

Ecology Practice Exam Questions: Abiotic Factors & Ecosystems

1. On Vancouver Island there are some remaining areas dominated by temperate rainforest that harbor great biodiversity and are home to a number of black bears (*Ursus americanus vancouveri*). One interesting feature of these forest, and Vancouver Island in general, is the absence of grizzly bears (*Ursus arctos horribilis*).
 - a. What are some of the resources that black bears on Vancouver Island need to survive, grow and reproduce? List five of them.
 - b. Draw a food web for black bears on Vancouver Island. Include as many sources of food as you think the bears might be using, and for each of these sources trace the flow of energy all the way from sunlight.

- c. Imagine that a family of grizzly bears swam all the way to Vancouver Island and settled in an area populated by black bears. Predict how the grizzlies would affect the black bear food web that you drew in part b. Explain your answer and include any assumptions you are making (e.g. "I assumed that grizzlies don't eat blackberries", "I assumed that grizzlies and black bears ignore each other", etc.).
 - d. Use the perspective of a community ecologist, and your answer to part c, to predict the interaction(s) that would take place between black bears and grizzlies on Vancouver Island.
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2. In any stable community or ecosystem on Earth, big, fierce predators are rare. Use your knowledge of ecosystem ecology to provide a hypothesis that explains this.

3. Kokanee salmon are a sub-species of Sockeye salmon (*Oncorhynchus nerka*), and are often considered “almost a separate species”. They differ from Sockeye in that they spend their entire lives in freshwater, and they are typically smaller. Kokanee salmon typically eat plankton, insects, freshwater shrimp and small fish.

You have been hired by a team of fish biologists, and your job is to figure out the respective trophic levels of the various sources of energy used by Kokanee salmon. To do so, you collect multiple samples from Okanagan Lake and measure the relative biomass of plankton, insects, shrimp, and small fish present in each sample and calculate the mean for each organism. The results are as follows:

Plankton:	90.63%
Insects:	0.95%
Shrimp:	8.30%
Small fish:	0.12 %

Based on these results, draw a food chain for the Kokanee salmon in Okanagan Lake that includes plankton, insects, shrimp, small fish and, of course, Kokanee salmon.

4. When studying the Great Bear Rainforest we said that in this ecosystem, salmon are a very important species for the health and productivity of the ecosystem. Past students, however, have argued that it is not salmon, but bears that are critical to the health and productivity of the ecosystem. Do you agree or disagree with this view? Explain your reasoning.

5. In a post-apocalyptic world thousands of years into the future, several of the species that are alive have changed substantially since the 'ancient times' (i.e.,: 2015). Your PhD supervisor has asked you to reconstruct the trophic levels and food web of the 'new world' based on the amount of biomass one his colleagues has collected. He hands you the following data:
- a. Using your knowledge of productivity and trophic levels, identify the trophic level of each species listed below.

Amount of biomass (kg/m²)	Species	Trophic Level
1.5	Neo-crickets	
15	Neo-grass	
1.5	Neo-sparrow	
1000	Neo-frog	
15	Neo-fox	
200	Neo-haw	

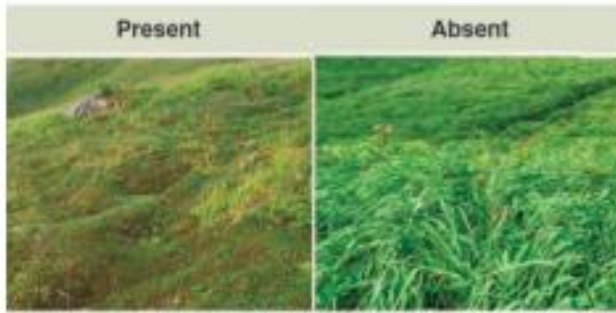
- b. Based on your answer to a, draw a food web for this ecosystem.

- c. What do you expect would happen to the fox population if we removed all grass? Explain why.

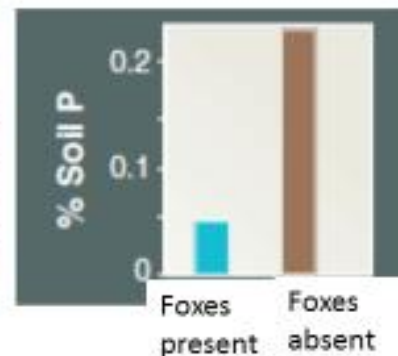
- e. What can we say for certain about Neo-frogs?

6. Answer the practice question below:

Practice Q



Estes et al., 2011



Arctic foxes consume sea birds.

When foxes are present (blue bar) there is less phosphorous in the soil compared to when foxes are absent (brown bar)

Note, phosphorus is a limiting nutrient. Propose a relationship between the foxes and seabirds and the arctic tundra ecosystem landscape. Explain your reasoning.

Note, you cannot answer this question using memorized information. You must generate a logical prediction based on your knowledge of the relationship between organisms in a community/ecosystem. How do/can abiotic and biotic factors influence the productivity and structure of an ecosystem?