

Unit 1: Sustaining Ecosystems

Let's talk about frogs! (because they're not talking as much anymore)

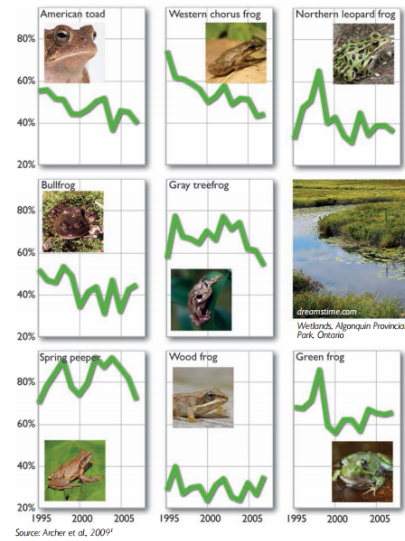
1.1 The Silence of the Frogs
With your partner, read pp. 10-13
Answer Q 1-5 and 7 on p. 13
Make sure you know the definitions of all the words in bold.

Why are frogs disappearing?

- Habitat loss and habitat fragmentation**
 - On the prairies approximately 70% of historic wetlands have been drained.
 - In southern Ontario 90% of wetlands have been drained.
 - Imagine if we removed 90% of the apartment buildings in a city. Would anyone be surprised if the number of humans in the area declined?
- Air and water quality**
- UV radiation**
 - Decreased ozone in the atmosphere allows more UV radiation to reach the Earth.
 - UV radiation damages cells.
 - Amphibians don't wear sunblock.
- Climate change**
 - Climate change includes not just warming but also drought in some areas and flooding in others, more severe storms, rising sea level and less predictable temperatures.
 - Amphibians are very dependent on the weather, particularly for the survival of their eggs and larvae.
 - For example, increased drought across the prairies could prevent many species from transforming before ponds dry up each year.
- Traffic Mortality**
 - Many amphibians migrate from overwintering sites to breeding ponds.
 - If these habitats are separated by a road it's big trouble.
 - Along one 4 km stretch of road in southern Ontario, over 10,000 Leopard Frogs were killed in just one year.
- Collecting**
 - People collect amphibians for food, medicines, bait, pets and even for teaching biology.
 - In eastern Ontario up to 45,000 Bullfrogs have been collected in a single year (this is now prohibited) and over a million Leopard Frogs have been collected in Manitoba in some years.
- Acid Rain**
 - Acid rain it acidifies lakes and ponds many plants and animals.
 - The eggs and larvae of amphibians are particularly sensitive.
- Agricultural Chemicals**
 - Some amphibians thrive in agricultural areas enjoying the benefits of irrigation and artificial ponds for watering livestock.
 - The increasing use of pesticides poses a threat.
- Introductions of Exotic Species**
 - Humans introduce (sometimes accidentally) animals and plants from their native habitats into new areas.
 - Sometimes these species compete with native species.
 - Sometimes amphibians are the introduced species. Bullfrogs escaped or released from "farms" where they were raised for frogs' legs have resulted in their introduction to many areas, such as British Columbia.
 - Bullfrogs are voracious predators of smaller frogs.
- Disease**
 - Introduced species sometimes carry diseases that the native species cannot resist.
 - Never release a pet into the wild.



Percent of monitoring stations where each species was observed from 1995 - 2007



Source: Archer et al., 2009¹

Federal government moves to protect Quebec frogs threatened by development

Species listed as 'globally secure' but threatened in Canada due to habitat loss and degradation

The Canadian Press Posted: Dec 05, 2015 9:02 PM ET | Last Updated: Dec 05, 2015 9:43 PM ET



The western chorus frog is a small olive or brown-colored amphibian that grows to a length of about 2.5 cm. It breeds in wetlands, which are threatened by urban development and agriculture. (Elienne Plasse/Un monde insipide)

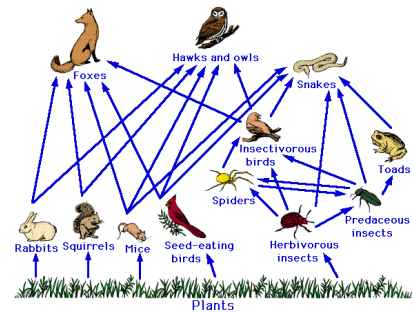
What is Ecology?

Ecology involves two things:

1. the study of interactions among organisms; and,
2. the study of how organisms interact with their environment.

Organisms and their environment are interdependent.

How would you describe this diagram?



An **ecosystem** is the relationships among the living and non-living parts of a particular environment.

- **biotic** - everything living
- **abiotic** - everything non-living

Try to label these as biotic or abiotic.



Biodiversity

Sustainability

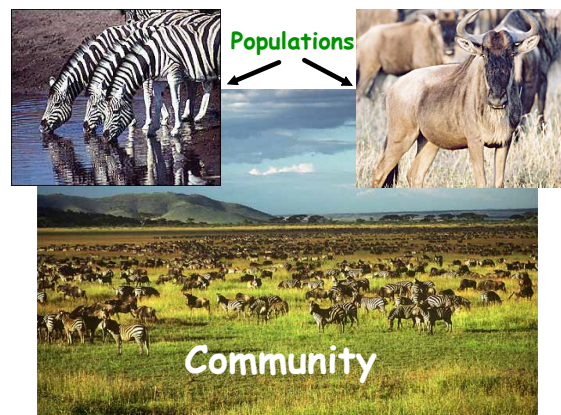
- A **sustainable** system is one that survives, functions, and is renewed over time.
- Sustainable systems, allow things to keep happening over time.
- *Biodiversity is a key factor in the sustainability of ecosystems*
- High biodiversity
 - large variety of different organisms
 - more sustainable
- Low biodiversity
 - little variety
 - less sustainable

Why is biodiversity important for sustainability?

- Biodiversity is essential because organisms are interdependent
- Biodiverse food webs are stronger



Members of the same species that live in the same habitat are known as a **population**.
A group of populations in the same habitat are called a **community** of organisms.



Who cares about biodiversity?

Bill on Biodiversity and Ecosystems!



Ecosystems don't usually have sharp boundaries and organisms move back and forth from one to another.

Write down an example of two ecosystems and the organisms that cross between them.

ecotone - the transitional area between two ecosystems

- ecotones have greater biodiversity than either of the ecosystems

Why?

- greater variety of food
- organisms from each ecosystem can venture into the ecotone



1. What ecosystems can you identify?
2. What kind of animals might you find in the ecotone(s)?

So far, we've talked about natural ecosystems. Is there any other type?

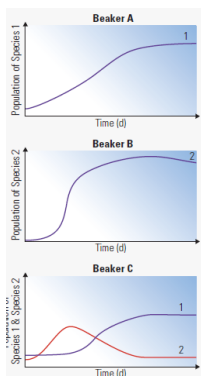
Artificial Ecosystems are planned and maintained by humans.

Natural Ecosystems occur naturally and grow on their own. They tend to change over time.



Let's Talk Ecosystems

1. Define ecology in your own words.
2. For each ecosystem, list four biotic and four abiotic factors.
 - a) a freshwater ecosystem, such as a lake
 - b) a terrestrial ecosystem, such as a forest
3. a) Describe the difference between a population and a community. Give examples.
 - b) Describe the difference between a community and an ecosystem. Give examples.
4. Predict whether you would find more biodiversity in a forest, an open field, or the ecotone between them. Justify your prediction.
5. The graphs below show changes in populations of paramecia in three beakers.



- a) Compare the growth of Species 1 in Beaker A with the growth of Species 2 in Beaker B.
- b) What evidence suggests that the populations of *paramecia* affect each other?
- c) Suggest a conclusion that can be drawn from the population changes in Beaker C.

Sometimes drastic changes happen to an ecosystem that are impossible for organisms to survive.

What is the result?

In Canada, there are over 521 species officially at risk (2015). There are various degrees of risk:

- **Vulnerable** species exhibit low or declining numbers at the edge of its range or in some restricted area.
- **Threatened** species are likely to become endangered if the factors making them vulnerable are not reversed.
- **Extirpated** species no longer exist in one part of a nation but can be found in other areas.
- **Endangered** species are close to extinction in all parts of a nation or in a significantly large location.
- **Extinct** species are no longer found anywhere on Earth.

• Colo's Legacy (7:50)

• 15 Rare animals (6:55)

• Species Extinction Video (9:18)

1.3 Extinction in the Modern World pp 16-19

With your partner, use the information on pp 16-19 to answer the questions below.

1. Explain why the passenger pigeon became extinct.
2. Explain the effect humans have had on extinction rates.
3. How could an asteroid hitting Earth cause extinction?
4. Explain how each of the following factors could lead to the extinction of a species. For each explanation, give an example of a threatened species.
 - a) Poor reproductive success.
 - b) Competition from an introduced species.
 - c) Climate change.
 - d) Hunting by humans.
5. a) Explain the term biodiversity in your own words.
 - b) Why is biodiversity important to a successful ecosystem?
 - c) Give an example of an ecosystem that has high biodiversity and one that has low biodiversity.
6. Which would have higher biodiversity, a golf course, or a natural field ecosystem? Explain why you answered as you did.
7. The common cockroach is an example of a species that has benefited from human activity.
 - a) Hypothesize why the cockroach has benefited from human activity.
 - b) Imagine a pesticide company is developing a chemical that will kill all cockroaches. Would it be wise to cause the extinction of the common cockroach? Justify your position.
 - c) Animals like raccoons and squirrels do well in artificial ecosystems. What characteristics do they have that have made them successful?



1.8 Comparing Ecosystems

With your partner, read pp 28-9 and answer the questions included.