LESSON 31

Virtual Survey of Invasive Plants

Grade level: 7-12
Subject Areas: Biology
Duration: 2 class periods
Setting: Classroom
Season: Any
Conceptual Framework Topics: Plant distributions, habitat, invasive species management, mapping and survey techniques

OBJECTIVES

Students will be able to understand the difference between a survey and a census, understand and implement different sampling techniques, and recognize that plants (including weeds) grow in specific niches or habitats.

METHOD

Students develop a weed sampling plan on a map of a park. They check the results of their sampling plan and calculate the area and percent of the park that is invaded by weeds.

MATERIALS

- ✎ Map of park (fictitious); attached
- ✎ Map of park (fictitious) that shows weed locations (for teacher); attached (you may want to copy this onto a plastic transparency to make it easier for students to quickly check their results with the key).

BACKGROUND

Many land managers are concerned about the spread of non-native, invasive plants (weeds) in natural areas. To be able to know whether or not weed populations are invasive, managers must first know where populations exist. Most areas are too large for conducting a census (i.e., complete count), so survey methods must be used. Surveys can tell you if and where species are present, and allow you to estimate how much of the total area is invaded. They don't tell you how many plants are present or how dense they are.

There are several such methods that can be used to survey an area for weeds. These include: (1) conducting a roadside survey, (2) surveying weeds along trails, (3) conducting surveys along transects (straight lines) that don't follow roads or trails, or (4) surveying in completely random locations. Each of these methods has potential advantages and disadvantages, and a sampling plan must consider these to get the most information possible to be able to know or predict where weeds are most likely to grow in the environment.

Contributed by Erik Lehnhoff, Center for Invasive Plant Management, Montana State University.

PROCEDURE

1. Explain to your students that they will be using a map of a fictitious area to explore how different methods of surveying an area can give different results on the distribution of invasive plants. The imaginative scenario is as follows:

- You have 4 days to sample the park area shown on the map.
- If you sample along the road, you can sample 50 squares per day.
- If you sample along a trail, you can sample 35 squares per day.
- If you sample along transects, you can sample 20 squares per day.
- If you sample with a totally random pattern, you can sample 10 squares per day.

Have students work in pairs or small groups to:

a. Choose their sampling method(s) and mark the squares on the map where they will conduct surveys.

b. Compare their map with the teacher's key to determine how many of the squares that they sampled had weeds.

c. Based on their findings, have them try to determine how much of the total area is infested with weeds.

2. When their calculations are complete, have them report to the rest of the class:

a. What method of sampling did you use?

b. How many of your sampled squares had weeds (list by species)?

c. How much of the total park area (what percent) do you predict to be infested with each weed species?

Note: Students will very likely overestimate the area infested because, without knowing it, they make the assumption that all habitat is the same. For example, if they find a certain weed in 90% of the squares they sample along a road, then they assume 90% of ALL squares have the weed. The correct way to make the determination would be to find out what percent of each habitat type has weeds, find out what percentage of the park is each habitat type, and from that, calculate how much total area has the weed species. For example, the weed may have been found in 90% of roadside squares sampled, but only in 2% of grassland squares sampled. If the park is 1% road and 99% grassland, the total percent infested could be predicted to be:
0.90 x 1% + 0.02 x 99% = 2.88% (round to 3%).

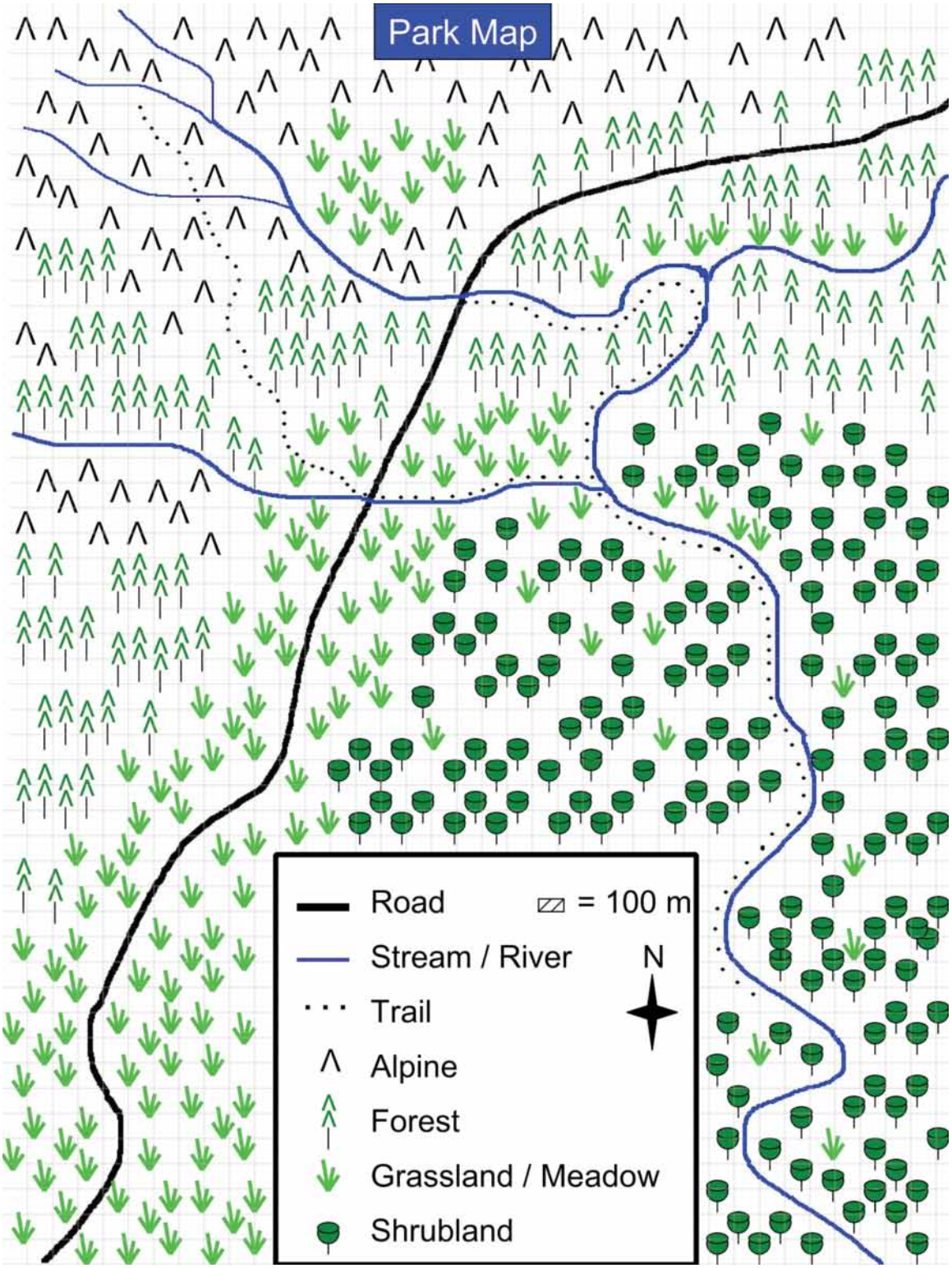
3. Discuss as a class:

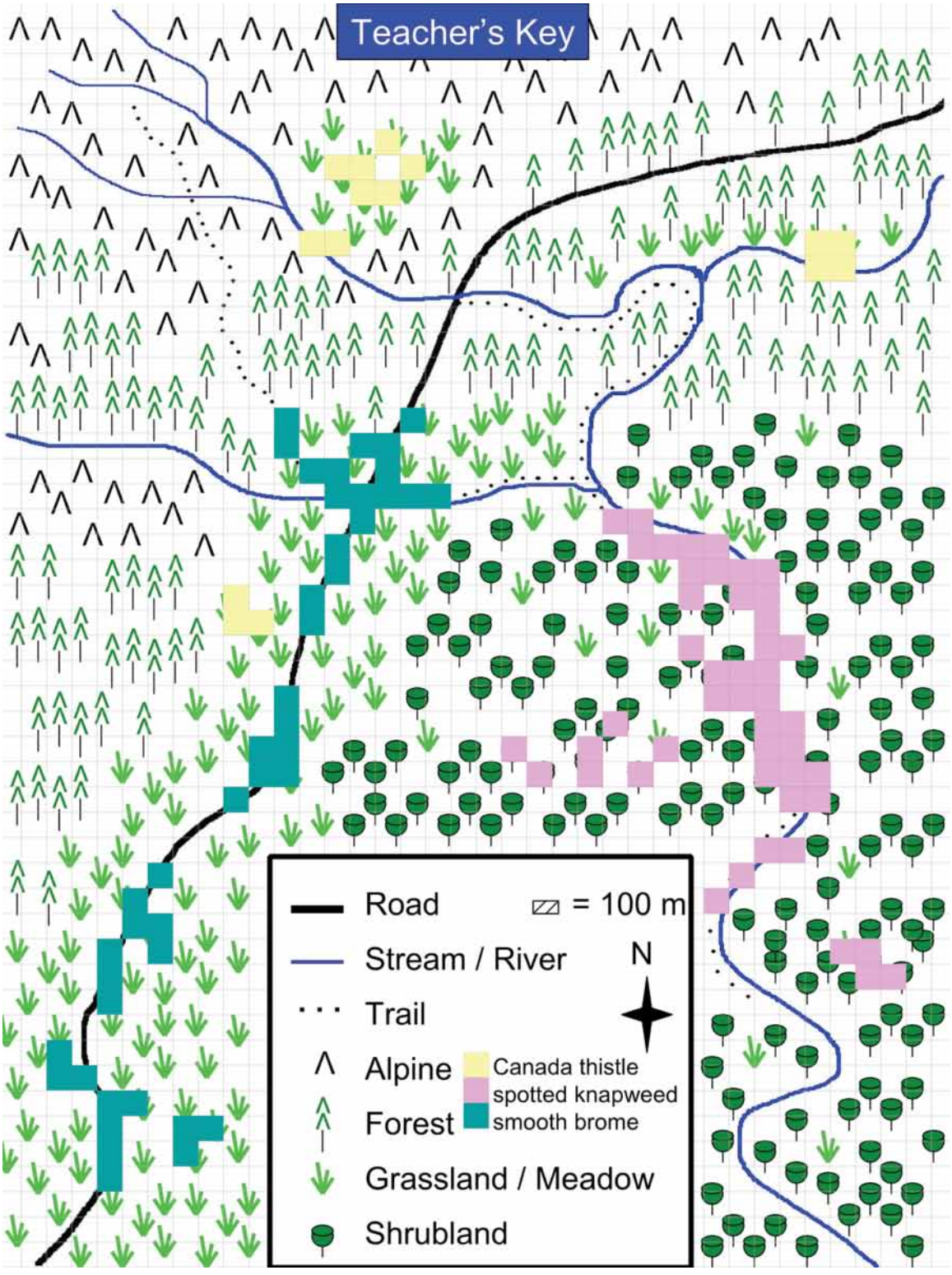
   a. How accurate were their methods?

   b. Were some methods better than others? Why?

4. If students haven't come up with the idea that they need to sample based on different habitat types, prompt them to look carefully at the maps and see if they can figure this out. Have them calculate an infestation using this method.

Extensions
Have students use their understanding of sampling methods to set up surveys for invasive plants in a park, empty lot, or another accessible area near your school.


Park Map
Road
= 100 m
Stream / River
N
Trail
Alpine
Forest
Grassland / Meadow
Shrubland


Teacher's Key
Road
= 100 m
Stream / River
N
Trail
Alpine
Canada thistle
spotted knapweed
smooth brome
Forest
Grassland / Meadow
Shrubland

Teacher's Key to habitat areas and percent infested by weeds.

Note: Many squares may have more than one habitat type. For example, all squares along the road may be considered road habitat or some other habitat such as grassland/meadow or forest. Similarly, many squares along a river could be considered to be river, trail or some other habitat. When there are multiple habitats, use the following priority: Road ➜ Trail ➜ Stream/River ➜ any other habitat.

	AREA (number of 100m x 100m squares) and percent of each habitat in park							
	Road	**Trail**	**Stream/ River**	**Alpine**	**Forest**	**Grassland/ Meadow**	**Shrubland**	**Total**
Area	99	83	177	230	315	353	387	1,644
Percent of total area	6	5	11	14	19	21	24	100

	AREA (number of 100m x 100m squares) infested by weeds in each habitat							
SPECIES	**Road**	**Trail**	**Stream/ River**	**Alpine**	**Forest**	**Grassland/ Meadow**	**Shrubland**	**Total Area Infested**
Canada thistle	0	0	4	0	0	11	0	15
spotted knapweed	0	20	4	0	0	2	22	48
smooth brome	27	8	0	0	0	9	0	44

	PERCENT OF HABITAT INFESTED							
SPECIES	**Road**	**Trail**	**Stream/ River**	**Alpine**	**Forest**	**Grassland/ Meadow**	**Shrubland**	**Total Percent of Park Infested**
Canada thistle	0	0	2	0	0	3	0	1
spotted knapweed	0	24	2	0	0	1	6	3
smooth brome	27	10	0	0	0	3	0	3