

Enriched living world worksheet

1. How does the Phosphorus cycle start?
 A) It begins with the formation of rocks and phosphorus.
 B) It begins when phosphates move from plants to animals.
 C) It begins by decomposing through bacteria and fungi.
 D) It begins when leaching occurs.
2. The company "Cleanall" conducts tests in their laboratory to determine the toxicity threshold of their cleaning products. Every 10 minutes, a technician adds a drop of a detergent to an aquarium containing a population of Daphnia (small crustaceans). She must determine the toxicity threshold of the detergent.

Which of the following statements indicates that the toxicity threshold for the detergent has been reached?

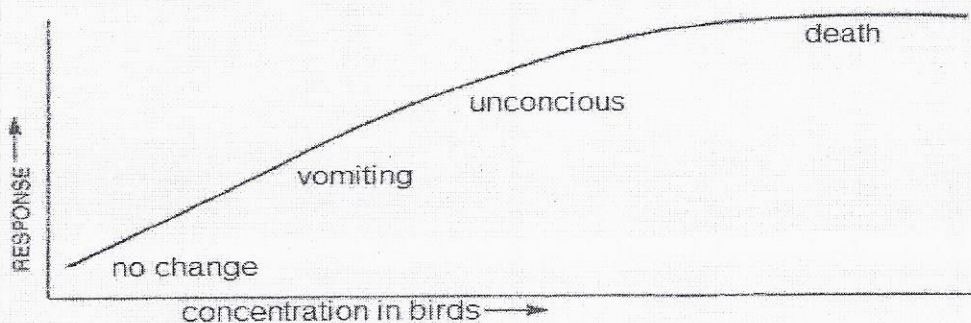
- A) The Daphnia are behaving normally, 10 minutes after the detergent has been added
 B) The mobility of a few of the Daphnia is reduced, 20 minutes after the detergent has been added
 C) Half of the Daphnia are dead, 30 minutes after the detergent has been added
 D) All of the Daphnia are dead, 40 minutes after the detergent has been added
3. A toxicologist must assess the danger related to the human consumption of some rice which may be contaminated with arsenic.
Listed below are 4 possible factors which may affect the toxicity of this rice to humans.
1- Frequency of consumption 3- Concentration of arsenic in rice
2- Volume of container 4- Mass of consumer
Which factors listed above should be assessed?
 A) 1 and 2 B) 1, 2 and 3 C) 1, 3 and 4 D) 2, 3 and 4
4. As long as the Earth's resources are able to sustain the Ecological Footprint of its human population, the Earth will be able to continue to provide for all of our needs. What step can be taken by different nations to contribute towards making Earth a sustainable planet?
 A) Create more mineral resources.
 B) Increase the Ecological Footprint.
 C) Plan cities with single family housing units.
 D) Provide subsidies (cash bonuses) for the purchase of electric vehicles.
5. Where would the lowest concentration of DDT (contaminant) be found?
 A) Predatory birds B) Fish C) Plankton D) Phytoplankton
6. Eutrophication _____.
 A) Is caused by the runoff of nitrogen and phosphorus. C) Results in massive fish kills.
 B) Causes algae to proliferate D) All of the above.

7. Bioconcentration refers to the process :
- where living organisms retain certain substances.
 - where the concentrations of toxic substances increases as we move up the food chain.
 - where the concentrations of toxic substances decreases as we move up the food chain.
 - of accumulating important nutrients during the life of an organism.
8. In Canada, microplastics have been added to a variety of personal care products such as shampoos and toothpaste, to enhance the product's scrubbing effect. The microplastics are not removed by waste water treatments and end up in freshwater systems. Microplastics can be ingested by aquatic organisms such as Atlantic mudsnails.



Which of the following statements refers to the toxicity threshold for microplastics ingested by the mudsnails?

- Microplastics, at a certain concentration, cause Atlantic mudsnails to die.
 - Microplastics can be transferred to higher trophic levels in higher concentrations.
 - Microplastics cause significant harmful effects once a certain concentration is reached.
 - Microplastics cause a stress on digestion such as physical blockage and more energy expenditure.
9. In response to the use of a new pesticide an increase was seen in the death of herbivorous birds. Medical tests were performed on the birds to detect how they respond to increasing concentrations of the pesticide. The graph below shows the birds' response as the concentration of the pesticide increases.



At which point in the graph has the toxicity threshold been reached?

- When there is no change
- When vomiting begins
- When the bird is unconscious
- When the bird dies.

10. An industry that employs 1 000 workers is looking to reduce its ecological footprint. Here are some proposed measures.

- Salary bonuses for all employees that carpool on a regular basis.
- Changing the cafeteria menu to include international foods.
- Installing air conditioning in all offices.
- Hiring an outside company to do all the necessary printing.

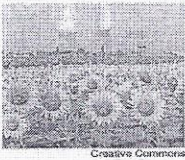
Which of the above measures would reduce the industry's ecological footprint.

- 1
- 2
- 3
- 4

11. Phosphorus cycles through the planet naturally occur. During this cycle, phosphorus can promote the process of eutrophication of a natural body of water. Which of the following has the lowest impact on eutrophication?

- A) Phosphorus dissolved in the hydrosphere
- B) Phosphorus present in the atmosphere**
- C) Phosphorus stored in sediment
- D) Phosphorus in dead organisms

12. In April 1986, the nuclear power plant in Chernobyl experienced a catastrophic nuclear accident that led to large quantities of radioactive particles being released into the environment. After the accident sunflowers were planted around Chernobyl in order to clean up the environment.



b) adv: less radiation in the air
dis: flowers + soil has an ↑ in radiation

a) Phytoremediation

- a- What is the process of using sunflowers to clean up the environment around Chernobyl called?
- b- Explain a consequence of using this process and identify it as advantageous or disadvantageous.

13. Eutrophication is a widespread environmental problem. Most scientists agree that eutrophication is caused by increasing inputs of phosphorus and nitrogen, which are abundant in human sewage, in the excrement of the livestock and in fertilizers applied to agricultural land. How do increases in nitrogen and or phosphorus lead to eutrophication in Quebec lakes? Give 4 statements.

- 1) PO_4 runs off
- 2) Proliferation of algae
- 3) Sun cannot penetrate water

- 4) plants can't do photosyn.
- 5) NO O_2 for fish + fish die + sediment

14. The accelerated eutrophication of lakes is a concern in several regions of Québec. One town in Québec passed by-laws requiring lakefront property owners to:

- a) Plant more shrubs and trees along the shoreline.
- b) Stop using chemical fertilizers on their lawns and gardens.

Explain how the requirements of the by-law listed above could help prevent accelerated eutrophication.

a) Shrubs + trees act as a filter preventing waste from entering the water.

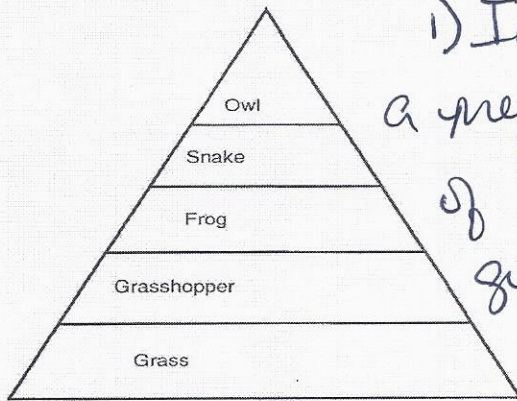
b) PO_4 will not end up in water areas = less eutrophication

15. Many countries have such a high ecological footprint that they are taking up the space of more than one planet. Yet, we only have one planet. Explain how this can occur.

Countries with less population can use up more space because countries with a very high population use up much less space.

16. Herbicides are chemicals used to control unwanted plants. Commercial herbicides can have a negative impact on wildlife and are considered contaminants. A herbicide is sprayed on the grass in a park to control unwanted plants. The frog population in the area is affected because a chemical in the herbicide makes the male frogs unable to reproduce.

Trophic Relationship



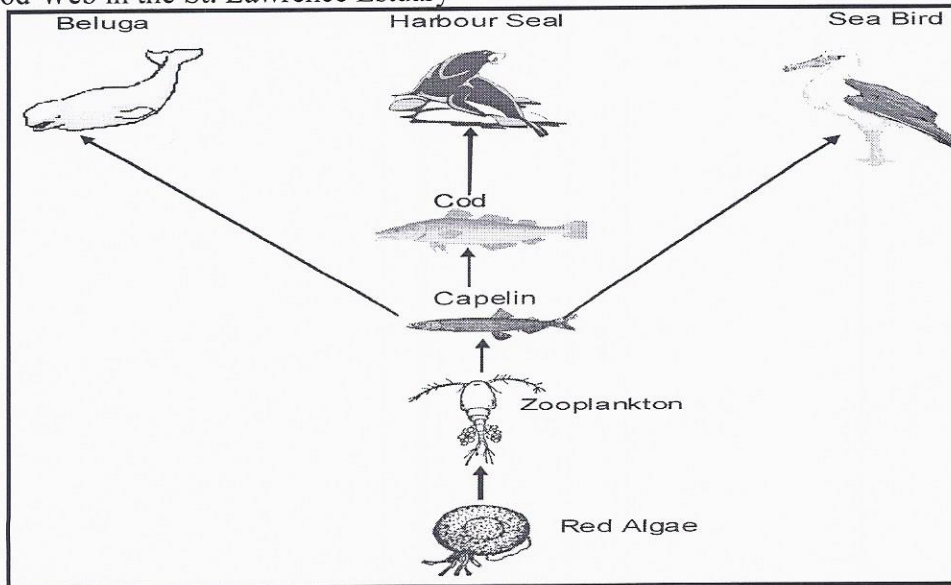
1) In the food chain, the frog is a prey of the owl + snake. Because of bioconcentration the owl will get more of the herbicide.

Explain how the accumulation of the herbicide in the tissues on the frogs would lead to the herbicide having a negative effect on the owl population.

2) Frog species will die off because males are sterile.
 ↓ frogs = ↓ prey = less food for owl.

17. In the summer of 2008, a toxic red algae bloom which lasted between 2 to 3 weeks caused the death of 10 belugas, 100 seals and over 1 000 birds and fish in the St. Lawrence Estuary. The red algae contain toxins that are harmful to the organisms in the estuary.

Food Web in the St. Lawrence Estuary



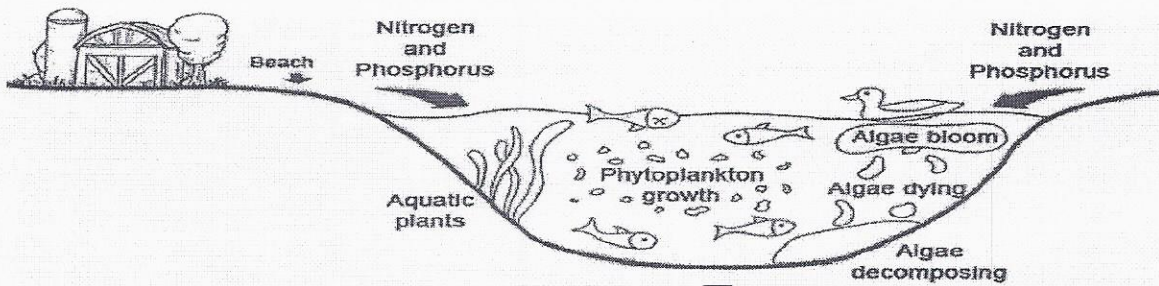
Why did more harbour seals than belugas die as a result of the red tide? Justify your answer.

The harbour seal has 4 trophic levels below it, while the beluga has 3 levels. ∴ beluga has less bioconcentration

18. Jennifer visits her grandparents who operate a small farm by a lake. Her grandparents had cleared a path to the lake to have access to a small beach. In doing so, many trees and shrubs were removed. Recently, her grandparents noticed an increase in algae bloom in the lake and a decrease in the quantity of fish. Jennifer explains to her grandparents the causes and effects of this ecological phenomenon by referring to the diagram below.

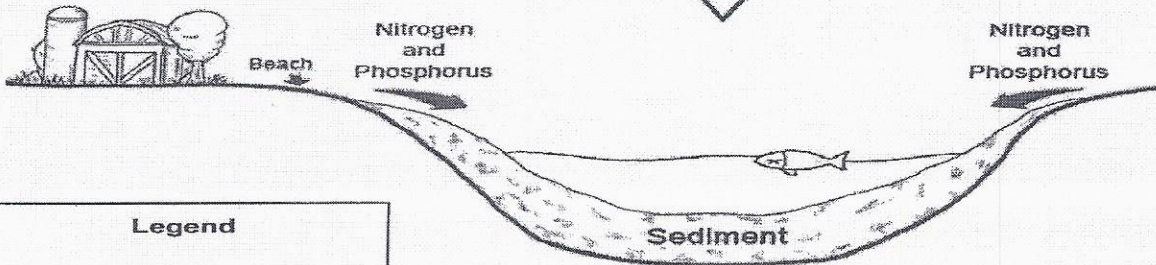
Diagram 1 refers to the current state of the lake and Diagram 2 refers to the future state of the lake.

Diagram 1: Current state of lake



The same lake later in time

Diagram 2: Future state of lake



Legend	
Dead Fish:	
Live Fish:	

- What is the name of the ecological phenomenon Jennifer is referring to?
- What are the causes of this phenomenon?

a) Eutrophication

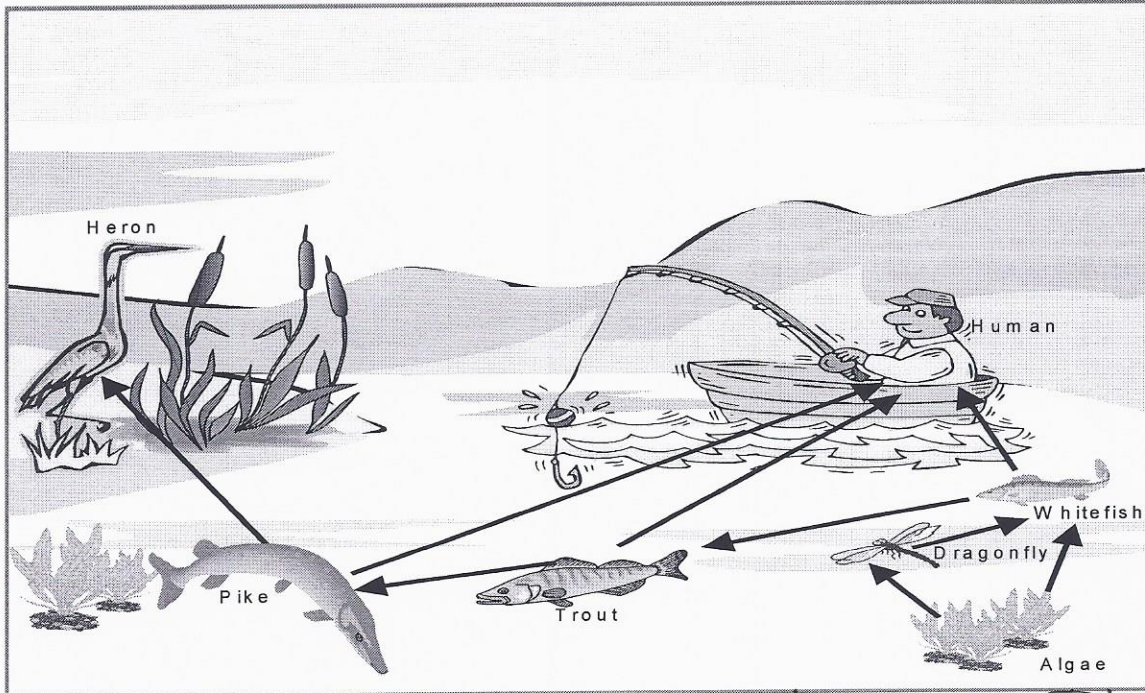
b) See # 13

19. Using the steps below, give the correct order of the phosphorus cycle.

- | | |
|---|--------------------------------|
| 1- Decomposition of waste and dead organic matter | 5- Proliferation of algae |
| 2- Uplifting of rock (new rock formed) | 6- Consumers eat the producers |
| 3- Plants absorb phosphates | 7- Leaching occurs |
| 4- Erosion of rocks | 8- Sediment is formed |

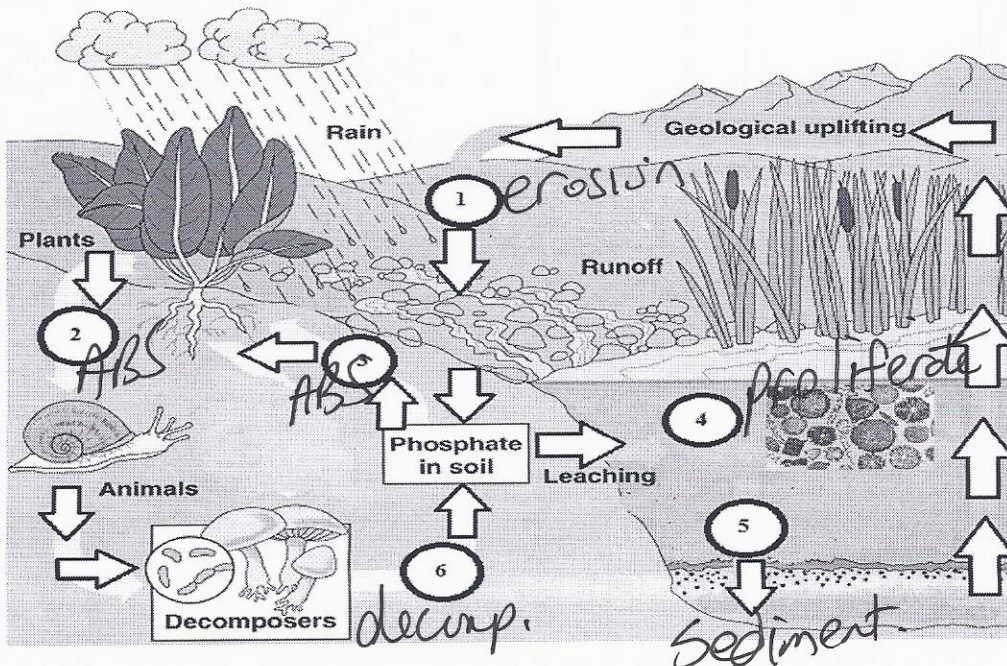
4 → 3 → 6 → 1 → 7 → 5 → 8 → 2

20. Use the food web in Figure 4 to explain which species of fish can be eaten more often and which can be eaten less often than the others.

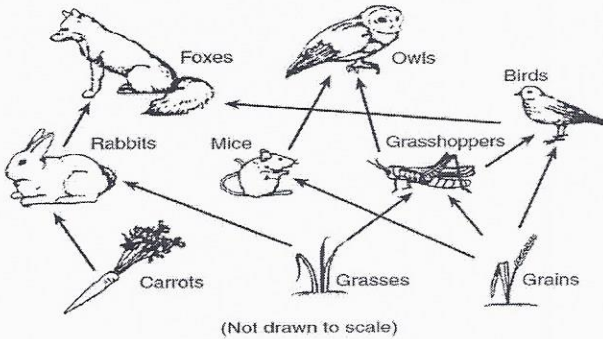


Can eat most = Whitefish = least bio concentration
 medium = middle bio concentration
 Can eat least = Pike = most bio...

21. Match the steps of the phosphorous cycle in the diagram with the terms below. 1 term is used twice. Absorption, Decomposition, Erosion, Proliferation of algae and sedimentation.



23. Use the picture below to answer questions a-c.



a- Which biotic organisms will show the least bioaccumulation?

Carrots, grass, grains

b- Looking at the picture, the fox can be either a second or third order consumer. Explain if it will be exposed to more contaminants as the second order consumer or the third order consumer.

3rd order because there were more trophic levels under the fox = more toxins accumulated.

c- If pesticides have been spread over the producers. Explain why the bird will have more bio concentration than the grasshopper even if they both eat grains.





Because the bird is also a second order consumer = more bioconcentration because more trophic levels

24. More than half of humanity now lives in cities. This is projected to rise to about 70% by 2050. According to the United Nations, managing urban areas has become one of the most important challenges of the 21st century. The environmental consequences of traditional urban development need to be addressed. As such, the United Nations Development Program suggests that a new ecological footprint should be a goal of sustainable development. Make four recommendations to potential city planners that would have a positive impact on decreasing the ecological footprint of our cities.

- plant trees
- reduce waste
- ↑ recycling
- build smaller home units
- create green spaces
- increase public transport
- increase renewable resources

25. Methyl mercury, CH_3Hg , ingested through fish consumption can cause health problems in humans such as reduced coordination and night blindness. CH_3Hg is found in fish that live in the lakes and reservoirs of hydroelectric dam regions. The consumption recommendations based on the length and species of fish are shown below.

Fish Consumption Recommendations

Fish Species	Length	Recommended Serving
Lake Whitefish 	500 mm	No restrictions
Walleye 	500 mm	Two meals per month
Pike 	800 mm	Two meals per month
Lake Trout 	600 mm	Two meals per month

- a) What biological process explains the presence of methyl mercury in fish tissue?
 b) Why do a Lake Whitefish and a Walleye of the same size and age have a different number of meal recommendations per month?

a) bioaccumulation

b) They have different trophic levels below them.

26. In 2011, Lake Erie experienced the largest harmful algal bloom in recorded history. The peak intensity, as illustrated below in the striped area of the map below, was over three times greater than any previously observed algal bloom.



- a) Give an example of human activity that promotes algal growth.

Run off water, use of fertilizer

- b) How does an increase in algal growth affect the oxygen level and ecosystem in Lake Erie?

algal growth will decrease the amount of O_2 that can penetrate the water. Less O_2 = plant & animal death = change in water area.