

Sustainability and Biodiversity

Big Ideas:

- Biodiversity is the wide variety of species (plants and animals), genes, and ecosystems on earth.
- Biodiversity is important for ecological, economic and cultural reasons.
- Biodiversity is important to sustainability because ecosystems with more genetic and species diversity tend to be healthier and less fragile.

Why biodiversity is important (excerpts)

(adapted from the David Suzuki Foundation website:

<http://www.davidsuzuki.org/Forests/Biodiversity/Importance.asp>, accessed May 2009)

Having a wide diversity of life on Earth is valuable for a variety of reasons. **These can be grouped into the three basic categories of (1) ecological values, (2) economic values and (3) cultural values.**

1. Ecological Values: All living creatures are supported by the interactions among organisms and ecosystems. Loss of biodiversity makes ecosystems less stable, more vulnerable to extreme events, and weakens its natural cycles.

Natural cycles (*some of which we will be studying in class*) such as the energy, water, carbon, oxygen and nitrogen cycles make Earth hospitable by moderating temperatures and climate, and by providing us with food, clean water and breathable air.

Ecosystems provide numerous additional services to humans, animals and plants that we take for granted. For example, bacteria and soil organisms decompose waste products and create fertile soils in which crops can be grown. Pollinators such as bees ensure our food crops reproduce, while other animals such as bats, ladybugs and dragonflies control crop pests.

The daily activities of a diverse range of creatures helps keep ecosystems functioning. In turn, these ecosystems support life. Healthy ecosystems are more stable and more adaptable to any change, such as extreme events like drought or floods which can alter entire ecosystems.

2. Economic Values: A biologically diverse natural environment provides humans with the necessities of life and forms the basis for the economy. Everything we buy and sell originates from the natural world.

Nature provides the raw materials we need for survival, and forms the basis for the global economy. The world food supply today is derived from 30 crops which supply about 90 per cent of calories to the human diet. And just 14 animal species make up 90 per cent of the livestock we raise. Since we depend on so few plant and animal species to supply us with food, we are vulnerable to environmental changes and crop diseases... Nature is also the source for many medicines such as aspirin, heart stimulants, antibiotics, anti-malarial and cancer fighting compounds.

Everything we use in our daily lives was originally derived from the natural world. In 1997, a team of ecologists and economists estimated the monetary value of nature's services to society to be at least \$33 trillion (US) each year, nearly twice the \$18 trillion combined gross national product (GNP) of all the world's 194 countries that year.

Climate regulation, water purification, soil regeneration, nutrient cycling, waste recirculation, crop pollination and production of timber, fodder, and biomass are provided by our living environment for free. This dollar estimate is purely a thought experiment since nature's services can't be replaced, but it demonstrates why maintaining biodiversity is essential for sustaining the global economy.

3. Cultural Values: Most people feel connected to nature, often for reasons that can be hard to explain. Some feel a strong spiritual bond that may be rooted in our common biological ancestry. Others are inspired by its beauty. Human cultures around the world profoundly reflect our visceral attachment to the natural world. Thus cultural diversity is inextricably linked to Earth's biodiversity.

From aboriginal creation myths and other ancient religions to the work of generations of artists, poets, musicians and storytellers, nature has been the foundation of human cultural identities, spiritual practices and creative expression throughout the ages.

The planet's cultural diversity is rooted in its vast biodiversity. According to Vandana Shiva, a scientist and agricultural activist in India who has been instrumental in advocating the importance of indigenous plant diversity, "The co-evolution of culture, life forms, and habitats has conserved the biological diversity of this planet. Cultural diversity and biological diversity go hand in hand in hand."

Canadians only need to look at their fragile coastal ecosystems to understand the peril that human communities face when biological diversity is at risk. In Newfoundland, the collapse of the Atlantic cod stocks ended a unique way of life – a cherished part of the Canadian mosaic – for thousands of people whose seafaring culture had gone back generations. Climate change now threatens delicate boreal and tundra ecosystems in the Arctic, and the wildlife on which the Inuit depend for food, income and ceremonial purposes.

Just as genetic diversity allows a single species to survive in the face of changing conditions, so diversity of traditional knowledge and cultures has been at the root of the development of Canada. Canadians – from the aboriginal people to immigrants from every country of the globe – have adapted to environments as diverse as the Arctic tundra, coastal rainforests, prairie grasslands, the Canadian Shield and modern megacities. Our diverse indigenous, ethnic, linguistic and regional cultures, combined with the biological wealth of Canada, lay at the root of our identity as a people and a country.

The loss of a Newfoundland out-port, an Inuit village, a prairie town should be seen as a weakening of our national fabric. More often than not, the decline of human communities is directly related to the health of ecosystems on which these communities depend. In this way, cultural diversity is an extension of the biological diversity we see in our planet's ecosystems.

Sustainability and Biodiversity Activity

Activity and Discussion:

1. In groups of 3 people, each person will be assigned to read one of the 3 basic categories of the importance of biodiversity (ecological, economic, cultural).
2. Underline or circle **the most important points** of your assigned reading. If there are any points you do not understand or do not agree with, put a question mark next to them or write down your question or alternative opinion. Write down your main points in the space provided on this worksheet.
3. Summarize your findings to your group of 3. You may read a summary of points, draw a large diagram or cartoon, or use some other creative method for explaining what you have learned to your group members. Listen carefully to your group members as they present their summaries. Discuss any points that are not understood or with which you may hold a different opinion. Based on the summaries of your group members, use the space provided on this worksheet to take notes on the other categories.

Why biodiversity is important: (notes based on group member summaries)

1. Ecological Values:

2. Economic Values:

3. Cultural Values:

Read and discuss the following case study if your group is finished.

Case Study: Biodiversity, Irish Potato Famine and Bananas

America's favorite banana, the Cavendish, is an example of how reduced biodiversity can threaten a species.

In 1845, potato plants started dying in Ireland. The next six years became known as the Irish Potato Famine. An airborne fungus called *Phytophthora infestans* killed the potatoes, and more than a million people starved. A major factor in the famine was a lack of biodiversity.

Although this might sound like something that couldn't happen in today's industrialized world, a lack of biodiversity can still threaten specific plant and animal species. One of today's examples is the Cavendish banana. The most popular banana choice in the U.S., the Cavendish, like all bananas, is a clone of one parent. And all the Cavendish plants in the world are genetically identical. Two blights currently threaten it — although there will still be other bananas should it become extinct.

The drop in biodiversity also ties in to habitat loss. A smaller space in which to live leads to a smaller population size, which leads to less genetic diversity. Human activities like industrialized farming play a role, too, as large fields of one type of plant replace a diverse population of plants and animals.

(by Tracy V. Wilson, from
<http://animal.discovery.com/tv/animal-armageddon/top-10/modern-mass-extinction/loss-of-biodiversity.html>, accessed September 2010)