

# 1.8 Case Study

## Comparing Ecosystems

Your schoolyard, local parks, farms, and managed forests are artificial ecosystems. An **artificial ecosystem** is planned or maintained by humans. Lakes, rivers, forests, deserts, and meadows can all be classified as natural ecosystems. In a **natural ecosystem**, the living community is free to interact with the physical and chemical environment. However, this does not mean that the area is untouched by humans: humans are a natural part of many ecosystems. Natural ecosystems haven't been planned or maintained by humans. In this case study, you will compare a meadow (natural) and a park (artificial).

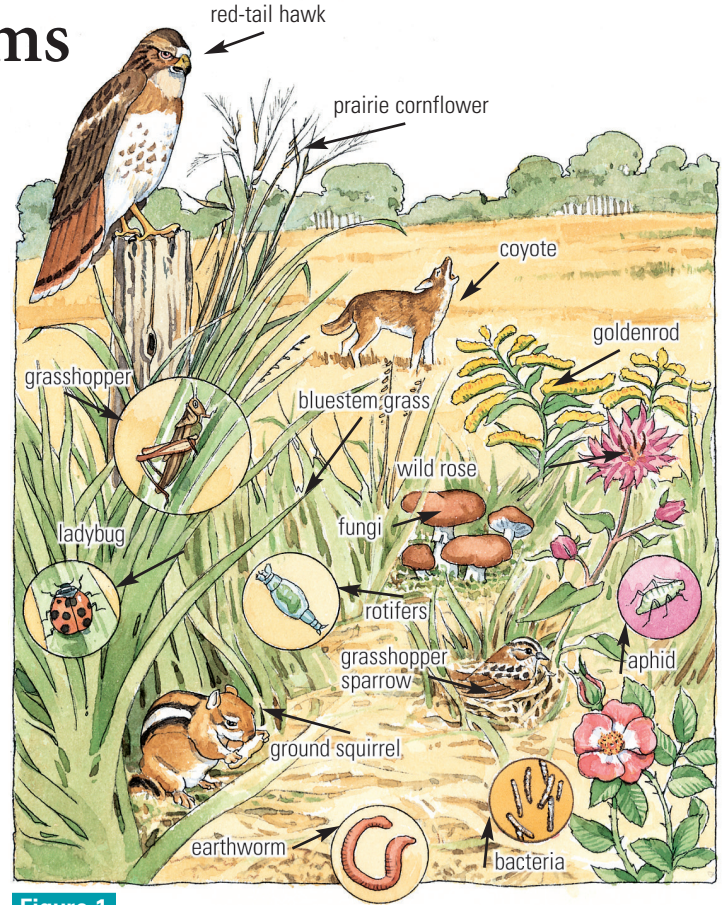
Change within a park is limited because of human interference. Although the trees grow, most parks look somewhat the same from year to year. Humans manage change. Natural ecosystems undergo subtle changes as one plant or animal species gradually replaces another. In natural ecosystems, only plants suited for the environment flourish. In an artificial ecosystem, plants selected by humans have an advantage.

- (a) List some reasons humans would select one plant over another in a park.

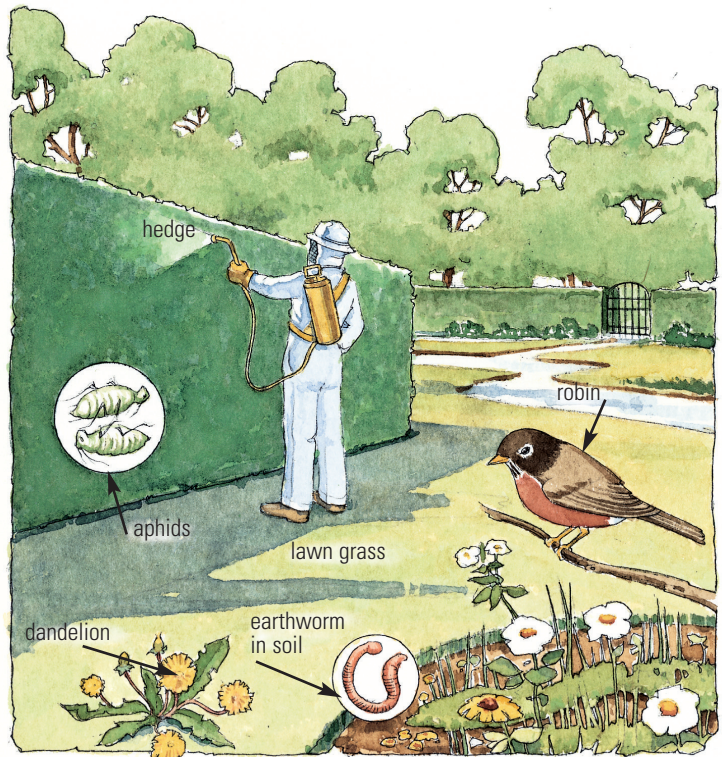
### Weeds and Artificial Ecosystems

Plants can be classified in many different ways. Ecologists classify them based on structure. However, gardeners and park workers have an overall classification: weeds and nonweeds. This is a subjective grouping — the classification is not based on structure, size, or reproductive capacity. Weeds are naturally occurring plants that have fallen out of favour with humans.

- (b) Suggest some reasons a plant might be categorized as a weed.



**Figure 1**  
A meadow



**Figure 2**  
A park

## Comparing Biotic Factors

Study Figures 1 and 2.

- What human activities prevent the artificial ecosystem of the city park from changing?
- Which ecosystem demonstrates the greater biodiversity? Explain your conclusion.
- Speculate about why grasshopper sparrows, found in the meadow, are less likely to be found in a city park.
- Speculate about why coyotes are not common in city parks.

## Comparing Environmental Factors

Table 1 provides data collected from a city park and a meadow. All measurements were taken on the same day at the same times.

Relative humidity is a measure of the percentage of water vapour in a mass of air, compared with the maximum amount of vapour that could be held at that temperature.

Evaporation rate measures the volume of water lost from soil in one day. Soil litter is a measure of the mass of decomposing organic matter found above the ground. Fallen leaves, twigs, and dead grass make up most of the soil litter.

- Why is it important to take measurements on the same day and at the same time?
- Speculate about why the wind velocity at ground level differs in the two ecosystems.
- Speculate about why temperatures tend to be higher in the park than in the meadow.
- Present an explanation that accounts for differences in the evaporation rate in the two ecosystems.

**Table 1** Abiotic and Biotic Factors in Two Ecosystems

Abiotic factors	City park	Meadow
temperature (maximum)	28°C	26°C
temperature (minimum)	12°C	10°C
wind speed at ground	22 km/h	15 km/h
evaporation rate	10 L/day	3.5 L/day
relative humidity	85%	64%
light at ground (% of sunlight available)	95%	91%
soil nitrogen rating	very high	low
soil phosphorus rating	high	low
Biotic factor		
soil litter	56 g/m <sup>2</sup>	275 g/m <sup>2</sup>

## Understanding Concepts

- List abiotic factors of the city park and meadow.
  - Explain how human interference influences each of the factors.
- Which of the two ecosystems, the meadow or the park, would provide a better habitat for a fox? Give reasons for your answer.
- Not all natural ecosystems have more biodiversity than all artificial ecosystems. Give two examples of an artificial ecosystem that might have more biodiversity than a natural ecosystem. Provide an explanation of each example.
- Tables 1 and 2 provide some data on two ecosystems. What additional data would be useful in making a comparison of an artificial and a natural ecosystem?

## Exploring

- Some animals, such as the raccoon and the tree squirrel, do very well in artificial ecosystems. What special adaptations or behaviours make these two animals successful in human-dominated environments? Report on the results of your research.

Table 2 provides detailed counts for some species in the two ecosystems.

- Speculate about why goldenrod is found in the meadow but not the city park.
- Provide a hypothesis that explains why more earthworms are in the meadow than the park.
- Why are more spiders found in the meadow?

**Table 2** Inventory of Species in 10 m x 10 m Study Areas

Types of organism	City park		Meadow	
	Number of species	Population of all species	Number of species	Population of all species
grass	1	100 000/m <sup>2</sup>	3	40 000/m <sup>2</sup>
goldenrod	0	0	1	51
weeds	3	6	17	459
earthworms	1	25	8	210
beetles	4	7	22	39
spiders	1	2	2	13
birds	3	10	11	39
rodents	0	0	3	45