**Biology - Sustainable Ecosystems**

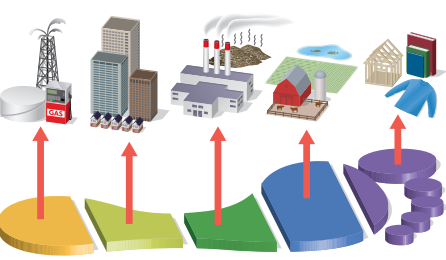
**Note - Environmental Stewardship**

In the Don River Valley, in Toronto, there exists an old Brick factory that closed in the 1980’s. Today the abandoned buildings are being transformed into a national center for environmental education. Every weekend the center supports a local farmers market to connect consumers with high-quality, locally produced food. Also, the Don River is being restored to make its banks more suitable for native species to thrive. It seems that both the lands and the buildings are undergoing renewal and is an example of how environmental stewardship takes hold in our society.

**Environmental Stewardship**

Being an **environmental steward** means taking care of our natural resources to ensure that they are used in sustainable ways for current and future generations. It includes reducing the amount of resources we use, reusing items instead of throwing them away, and recycling used items. One other important component is to conserve existing ecosystems and restore damaged ones. Environmental stewardship requires support from all stakeholders; governments, organizations, and communities.

**Ecological Footprint**

An **ecological footprint** is an estimate of how much land and water is needed to support your lifestyle. It includes all the land and water needed to produce the resources you consume as well as absorb all the wastes you produce. 

The average Canadian requires 8.9 ha to maintain his or her lifestyle, this is equivalent to about 17 football fields. If everyone on the Earth lived like this we would need 5.7 Earths. By understanding our ecological footprint we can start to look for ways to engage in more sustainable activities. Many Canadian municipalities use ecological footprints to measure their progress towards sustainability. As the population continues to grow scientists worry that we will consume the resources faster than they can regenerate.

What is your ecological footprint?

* <http://ecologicalfootprint.com/>
* <http://www.footprintcalculator.org/>

**Sustainable Agriculture**

Farmers were concerned about the methods they were using and the effects on the environment. For example, some were concerned about fertiliser's impact on water quality. Others were worried about soil erosion from the tilling methods used. In conjunction with the federal government they developed a program called the Environmental Farm Plan (EFP). The plan has allowed farmers to identify environmental problems and develop action plans to address them. This has led to things like integrated pest management, soil conservation and organic farming.

**Integrated Pest Management** means using knowledge of the pest’s biology and habits to control pests that negatively affect crops and crop yields.

**Soil Conservation** means using farming methods that protect the soil from erosion and loss of nutrients. For example, farmers can use no-till farming for some types of crops. This method leaves the roots from last year’s crop in the soil. The roots hold the soil in place and reduce erosion.

**Organic farming** has also become more prevalent in the last 15 years. These farms do not use chemical fertilizers or pesticides. With the reduced use of fertilizers and pesticides there is less water pollution from runoff.

**Eating Locally Produced Foods**

Due to the global economy we have access to fresh fruits and vegetables year-round. The problem is that shipping food around the country or the world leads to a huge ecological footprint. Sustainable agriculture and eating locally produced foods are connected. Buying from local farmers ensures a decent income for the farmer, who will be more likely to continue to use the land to farm instead of selling the land to housing developers.

**Learning Checkpoint**

1. What is an ecological footprint?
2. Use a calculator and determine what your ecological footprint is.
3. What does it mean to be an environmental steward?
4. How is soil conservation related to sustainable agriculture?



**Sustainable Forestry**

The Forest Stewardship Council of Canada (FSC) is a non-governmental organization, or NGO. This means it operates independently of any government. The FSC originated in Ontario but operates around the world. It sets standards for sustainable forest management and certifies forests and forestry practices that meet their standards. For a forestry practice to be certified:

* Waterways and wildlife habitat have to be protected.
* Parts of the forest have to be preserved.
* The cut areas have to be replanted.
* The cut areas cannot be replanted with just a single species. The forest must be able to achieve a wild state.

For consumers to know if they are purchasing wood, or a wood product from a source that is not endangering an ecosystem all they have to do is look for the [FSC label](https://ca.fsc.org/en-ca/about-us/what-do-the-labels-mean). It indicates that the wood was obtained in a responsible manner. 

**Establishing Protected Areas**

Establishing protected areas is one method to slow down the loss of biodiversity. Protected areas include national parks, provincial parks, wildlife reserves, and marine sanctuaries. Conservation biologists around the world look for “biodiversity hotspots”, areas that have unique ecosystems and whose biodiversity is threatened.

In Ontario and the rest of Canada, parks and wilderness areas protect ecosystems by keeping them relatively undisturbed. This helps conserve biodiversity. Parks also allow humans to enjoy the ecosystem. Parks officials work hard to balance humans’ need for recreation with the ecosystems’ need to remain undisturbed.

**Creating Action Plans to Restore Ecosystems**

Many human activities cause damage to the natural environment. Remedial action plans involve governments, industries, and community groups working together. Ecological Succession is the process where the mix of species and habitat in an area changes over time. Remedial action plans often work to encourage natural succession in areas that were previously damaged by humans

Kerncliff Park found here in Burlington is an amazing example of how the government, organizations and communities can work together to restore damaged ecosystems. Originally called Nelson Quarry, Kerncliff Park is now managed by the City of Burlington along with the Cootes to Escarpment Ecopark System which works in partnership with landowners to conserve the natural landscape and promote sustainable outdoor recreation. Ecological succession has worked to convert an old Quarry into a rich ecosystem that can sustain future generations of many different species.

**Laws and Government Programs**

The Canadian government has introduced Laws and Regulations to prevent overexploitation and destruction of our ecosystems Include, regulations on Hunting and Fishing to preserve wildlife, regulations on development (Greenbelt) to protect various ecosystems, Environmental Protection Act (Ontario) to protect the land from pollution and ensure proper waste disposal. Government Programs have also been introduced to encourage sustainable practices. These include, recycling and composting programs, electric vehicle rebates ([eligible vehicles](https://tc.canada.ca/en/road-transportation/innovative-technologies/zero-emission-vehicles/light-duty-zero-emission-vehicles/eligible-vehicles)), investments into Green Energy such as solar, wind and hydroelectic.

**Individuals and Sustainability**

Here are some actions that individuals can take to use resources in a more sustainable way.

| **Action** | **Consequence** |
| --- | --- |
| Reduce emissions | * Riding your bike, taking public transit, and using fuel efficient vehicles are all ways to reduce carbon emissions. |
| Save energy | * Lowering the thermostat, unplugging small appliances, and installing CFLs or LEDs all reduce the demand for electricity, which is often generated by burning fossil fuels. * Reducing electricity consumption indirectly reduces air pollution. |
| Eat food locally | * Buying food from local farmers reduces pollution from the trucks used to transport the produce. Buying from local organic farmers reduces pollution from pesticide use. |
| Plant wisely | * Planting native plants reduces the chance of introducing invasive species. * Planting drought-tolerant plants reduces water usage in summer. |
| Buy wisely | * Buying only what you really need reduces waste and reduces pressure on ecosystems. * Think about the impact that using and disposing of the item will have on the environment. * Choose products that have the EcoLogo or that you know were made in an environmentally responsible way. |
| Get involved | * Check out your school community. Does it have an environmental awareness group? Is a full recycling program in place? If so, check it out. If not, think about organizing one. * Invite your family and friends to do an ecological footprint assessment. * Check out local or national organizations promoting environmental sustainability. |

**Learning Checkpoint**

1. How does the Forest Stewardship Council help make it possible for consumers to make environmentally responsible decisions regarding the purchase of wood products?
2. What is meant by the acronym “NGO” with respect to community groups?
3. How have Indigenous practices helped sustain Salmon populations in British Columbia?
4. Identify one environmentally sustainable action that an individual can do, and give one or two positive consequences of this action.

**Here is a summary of what you learned in this note:**

* Ecological footprints show individuals, groups, or nations how much land is needed to produce what they consume and absorb their wastes.
* Environmental stewardship means taking care of resources in a sustainable way.
* Organizations and individuals are taking action to make sure we use resources in a sustainable way.

**Homework:**

1. The ecological footprint of all humanity has been calculated to be equivalent to 1.3 Earths. What does this mean?
2. What two technological developments contributed to the ability to ship food products very long distances?
3. What is organic farming?
4. How do good soil conservation practices reduce soil erosion?
5. An owner of a plant nursery finds aphids, a small insect pest, on some of her plants. She decides to introduce ladybugs to eat the aphids.
   1. Name the strategy she is using to control the pest.
   2. Explain the benefits of this strategy.
6. Why is it important to have an agreement between Canada and the United States to help rehabilitate the Great Lakes?
7. Will the ideas encountered in this lesson affect the way you live? How?
8. If you were determined to make one personal lifestyle change that would have the greatest impact on improving sustainability in your community, what would it be? Explain.

Answers

1. This means that in order to sustain our current population of humans, we would need one and one third Earths. This also means that we are not living sustainably (we are exceeding our carrying capacity).
2. Shipping efficiently and food preservation.
3. Organic farming is farming without the use of pesticides.
4. No-till farming leaves the roots from the previous year so that the soil can be held in place.
5. This is called integrated pest management, and it is useful because we are not using toxic pesticides which can affect other organisms in the habitat.
6. The Great Lakes are shared by both countries therefore it is important that they are both involved in rehabilitation and protection.
7. Answers will vary based on the student.
8. Answers will vary based on the student.