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**Environmental systems and societies**  
**Standard level**  
**Paper 1**

Friday 8 November 2019 (afternoon)

Candidate session number

1 hour

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**Instructions to candidates**

- Write your session number in the boxes above.
- Do not open this examination paper until instructed to do so.
- Answer all questions. Refer to the resource booklet which accompanies this question paper.
- Answers must be written within the answer boxes provided.
- A calculator is required for this paper.
- The maximum mark for this examination paper is **[35 marks]**.



Answer **all** questions. Answers must be written within the answer boxes provided.

1. (a) Using **Figure 4(a)**, identify an ecosystem that has an average net primary productivity above  $30\,000\text{ kJ m}^{-2}\text{ a}^{-1}$ . [1]

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- (b) Suggest **one** reason for the zonation seen in **Figure 5(b)**. [1]

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- (c) Estuaries are one of the most productive ecosystems in the world, but only account for 3% of global productivity.
- State **one** reason why this occurs. [1]

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- (d) Outline why estuaries are highly productive ecosystems. [3]

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2. (a) Using **Figure 6(c)**, identify a food chain in the St Lawrence River ecosystem that has five trophic levels. [1]

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- (b) Using **Figure 7**, state the St Lawrence beluga whale population in 1920 and 1940. [1]

1920: .....  
1940: .....

- (c) Calculate the percent decrease in beluga whale numbers from 1920 to 1940. [1]

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- (d) With reference to **Figure 8**, explain why the beluga whale is more at risk from toxic pollutants, such as heavy metals and persistent organic pollutants (POPs), than most other organisms in its food web. [3]

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08EP03

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**(Question 2 continued)**

- (e) Suggest why the St Lawrence River beluga whale population has not recovered despite being given protected status in 1983.

[4]

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- 3. (a) Using **Figures 9(a)** and **9(b)**, identify **one** feature of the round goby that shows it is an r-selected species.

[1]

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- (b) With reference to **Figure 9(a)**, outline how the round goby both positively and negatively affects the St Lawrence River ecosystem.

[3]

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08EP04

**(Question 3 continued)**

- (c) With reference to **Figure 9(a)**, explain why the realized niche of the mottled sculpin has changed in recent years. [3]

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- 4. (a) Using **Figure 11(b)**, estimate the highest concentrations of coliform bacteria (in units/100 mL) found in the St Lawrence River one day after the untreated sewage was released. [1]

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- (b) Outline an environmental problem that may result from the release of untreated sewage into a river. [2]

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08EP05

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**(Question 4 continued)**

- (c) With reference to **Figures 10, 11(a)** and **11(b)**, describe a method to monitor the impact of the release of untreated sewage into the St Lawrence River ecosystem. [3]

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- 5. With reference to information in the resource booklet, evaluate the sustainability of Canada’s management of the Large Ocean Management Area of the St Lawrence River estuary and Gulf of St Lawrence. [6]

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08EP06



08EP07



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Answers written on this page  
will not be marked.



08EP08