by rare or highly valued plants or animals.

IV. Difficulty of control and establishing replacement species: Give priority to managing species that are able to be controlled with available resources with minimum harm to desirable plants, and which can be replaced by desired plants with minimum additional resources.

B. Summary of Specific Actions Planned

Briefly (1-3 paragraphs) describe or outline your weed control plan. Note which species you plan to control, where and over what period you plan to do so, the methods you plan to use, which species you plan to monitor, and how you plan to do so. You may also briefly explain why you do not plan to control certain species.

C. Tables

Use Excel or another spreadsheet program to create a prioritized list of weed species, an implementation schedule for you plan, and the estimated costs to carry out the plan.

Table 1. Prioritized List of Weed Species

Rank species based on your priorities, using a format such as the example below.

Scientific Name	Common Name	Rank/Priority	Comments
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Table 2. Weed Management Plan Implementation Schedule

Schedule the planning, surveying, and treatment for each target weed for at least the next year as the example below.

	Year 1				Year 2			
Target Species	Winter	Spring	Summer	Fall	Winter	Spring	Summer	Fall

Codes: S=survey; T=treatment; P=plan control efforts

Table 3. Projected Resource Costs to Implement Weed Management Plan

Estimate the hours and costs needed for the work you have planned as the example below.

			Year 1	Year 2	
Target Species	Resource (For example, labor, materials, transportation, etc.)	Items/ Comments:	Estimated Cost	Estimated Cost	Total Cost

(copy this and next page for additional species)

3. SPECIFIC CONTROL PLANS FOR HIGH PRIORITY WEED SPECIES

Scientific name: _____ Common name: _____

A. PRIORITY _____

B. DESCRIPTION

In 2-3 lines list habit, life history, native range, and other outstanding characteristics

C. CURRENT DISTRIBUTION ON THE SITE

Refer to maps, Section 1C.

D. DAMAGE & THREATS

Outline damage caused and threats posed by the species. Refer to Section 1B.

E. GOALS

Outline long-term goals for this species. For example, you may want to reduce numbers of this species so that it no longer threatens populations of a rare species or so that it does not affect fire frequencies on the site. You may want to list measurable objectives, such as reduce the population by 50% in 2 years.

F. MANAGEMENT OPTIONS

Viable control options are:

- (1) No treatment;*
- (2) (Treatment alternative 1);*
- (3) (Treatment alternative 2).*

Briefly discuss the alternatives, indicate which are preferred and the conditions (location, anticipated cost, etc.) under which they may be used.

I. HOW ACTIONS WILL BE EVALUATED (Criteria for success)

Outline the methods that will be used to monitor control activities and how success or failure of the program will be determined.

J. RESOURCE NEEDS

Estimate the amount of time and money that will be required to carry out the planned control, monitoring and evaluation for this species.

4. APPENDICES

Appendix 1. BLANK MAPS/SAMPLE MAPS

Attach copies of the map(s) of the site, and of (overlaid) maps depicting the extent of the target weed(s) on the site here.

Appendix 2. FORMS USED IN COLLECTING INVENTORY AND MONITORING DATA

Attach copies of data collection sheets here.

Use the following 3 appendices if herbicides are to be used.

Appendix 3. HERBICIDE USE PROTOCOLS

After noting which herbicide(s) will be used and roughly how much will be used, outline any state and local requirements for applicator licensing and/or posting of treated areas. Then, BRIEFLY describe how the herbicide(s) will be stored, mixed and transported. Describe how excess herbicide and any equipment or clothing that has become contaminated will be disposed of. Describe emergency first aid procedures and plans for responding to spills or contamination. List who may apply the herbicide(s), and what protective gear will be available for them.

Appendix 4. HERBICIDE USE RECORD FORMS

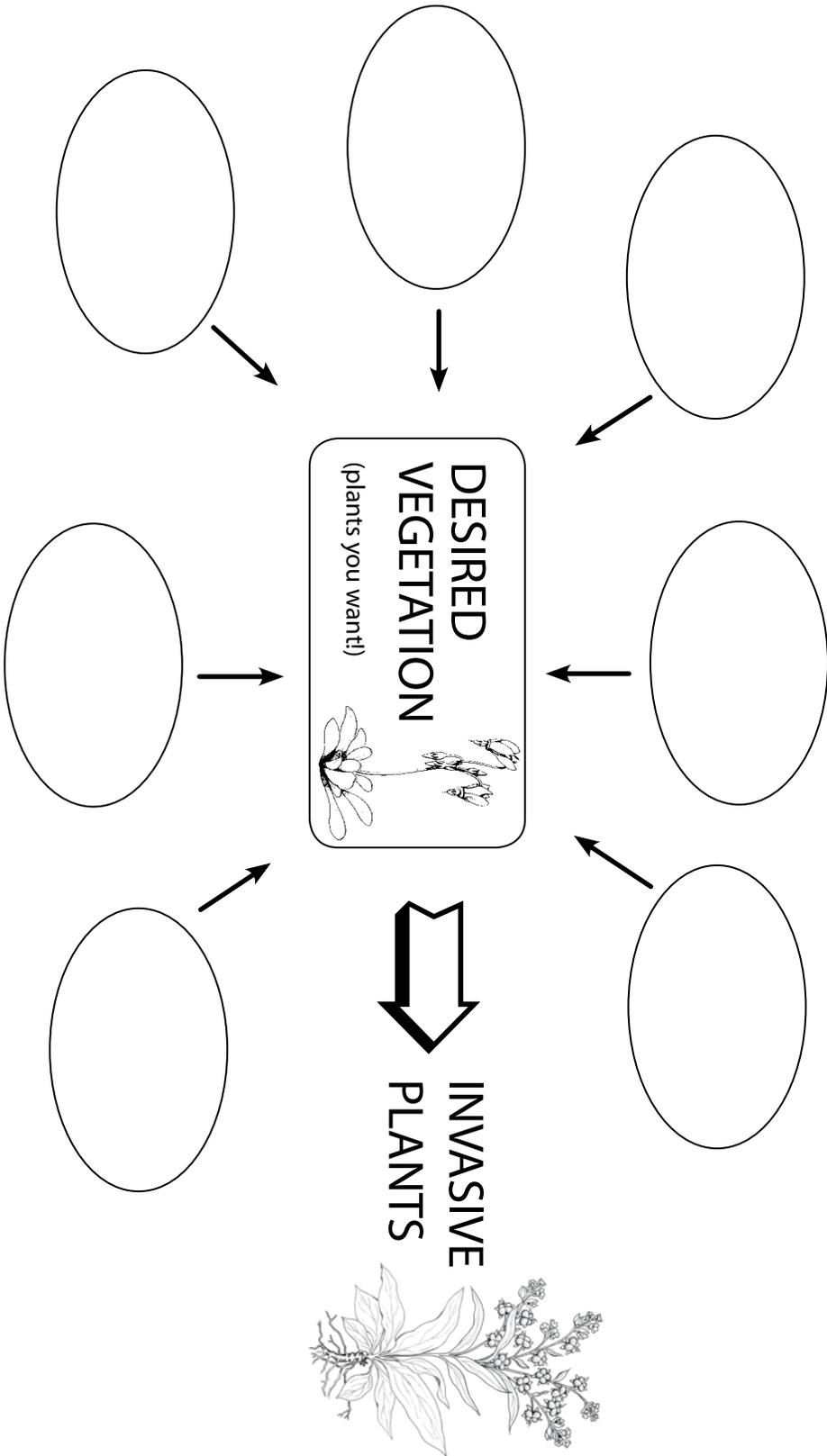
When using herbicides it is critical (and, in many cases, required by law) to keep detailed records of all relevant information. Ideally, records would include data on the condition of the site prior to herbicide application, the type of species present, and percent cover of invasive and native species prior to application. This information will be valuable in evaluating the effectiveness of the herbicide. At the time of application, take detailed notes of the type and concentration of the herbicide, the amount, location, and method of application, weather conditions, and any other observations made during the course of application. This information is important in evaluating the project's success, improving methodology, and identifying mistakes. In addition, it documents the procedure for future site managers and biologists

Appendix 5. HERBICIDE LABELS

Attach copies of the herbicide label(s) here. Herbicide labels can be found on the internet by searching for the name of the herbicide.

1

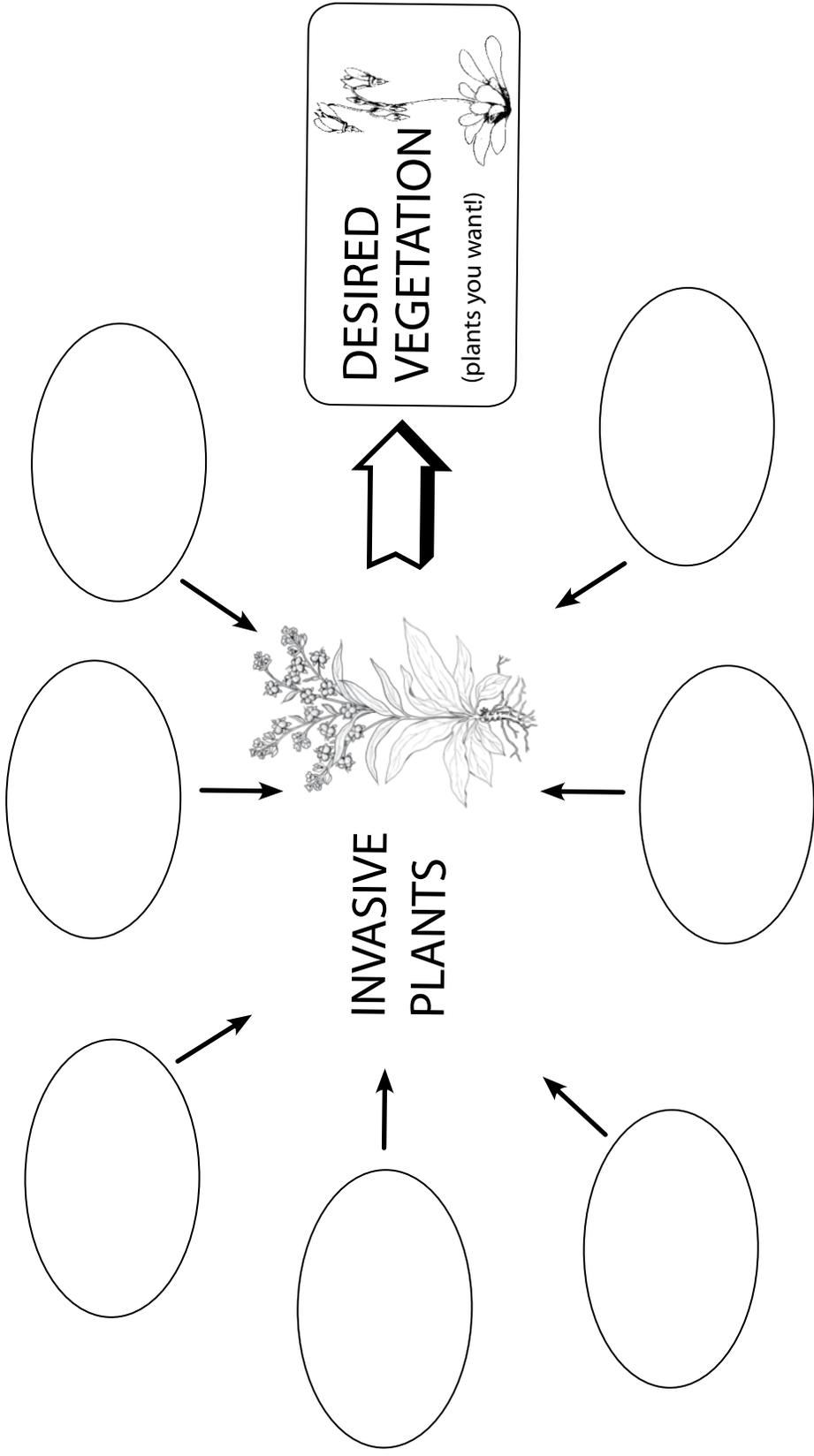
What kinds of things do you think might make it easier for non-native plants to invade an area and replace desired plants, such as native plants or agricultural plants? Can you think of human factors? Natural factors?



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