

To take full advantage of the practice midterm you should:

1. Review course material and make your summary notes.
2. You should physically write the exam, so either print it or write on a sheet of notebook paper, but write only in the amount of space provided. Pick a quiet place and give yourself 60 minutes to do the exam. Keep a clock handy to you can practice pacing yourself.
3. Check your answers with the marking key provided (Posted on Monday the 26<sup>th</sup> in the evening).
4. Continue with your reviewing as necessary.
5. If you are unclear about material, go to office hours, post questions on the bulletin board, ask your group members, email someone from the teaching team.
6. Note: The last opportunity to meet with members of the teaching team or have emails answered before the midterm will be 3 p.m. Wed. Jan. 28. Check office hours posted on Connect.

Keep in mind that this is a practice midterm and the questions on your midterm will be similar in format and style, not necessarily in content.

UNIVERSITY OF BRITISH COLUMBIA

Biology 121  
Section 221

Practice Midterm 1, January 2015

Instructor: Dr. Laura Parfrey

Name: \_\_\_\_\_ Student number: \_\_\_\_\_

Instructions:

1. Answer all questions in the space provided.
2. All writing must be in **INK**. Challenges to exams mark will not be permitted if the exam is written in pencil.
3. Answers may be in sentences or point form. Illustrations are acceptable but must be annotated.
4. No memory devices are permitted except your notes page. This must be **one side of one page**, handwritten, have your name and student number, and be turned in with your exam.
5. Students may not speak or in any other way communicate with other students while in the examination room.
6. No calculators or electronic devices are permitted.
7. Students may not expose their written paper to other students. The excuse of accidental exposure, forgetfulness, or ignorance will not be accepted.
8. Students suspected of any of dishonest practices will be immediately dismissed from the examination and will be subject to disciplinary action.
9. Make sure you have **7** pages including this cover page.

I have read and fully understand these instructions.

Student signature \_\_\_\_\_

Mark allocation:

Question	Marks possible	Your mark
1	12	
2	12	
3	14	
4	6	
5	12	
Total	<b>56</b>	

**Question 1 (12 marks total)**

Rees and Juday (2002) compared the number of species in Alaskan boreal forests following either logging or forest fires in six different forests. To compare species diversity across developmental stages, multiple sites were chosen in each forest that represented different developmental stages following burning or logging: A (2-5 years); B (3-18 years); C (30-38 years) and D (75-95 years).

a) (1 mark) The change in the abundance and composition of species at the different developmental stages is called \_\_\_\_\_.

b) (1 mark) Fire and logging are examples of \_\_\_\_\_.

c) (3 marks.) Based on the data present in the figure, what can you conclude about the effects of logging compared with fire on biodiversity?

Your answer should include reference to specific data present in the figures.

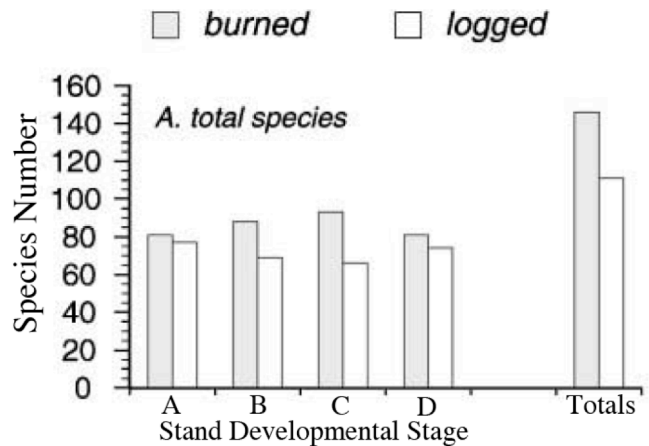


Figure 1 shows the total number of plant species present at burned and logged sites for each developmental stage and the total summed across all developmental stages.

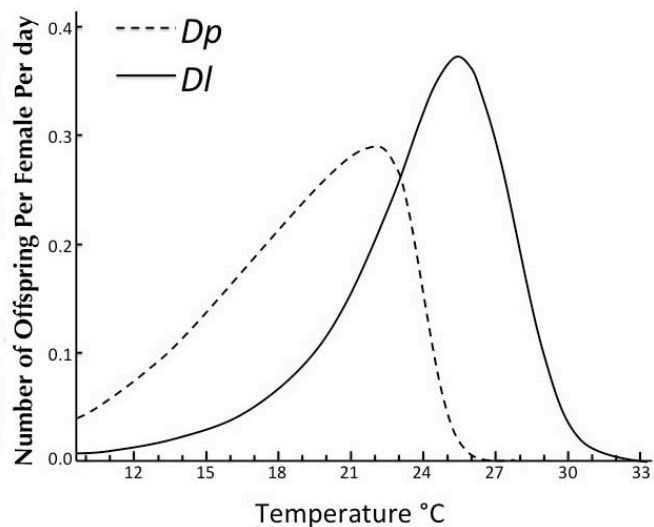
d) (3 marks) Why doesn't the number of species present at each stage continually increase over time?

e) (2 marks) Do you think that all of the forests that burned ended up with the same composition of species at Stage D? Why or why not?

d) (2 marks) Name two characteristics you would expect the species present at stage A to have, and two characteristics you would expect species at stage D to have.

**Question 2 (12 marks total)**

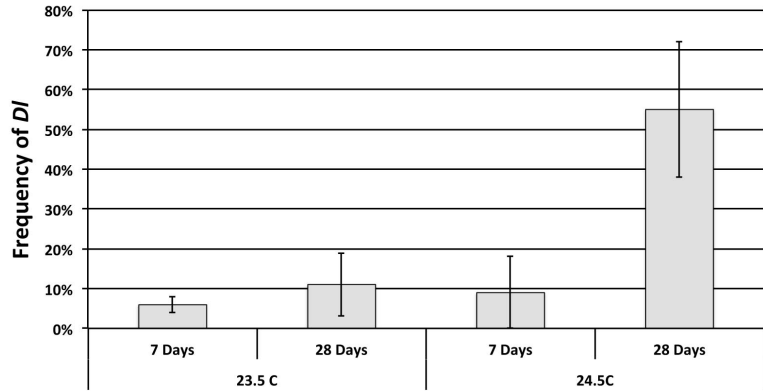
*Daphnia* species are small (~ 1mm) freshwater crustaceans. *D. lumholtzi* (*DI*) is a tropical, Asian species that has been introduced to the Southern US and is spreading northwards. *D. pulex* (*Dp*) is found in the northern US. Both species eat single-celled algae and live in the same regions of lakes and ponds. Fey and Cottingham examined the effect of global warming on spread of *DI* into habitats currently occupied by *Dp* by measuring the effect of temperature on fitness of the two species. The results are shown in the figure below.



a) (2 marks) What is the most important factor(s) responsible for a difference in the geographic distribution of *Dp* and *DI*? Briefly explain your answer.

b) (4 marks) Consider a pond where *Dp* and *DI* co-occur. The pond has an average temperature of 25°C. Initially the number of individuals of each species was the same. Discuss how you would expect the frequency of *Dp* and *DI* in this pond to change over time. Justify your answer with specific reference to data from the figure.

Fey and Cottingham performed a second experiment to determine if temperature affected the ability of *Dl* to spread to ponds already occupied by *Dp*. They created ponds that were kept at ~23.5 C and ~24.5C. The ponds contained a large number of *Dp*. A small number of *Dl* were added to each pond and the frequency of *Dl* relative to the total number of both species (*Dp* + *Dl*) was measured after 7 days and 28 days. The results are shown in the figure to the right.



c) (6 marks) Based on this experiment, discuss how an increase in average temperature due to global warming could affect the geographic range occupied by *Dl* in North America and predict how populations of *Dp* would be affected. Justify your answer with specific reference to data from the figures.

**Question 3 (14 marks total)**

The following species are found in a forest ecosystem:



*Felis concolor* (cougar)



*Lepus capensis* (brown hare)



*Odocoileus virginianus*  
(white-tailed deer)



*Trifolium repens*  
(white clover)



*Boletus edulis*  
(king bolete)

- a. Use a diagram to illustrate the different trophic levels represented by these species. Use arrows to indicate the direction of flow of energy through this community. Indicate where energy and carbon enter the system (5 marks)
- b. Which species would have the most biomass? Give one reason why. (2 marks)
- c. Explain what would happen to each of the trophic levels in (a) above, if brown hares were removed from the food web. (4 marks)

- d. In any stable community or ecosystem on Earth, big, fierce predators are rare. Use your knowledge of ecosystem ecology to explain why this might occur. (3 marks)

**Question 4 (6 marks total)**

The North Shore (North Vancouver, West Vancouver) is one of the rainiest regions of the Lower Mainland, while White Rock (40 km away) is one of the least rainy.

- a. Explain why this might be the case. (2 marks)
- b. Do you expect to see the same organisms, in the same numbers, in a North Shore forest and in a forest near White Rock? Explain why or why not. (2 marks)
- c. Before humans arrived in British Columbia, How do you think the amount of biomass in a forest near White Rock compared to the amount of biomass in a forest on the North Shore? Explain your reasoning. (2 marks)

**Question 5 (12 marks total)**

In the North Pacific (open ocean ecosystem) researchers have observed that phytoplankton bloom after addition of Iron to the water. Iron addition can occur naturally as a result of iron-rich ash from volcanic eruptions falling into the water. Researchers have confirmed this finding directly by adding iron oxide to the water in small experiments.

- a. What must be true of iron in the North Pacific to explain these blooms? (1 mark)

- b. Based on these observations, in 2012 a group of citizens added large quantities of Iron oxide to the North Pacific in hopes of increasing the number of salmon in the North Pacific. Why, in theory, would these citizens expect iron addition to increase salmon numbers? (2 marks)
- c. Draw an example of a marine food web that includes phytoplankton and salmon. Indicate the trophic levels and the flow of energy and carbon. Draw arrows to show the flow of energy in the food web. Include 1-3 species at each trophic level. (5 marks)
- d. Using your knowledge of ecosystem ecology and food webs, suggest two reasons why this iron addition might NOT increase salmon numbers. (4 marks)