

United Nations Educational, Scientific and Cultural Organization



BIOSPHERE BOOKLETS

Lesson Plans & Activities

BIODIVERSITY

SUMMARY/OVERVIEW

Grades: 6-7

Prep Time: 1 hour Learning Environment: Outdoor & Indoor

Total Lesson Length: 6 hours

DESCRIPTION:

This booklet introduces the concept of biodiversity to students and promotes a greater awareness of their environment, the importance of biodiversity, and how it affects us (including economically). Activities involve outdoor exploration as well as indoor worksheets and discussion topics. Students will examine some of the current threats to biodiversity as well as what can we do to help. Activities can be delivered separately or on the same day.

CURRICULUM EXPECTATIONS:

Questioning and predicting:

- Make observations aimed at identifying their own questions about the natural world

- Identify a question to answer or a problem to solve through scientific inquiry

Processing and analyzing data and information:

- Experience and interpret the local environment

- Use scientific understandings to identify relationships and draw conclusions

BACKGROUND:

Biodiversity refers to the total number of different species found in the same area/habitat. Different species are interconnected and depend on each other for food, shelter, defense, etc. Biodiversity provides us with several "ecological services". The number of species in each habitat (biodiversity) is distributed differently across the globe, with more species found in the tropical/equatorial latitudes.

LESSON PLAN

TIME

ACTIVITY

- 1 hour 1. Introduction What is Biodiversity?
- 30 mins 2. Benefits of Biodiversity
- 1 hour 3. Matching Challenge
- 3 hours 4. Threats to Biodiversity
- 30 mins 5. Conclusion Survival of the Fittest

LOCATION

Outdoor Indoor Indoor Indoor Indoor

MATERIALS

Printed worksheet Printed worksheet Printed worksheet, scissors, glue Printed worksheets, coloring pencils Printed worksheet



TIMEACTIVITY1 hour1. Introduction – What is Biodiversity?

LOCATION Outdoor

Introduction: What is Biodiversity?

GOAL: Provide students with an understanding of what biodiversity is. **PREPARATION:** Print page 3/20 (next page). Bring pens and clipboards (optional) to nearby park or school park.

LESSON PLAN:

INTRODUCTION: Initial Discussion (10-15 mins)

 Ask students if they have heard the term "biodiversity" before. If so, ask them to explain what it is. If not, ask what they think it means by breaking down the name. (bio=biological=living, and diversity=different)

Biodiversity is the total amount (number) of species found in a certain area

- Ask if they have noticed or counted the number of organisms around them when they go out for a walk or even in their own backyard.
- 3. Explain the interdependency between species as different animals eat different things. Animals can either be a GENERALIST (eats several different types of food), or it can have a specific NICHE diet, meaning it is very "picky". (Disappearance of its food = Disappearance of the animal as well).

HANDS ON: Counting Biodiversity - Gathering Data (45 mins)

 Take the students to a nearby park and ask them to explore and fill in the BIODIVERSITY INDEX WORKSHEET (next page = 3/20).

The next activity can be conducted in the classroom or in the park

- 5. Ask students to count the number of different species they saw of each category, the number of individuals, and calculate the Biodiversity Index.
- 6. Ask them to rank the categories from most diverse (1) to least diverse (4). (Expected Answer: 1-Insects 2-Plants 3-Fungi 4-Mammals)
- 7. Compare and discuss their results as well as the Biodiversity Index results.

Biodiversity Index Worksheet

At a nearby park, count the number of different species and the number of individuals you see in each category below and record it. You don't have to know their names, simply identify that they are different species.



TIME 30 min

What are the Benefits of Biodiversity? What is biodiversity "good" for?

GOAL: Understand the importance and effects of biodiversity. **PREPARATION:** Print page 6/20 for each student.

LESSON PLAN:

INTRODUCTION: Ecological services "checklist".

Ask students why they think biodiversity is favourable. In other words, what is biodiversity "good" for? Biodiversity is beneficial because it provides us with several benefits or "services" that make life possible, and for free! Look over the checklist below to view some of the main biodiversity benefits:

- **SOIL** formation and quality maintenance did anyone use any soil lately? The food you eat is certainly dependent on quality soil.
- Upkeep of WATER QUALITY by plants and filter-feeder organism such as clams, sponges and cyanobacteria. We need water to drink, to cook, to clean, and most importantly, our cells need water to work well.
- WASTE REMOVAL is done by decomposing fungi and bacteria. Waste includes not only animal droppings but dead leaves, dead trees, dead animals, etc. These things don't just "disappear", they are recycled by animals that eat decomposing organisms (called detritivores).
- **POLLINATION AND SEED DISPERSAL** is crucial for the life cycle of plants, flowering or otherwise. It is the spread of pollen from one plant to another which ensures that the genetic material is passed on. Without pollination, most of the crops we have would disappear. Has anyone recently eaten plants that need pollination? Absolutely! Most berries, tomatoes, oranges, almonds, watermelons, cabbages, peppers, pumpkin, broccoli, apples, bananas, etc. require pollination.
- MEDICINE & ECOTOURISM are also provided by biodiversity. A lot of the medications we use today are derived from plants. Ecotourism refers to enjoying the outdoors while travelling. Medication that is dependent on plants include: aspirin, morphine, quinine. The horseshoe crab's blood is collected to be used in medications that help with our immunological system, frog skin components are used in some antibiotics, as well as some snake venoms. Has anyone ever taken a medication before?

This discussion will set them up for the fill-in-the-blanks activity. They will need to read the short description to know which word fits in each sentence. Note that there are three bonus words to be found in the wordsearch!

Benefits of High Biodiversity

ANSWER KEY

SOILS: Biodiversity includes not only the large plants and animals we see, but also <u>MICROSCOPIC</u> bacteria, fungi, algae and many tiny insects and invertebrates. These smaller organisms are the ones <u>RESPONSIBLE</u> for creating soil and maintaining the quality of soil.

WATER QUALITY: The benefits of biodiversity include keeping water quality pure. In <u>WETLANDS</u>, plants will take up contaminants in water and process and purify the water. Shellfish such as mollusks take in nutrients from the water, thereby preventing a condition called eutrophication, which leads to <u>OXYGEN</u> depletion and mass die-offs.

WASTE REMOVAL: The diversity of microbes, fungi, and other smaller organisms is important in decomposing waste matter. Organic material in nature (leaves, logs, twigs, animal droppings, dead animals, etc.) is degraded and <u>DECOMPOSED</u> by the biodiversity of organisms in the ecosystem. It is a <u>DELICATE</u> balance, in which insects or microbes perform a vital function in removing waste from the environment.

POLLINATION AND SEED DISPERSAL: Bees are not the only organisms responsible for **pollinating** plants and crops. In fact, birds, **BATS**, and butterflies play a vital role in spreading pollen and in dispersing **SEEDS**.

MEDICINE & ECOTOURISM: Thousands of modern medicines incorporate natural ingredients from plants. Should any of these plants become

E	W	E	Т	L	A	Ν	D	S	Y	U	Ρ	F	S	0	R	Н	D	S	0	0	W	A
Е	Y	U	С	А	В	E	0	Н	Q	S	Ζ	А	Т	E	Х	Т	- I	Ν	С	Т	0	V
А	L	S	Н	Т	В	Х	R	U	L	U	А	Υ	А	А	S	I	Т	С	W	U	Ν	R
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EXTINCT, medicinal treatments would suffer. Examples of plants used in modern medicine include **quinine** from South America, used to treat **MALARIA** and **cortisone** from Central American yams, which is a main ingredient in birth control pills. Travel companies promote tours into off-the-beaten-path locations, where tourists can observe and enjoy nature without disturbing the **ecosystem**. Money from ecotourism goes back into the region and helps to preserve the diversity of plants and animals.

SOURCE: SCIENCING.COM

Benefits of High Biodiversity

WORD BANK: MICROSCOPIC RESPONSIBLE WETLANDS OXYGEN DECOMPOSED DELICATE BATS SEEDS EXTINCT MALARIA

Find the words that fill the blanks below. There are three bonus words in the wordsearch!

WATER QUALITY: The benefits of biodiversity include keeping water quality pure. In ______, plants will take up contaminants in water and process and purify the water. Shellfish such as mollusks take in nutrients from the water, thereby preventing a condition called **eutrophication**, which leads to ______ depletion and mass die-offs.

WASTE REMOVAL: The diversity of microbes,	E	W	Е	Т	L	А	Ν	D	S	Y	UΡ	E	S	Ο	R	Н	D	S	0	0	W	А
fungi, and other smaller organisms is	F	Y	U	C	А	В	Е	0	Н	0	SΖ	A	Т	Е	Х	Т	I	Ν	С	Т	0	V
important in decomposing waste matter.	^	, T	c	с Ц	т	D	- V	D		1		V	Δ	Δ	c	, I	т	C	1/1/		N	D
Organic material in nature (leaves, logs, twigs,	A	L	2		1	D	^			1		1		~	2	-		C	vv	0		
animal droppings, dead animals, etc.) is	G	В	Ρ	A	S	Į.	A	E	J	A	NJ	V	Q	L	2	F	A	S	Н	G	D	I
degraded and	L	Ν	А	Н	Y	U	0	S	W	К	LΧ	Ν	0	S	М	Ρ	Κ	W	S	Т	E	Ρ
by the biodiversity of organisms in the	Т	F	G	Т	G	А	Q	Ρ	S	S	A O	A	K	Н	А	L	D	А	Х	Н	Т	R
ecosystem. It is a	А	Н	Т	Κ	S	Y	L	0	А	0	ΡX	N	D	Е	L	Ι	С	А	Т	Е	Ρ	F
balance, in which insects or microbes perform	В	D	T	L	Н	S	А	Ν	L	W	ΟY	S	D	U	А	J	0	Ζ	I	Q	L	А
a vital function in removing waste from the	R	К	U	А	F	Н	М	S	S	Н	WΚ	Q	J	R	R	S	Е	Н	С	Ρ	0	В
environment.	W	А	А	0	В	W	Μ	Ι	С	R	ΟS	C	0	Ρ	ī	С	V	S	D	А	F	S
POLI INATION AND SEED DISPERSAL Bees	0	Ι	S	Х	S	I	0	В	Q	I	DJ	L	К	D	А	Т	D	Т	Е	Ν	U	Е
are not the only organisms responsible for	Х	W	S	Y	L	J	L	L	0	S	JΕ	A	Т	S	W	F	L	I	L	Е	Κ	Е
pollinating plants and crops. In fact, birds.	Μ	Е	Μ	G	W	L	А	Е	I	L	WI	G	A	D	Y	U	Н	G	Y	G	D	Ζ
, and butterflies play a vital role	, I	R	С	Е	G	G	S	Е	R	Н	СT	V	L	А	Q	Е	Е	R	К	Y	С	S
in spreading pollen and in dispersing	0	Ν	Ν	Ν	S	Т	S	Μ	R	G	CS	С	P	L	А	0	Ρ	L	А	Ν	Т	S
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	0	I	Е	Μ	U	Ρ	Ι	L	S	А	ΒН	О	K	Ρ	Е	Κ	Ρ	0	Y	В	Т	1
MEDICINE & ECOTOURISM: Thousands of	Y	L	С	Κ	S	Q	Ρ	F	К	0	GΙ	S	D	Y	S	S	L	S	К	Е	А	V
modern medicines incorporate natural	_	_	-			`	_	_				_			_	_	_	_	_	_	_	_
ingredients from plants. Should any of these																						

plants become ______, medicinal treatments would suffer. Examples of plants used in modern medicine include **quinine** from South America, used to treat ______ and **cortisone** from Central American yams, which is a main ingredient in birth control pills. Travel companies promote tours into off-the-beaten-path locations, where tourists can observe and enjoy nature without disturbing the **ecosystem**. Money from ecotourism goes back into the region and helps to preserve the diversity of plants and animals.



TIMEACTIVITY1 hour3. Matching Challenge

LOCATION Indoor **MATERIALS** Printed worksheet, scissors, glue

Matching Challenge

GOAL: For students to understand that biodiversity is applicable to several different environments and that different species vary in the food they consume and/or the environment they live in.

PREPARATION: Print one copy of page 8 and 9 for each student. Ask the student to cut the rectangles (page 9) and match the animal's diverse habitats or diets (page 8). Students will need glue and scissors for this activity.

LESSON PLAN: INTRODUCTION: Initial Discussion (10-15 mins)

This exercise is meant to exemplify the biological diversity in different scenarios. Birds may live in the same habitat, but are adapted to have different diets and not compete with each other, enhancing their chance of survival. Animals may also live in different habitats, adapting to different temperatures, humidity levels, oceanic pressure, etc.

ANSWER KEY:







pac.dfo-mpo.gc.ca/fm-gp/salmon-saumon

entomology.wsu.edu



https://www.audubon.org

ceannetworks.ca/article-tags/spotted-ratfish

dangeredlist.org/animal/golden-toad/



https://www.dfo-mpo.gc.ca

DIET DIVERSITY

naturemappingfoundation.org





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Biodiversity Matching Challenge

The diversity of species is a reflection of the diversity in the habitat/environment the organisms live in. Diversity of species makes them specialized to inhabit several different types of habitats, resorting to different strategies to consume food, hide from predators and pass on their genes.

Cut and glue the animal's pictures to match their diverse habitats and diets below:



Biodiversity Matching Challenge











































































































TIME 3 hours **ACTIVITY** 4. Threats to Biodiversity

LOCATION Indoor **MATERIALS** Printed worksheets

Threats to Biodiversity What is affecting biodiversity?

GOAL: Explain to students that biodiversity isn't a fixed and permanent thing. It is delicate, currently vulnerable and needs to be protected.

PREPARATION: Print pages 12 and 13 for each student. Provide coloring pencils to students for Part 2 of activity (bottom of page 11).

LESSON PLAN:

INTRODUCTION: Initial Discussion (30 mins)

Ask the students if they think **biodiversity is threatened** in any way. Give examples of threats to biodiversity. Some of the biggest threats to biodiversity are:

HABITAT DEGRADATION

Human developments often disrupt and/or destroy the natural habitat of many species. We expand and urbanize our cities, log for wood, and pollute, for example.

INVASIVE SPECIES

When animals are found in a habitat where they do not originate, meaning they are not in their natural habitat.

EXTRA VOCABULARY: ENDEMIC = a species that only exists in one area of the world.

EXTRA VOCABULARY: A species that is often INTRODUCED accidentally by humans can be also called an ALIEN species.

CLIMATE CHANGE

Decades of observation and research describe a trend in variations on Earth's climate. Global warming is just one consequence of climate change. Others are ocean acidification and species extinction.

EXTRA VOCABULARY: EXTIRPATION = when a species disappears completely from an area that used to be its habitat. The species isn't EXTINCT, as populations in other locations of the world still remain.

LOW POPULATION

The higher the number of individuals a population has, the more variation of DNA (an organism's "blueprint") there will be, leading to more resistant differences to be favoured by natural selection.

EXTRA VOCABULARY: A small population leads to low **GENETIC VARIATION** (or GENETIC DIVERSITY), meaning that species has a lower chance of survival in the case of a catastrophic event or disease.

HANDS ON:

Part 1: Examples of threats to biodiversity (15-20 mins)

This will provide students with some **real-life examples for part 2 of the activity**. Ask the students to read the descriptions below and identify what type of threat to biodiversity it is exemplifying.





Part 2: Create a Comic Challenge! (Suggested 2-hour activity)

Ask the students to draw a comic strip (page 13) telling a story where they create a solution for a threat to biodiversity. The story can be a real-life case, or it can be a made-up case. The main focus is to ask the student to create a viable solution for the problem. *Note: Students may need more than one worksheet to complete.*

OPTIONAL:

Ask the class to vote on the most creative comic.

Threats to Biodiversity

Read the descriptions below and identify which type of threat to biodiversity it is exemplifying.



What is being done? Population awareness with signs, camera monitoring and nest protection by local researchers. Urban growth and introduction of exotic species in Mexico are the leading causes for the sharp decline in **Axolotl** (*Ambystoma mexicanum*) populations (endemic). There were only two populations that we know of in Mexico, one in Lake Xochimilco and the other in Lake Chalco. As amphibians, they are very vulnerable to pollution and depend on water for

survival and reproduction.



What is being done? Captive breeding and habitat protection.

Polar bears (*Ursus maritimus*) are powerful carnivores that spend most of their lives around water and ice. Unfortunately, the Arctic ice has been melting away twice as fast as the global average.



What is being done? Canadian governmentfunded research.

(Reducing carbon emissions significantly on global scale is also needed, but harder to achieve) The Vancouver Island Marmot (Marmota vancouverensis) is a rare mammal endemic to Vancouver Island. There are only about 200 individuals remaining, a great improvement when compared to the population of only 30 individuals in 2003. Ongoing developments in parallel with periodically stronger predator- prey dynamics have contributed to the decline.



What is being done? Captive breeding and release and habitat protection.

Threats to Biodiversity

Use the frames below to create your own comic story highlighting a threat to biodiversity, as well as an action plan to preserve it.



Description:



TIMEACTIVITYLOCATIONMATERIAL30 min5. ConclusionIndoorPrinted and cut cards, tape

Conclusion: Survival of the Fittest!

GOAL: Conclude the topic by understanding and playing with the famous phrase "survival of the fittest". **PREPARATION:** Draw a <u>BLANK</u> table like the one below (but without the answers!) on the board. Print the cards on the following pages (page 15-19). Lamination is recommended but not required.

			HABITATS					
ORGANISM	DESERT	TREE	CAVE	SEA				
PLANT	<mark>CACTUS</mark>	ORCHID	NOT FIT (needs sunlight)	<mark>KELP</mark>				
MAMMAL	MEERKAT	SQUIRREL	BAT	WHALE				
FISH	<mark>NOT FIT</mark> (needs water)	<mark>NOT FIT</mark> (needs water)	CAVEFISH	SHARK				
ARTHROPOD (insects + crustaceans)	SPIDER	BEETLE	CAVE MILLIPEDE	LOBSTER				
BIRD	<mark>GREATER</mark> ROADRUNNER	WOODPECKERS	NOT FIT (uses sight to fly)	NOT FIT (cannot survive underwater)				

LESSON PLAN:

INTRODUCTION: With our new knowledge of the importance and meaning of biodiversity, it now becomes clear that the famous phrase "survival of the fittest" actually means "survival of the one that is most fit to survive in its environment" and not necessarily the *strongest* individual in a population, as it is commonly thought.

HANDS-ON:

 Give each student one card and ask them to place/stick their card in one of the available spots on the table drawn on the board. Check if the answer is correct and discuss with class. Encourage questioning and make sure the answer is correct before the student goes back to their desk. The goal is to complete the table and understand all the different (DIVERSE) types of "fitness".













HOW DO I HELP BIODIVERSITY?



Create beautiful, easy-to-maintain naturescapes that attract birds and butterflies b

Gardening with Native Plants





