Renewing Biodiversity Resource Package

This resource package is created for the Environmental Science 11 course, focusing on the concept of biodiversity. Students are encouraged to think about biodiversity as a renewable resource, like minerals and oil, and think about how biodiversity can be sustained by land conservation efforts of provincial parks with scientific significance. This resource will require students to reflect on previous knowledge from grade 10 science (natural selection, evolution, adaptations, extinctions, etc.) and apply them to biodiversity in an inquiry based, student-centered way.

Included Materials

Curriculum Links ..........................................................................................................................................................................1
Renewing Biodiversity .............................................................................................................................................................. 3
Save that Park!............................................................................................................................................................................. 6
Additional Links......................................................................................................................................................................... 8
Answer Key .................................................................................................................................................................................. 9

Curriculum Links

This resource is created using the British Columbia curricular competencies for Environmental Science 11. Please see below for some suggested curricular competencies and objectives in association with the resource package.

Big Ideas:

- Human practices affect the sustainability of ecosystems
- Humans can play a role in conservation and restorations of ecosystems

Suggested Unit: Sustainability in local ecosystems

Topics: Unsustainable and sustainable (resource extractions, species at risk, extinctions, land use, habitat loss/ fragmentation

Curricular Competencies:

- Demonstrate a sustained intellectual curiosity about a scientific topic or problem of personal, local, or global interest
- Make observations aimed at identifying their own questions, including increasingly abstract ones, about the natural world
- Experience and interpret the local environment
- Analyze cause-and-effect relationships
- Connect scientific explorations to careers in science
- Contribute to care for self, others, community, and world through individual or collaborative approaches
- Contribute to findings solutions to problems at a local and/or global level through inquiry
• Communicate scientific ideas, information, and perhaps a suggested course of action, for a specific purpose and audience, constructing, evidence-based arguments and using appropriate scientific language, conventions, and representations
• Express and reflect on a variety of experiences, perspectives, and worldviews through place

Content Objectives:

• Understand the effects of human impact on extinction and biodiversity
• Understand how biodiversity is affected by extinctions
• Understand the importance of protected areas, such as geoparks and provincial parks
• Understand the significance of the fossil record in understanding biodiversity
• Understand the impact a single individual can have in conservation (land, species, etc.)
• Understand that biodiversity is a renewable resource dependent on human impact
• Know what local research on biodiversity and conservation is occurring currently

Language Objectives:

• Define and apply academic vocabulary (e.g. extinction, biodiversity, conservation, etc.)
• Explain the significance of fossils in understanding the changes in biodiversity over geological time
• Describe the importance of protected lands, such as geoparks, and their impact on biodiversity
• Discuss ideas for land conservations, with arguments focusing on the how biodiversity can be renewed, and local considerations involved to make it happen
• Investigate local research on ecosystem conservation
Renewing Biodiversity

This worksheet is designed to be complete either at the Beaty Biodiversity Museum or in the classroom. It focuses on human impact on biodiversity, focusing on the significance of fossil evidence in understanding how biodiversity changes over geological time. Students will answer questions based on the Dinosaur Trackways, the Fossil and Cowan Tetrapod Collections, and their own understanding of biodiversity.

Information about each exhibit can be found at the Beaty Biodiversity Museum’s website:


**Dinosaur Trackway:**  [http://beatymuseum.ubc.ca/whats-on/exhibitions/permanent-exhibitions/dinosaur-trackways/](http://beatymuseum.ubc.ca/whats-on/exhibitions/permanent-exhibitions/dinosaur-trackways/)

**Suggested time for activity:** 30 – 45 minutes
Renewing Biodiversity

The environment is constantly changing, and organisms must change in response to survive. When populations are unable to adapt fast enough, they die out or go extinct. For a species to survive change, adaptations must accumulate in the population over many generations and be beneficial for the overall fitness of the individual, so their genes are passed onto the offspring.

There have been five major extinction events over that last 4.5 billion years caused by various natural events (volcanic eruptions, climate change, etc.). As species go extinct, the total biodiversity (variety of life) of the ecosystem changes. Biodiversity, like oil and minerals, is a natural resource that is in a steep decline due to human industry (forestry, hunting, etc.). Human impact on biodiversity is seen by the scientific community as the sixth mass extinction because we are losing species faster than gaining them.

Using this information and what you learned at the museum, answer the following questions:

1. What is the importance of exhibits such as the Dinosaur Trackway Exhibit?
   __________________________________________________________________________
   __________________________________________________________________________
   __________________________________________________________________________

2. How can fossils help us understand the changes in biodiversity over geological time?
   __________________________________________________________________________
   __________________________________________________________________________

3. Dinosaurs are still alive today, although they are better known as modern birds. What are two threats modern birds face from human impact?
   __________________________________________________________________________
   __________________________________________________________________________
   __________________________________________________________________________
4. What does the phrase “biodiversity as a renewable resource” mean to you?
___________________________________________________________________________
___________________________________________________________________________
___________________________________________________________________________

5. How might protected parks (geoparks, provincial parks, etc.) help sustain biodiversity?
___________________________________________________________________________
___________________________________________________________________________
___________________________________________________________________________
Save that Park!

This activity is designed to be completed either at the Beaty Biodiversity Museum or in the classroom. The purpose of the activity is to have students research and come up with creative ways to conserve land of scientific or heritage significance.

Working in pairs or individually, students will create a brochure for an area of interest, explaining why the land should become a geopark instead of being used for mining. According to UNESCO (United Nations Educational, Scientific and Cultural Organization), a geopark is any area with geological heritage of international significance and aims to reconnect people with nature and history.

Students will be encouraged to create clear connections on how geoparks are an important source of information on the biodiversity of an area, and the significance of fossils in understanding that richness. If the activity is completed at the museum, use the following displays to gain some real-life examples and inspiration: The Dinosaur Trackway Exhibit, the Fossil and Cowan Tetrapod Collections. Students will also be required to look at some local research on the importance of land conservation for biodiversity using the “Researchers Revealed” page on the Beaty Biodiversity Museum’s website.

Information about each exhibit and resource can be found at the Beaty Biodiversity Museum’s website:


Researchers Revealed: [http://beatymuseum.ubc.ca/research-2/research/researchers-revealed/](http://beatymuseum.ubc.ca/research-2/research/researchers-revealed/)

The Dinosaur Tracks in the exhibit were found in Tumbler Ridge, here in British Columbia. For information about Geoparks, specifically Tumbler Ridge, see the following resources:

Tumbler Ridge Geopark Website: [http://tumblerridgegeopark.ca/](http://tumblerridgegeopark.ca/)

UNESCO: [https://en.unesco.org/](https://en.unesco.org/)

Suggest time for activity: 90 minutes
Save that Park!

Tracks and fossils can be found in British Columbia in parks, such as the Tumbler Ridge Geopark.

According to UNESCO (United Nations Educational, Scientific and Cultural Organization), a geopark is any area with geological heritage of international significance and aims to reconnect people with nature and history. However, as industry progresses, these areas can become threatened for their availability of natural resources, such as forestry and mining. Imagine an area of land is considered a valuable source of minerals but also is an area of scientific significance and a habitat for many organisms.

An oil company and UNESCO want to buy the land, but the land owners are not sure if they should sell or turn it into a geopark. Create a brochure to convince the land owners why they should not sell the land to the oil company, focusing on the significance of fossils and impact on biodiversity.

Your poster should include the following (check off the boxes as you complete each requirement):

- Name of the park
- Catchy title to grab the reader’s attention
- Short description of the park
  - Three sentences maximum: Include what type of park it is, where it is located, which ecosystems might be present, and who the park is for
- How is the park impacts biodiversity (e.g. How do parks help sustain biodiversity?)
- The importance of preserving fossils in nature and their significance
- Mascot- find an extinct organism to represent your park (it can be a plant, animal, or insect)
- Three reasons to conserve the land
- Using the “Researchers Revealed” webpage (http://beatymuseum.ubc.ca/researchers-revealed) on the Beaty Biodiversity Museum website, learn about some past local research that focusses on sustainability of our ecosystems. Include one thing you learned from your research on the poster to help convince the owners (e.g. impact of forestry on biodiversity, the damage done by human industry, etc.)
  - Note: be prepared to present the poster to the group
Additional Links

Did you know the Pacific Museum of Earth is located across the street from the Beaty Biodiversity Museum? Tour 4.5 billion years through the evolution of Earth, touch a real dinosaur bone, be informed about the hazards of natural disasters, gaze at dazzling mineral and gem displays, and learn about the mineralogical guts of your smartphone. Check out their site at http://pme.ubc.ca.

If your group is interested in paleontology and Earth sciences, check out the Earth Experience offered by the Beaty Biodiversity Museum and the Pacific Museum of Earth (http://pme.ubc.ca/programs/earth-experience/). This program allows students to explore the amazing natural forces that shape the earth and how this has influenced the variety of insects, plants, and animals around us.
Answer Key

Renewing Biodiversity

The environment is constantly changing, and organisms must change in response to survive. When populations are unable to adapt fast enough, they die out or go extinct. For a species to survive change, adaptations must accumulate in the population over many generations and be beneficial for the overall fitness of the individual, so their genes are passed onto the offspring.

There have been five major extinction events over the last 4.5 billion years caused by various natural events (volcanic eruptions, climate change, etc.). As species go extinct, the total biodiversity (variety of life) of the ecosystem changes. Biodiversity, like oil and minerals, is a natural resource that is in a steep decline due to human industry (forestry, hunting, etc.). Human impact on biodiversity is seen by the scientific community as the sixth mass extinction because we are losing species faster than gaining them.

Using this information and what you learned at the museum, answer the following questions:

1. What is the importance of exhibits such as the Dinosaur Trackway Exhibit?
   
   Exhibits provide us with the evidence of the progression of evolution, relationships between different groups of organisms, information about what the habitat and climate was like in the past and how it changes and impacts organisms, etc.

2. How can fossils help us understand the changes in biodiversity over geological time?
   
   Fossils provide us almost a play-by-play of small changes that occurred over time, allowing us to understand the concept of speciation from common ancestry. They also provide information on what kind of conditions organisms thrived in and which conditions decrease their fitness, etc.

3. Dinosaurs are still alive today, although they are better known as modern birds. What are two threats modern birds face from human impact?

   Loss of habitat, pollutants, decreasing egg shell quality, hunting, and biomagnification are all examples of threats facing modern birds.

4. What does the phrase “biodiversity as a renewable resource” mean to you?

   Biodiversity is a resource because it allows ecosystems to sustain themselves and function effectively. However, due to human impact and the huge industry of forestry, hunting, etc., the diversity of species is declining faster than nature can replenish it. Therefore, we need to increase conservation efforts and be proactive at increasing species diversity.

5. How might protected parks (geoparks, provincial parks, etc.) help sustain biodiversity?

   Protect various habitats from things like forestry, hunting, pollution, etc., and in turn, protect the organisms living there. They also inform citizens more about life and promote a sense of appreciation for nature and protect it. They allow for the preservation of land of scientific importance to understanding the Earth’s history, etc.