
Teacher Package

Science Exemplar Task Biology, Grade 12, University Preparation (SBI4U) Teacher Package

Title: A Report on Invading Species

Time Requirement: 5 periods of 75 minutes each

Expectations Addressed in the Exemplar Task

This task gives students the opportunity to demonstrate achievement of all or part of each of the expectations listed below. Expectations 1, 3, and 6 are from the Evolution strand of the course. Expectations 2 and 4 are from the Population Dynamics strand of the course. Expectation 5 is from the list of expectations that precedes the strands of the course in the curriculum document and that applies to all strands of the course.

Students will:

1. explain, using examples, the process of adaptation of individual organisms to their environment;
2. compare and explain the fluctuation of a population of a species of plant, wild animal, and micro-organism, with an emphasis on such factors as carrying capacity, fecundity, and predation;
3. analyse evolutionary mechanisms and their effects on biodiversity and extinction;
4. use conceptual and mathematical models to determine the growth of populations of various species in an ecosystem;
5. communicate the procedures and results of investigations and research for specific purposes using data tables and laboratory reports;
6. analyse how the science of evolution can be related to current areas of biological study, and how technological development has extended or modified knowledge in the field of evolution.

Description of the Task

Present the following instructions and scenario to students:

New species (including viruses) are introduced into our environment on an ongoing basis. These species have the potential to change our environment and to make an impact on the way we live in Ontario.

You are a laboratory technician working for the Ministry of the Environment or Ministry of Health. A specific invading species is of concern to the ministry. As a laboratory technician, your role is to analyse the situation and write a report to the ministry. You will need to research background information on the species and the extent and effect of the invasion. Your report will include a recommendation for a course of action to deal with the invasion.

Final Product

Each student will submit a report on an invading species to the Ministry of the Environment or the Ministry of Health. The report will contain the following:

- a clear explanation of the actual or potential problem
- a scientific analysis of the actual or potential problem
- a prediction of the future impact of the problem on the environment and/or the human population in Ontario
- originally developed charts, tables, and/or graphs to support the prediction
- a recommendation and justification for a course of action
- a bibliography listing all sources used

Note: The bibliography will not be assessed as part of the exemplar task but is included to ensure that all sources used by the student to complete the task are cited. You will determine an appropriate bibliographic style for your students.

Assessment and Evaluation

The final draft of the report on an invading species will be assessed and evaluated using the task-specific rubric provided.* Introduce the rubric to the students when you introduce the task. Review the rubric with the students to ensure that each student understands the criteria and the descriptions for achievement at each level. Allow ample time for a thorough reading and discussion of the assessment criteria outlined in the rubric.

Some students may perform below level 1. Although the rubric does not include descriptions of achievement below level 1, the characteristics of these students' work should be reviewed in relation to the criteria outlined in the rubric.

Teacher Instructions

Prior Knowledge and Skills

To complete this task, students are expected to have some experience in, or some knowledge or skills relating to, the following:

- the concept and mechanisms of speciation, using Darwin's finches as a model
- molecular changes in genetic makeup
- mathematical models of population growth
- the concept of interactions between organisms (e.g., predation, competition)
- the interaction of population changes and ecological hierarchies
- Internet searches
- the use of a computer to create tables and graphs

*The rubric is reproduced on pages 10–11 of this document.

Accommodations

Accommodations that are normally provided in the regular classroom for students with special needs should be provided in the administration of this performance task.

Materials and Resources

- computer
- research sources (e.g., newspapers, magazines, library materials, the Internet)

Additional information can be ordered from the Invading Species Hotline at 1-800-563-7711.

Plagiarism

It is important that you discuss copyright issues with your students. Their bibliographies must list all sources used for research, and if any quotations are taken directly from a source, they must be appropriately recognized. Copyright applies to text and visual materials taken from both the Internet and print sources. Plagiarism is defined as “using the work (or part of it) of another person and claiming it as your own”.¹

Task Instructions

Preparatory Notes

- Students will need computer access to complete the task. Book computer time in the library or computer lab in advance. If there is difficulty with access to computers in your school, you may allow students to use computers at home, or in another facility, to key in their work and create appropriate graphs.
- You may wish to have students gather research information before the task begins..

Day 1

- Discuss the performance task and the task-specific rubric with the students.
- Explain to the students that the final product of the task is not an essay but a *scientific report* from the laboratory technician to the Ministry of the Environment or the Ministry of Health. Remind students to arrange their information under appropriate headings, and to include only current, relevant information.
- Discuss with the students the final product requirements, including the need for at least one original chart, graph, or table to support the prediction of the future impact of the invading species.
- Suggest a reasonable length of approximately five pages for the report.
- Review the prior knowledge and skills with the class, as necessary. For example, you might review Darwin’s finches as descendants of an invading species. Alternatively, you might provide another example of an invading species as an introduction to the task.

1. Canadian Intellectual Property Office, Industry Canada, *A Guide to Copyrights* (Hull, Quebec: Canadian Intellectual Property Office, Industry Canada, 2000), p. 20.

- Brainstorm with the students a list of invading species in Ontario. A *sample* list might include:
 - such species as the zebra mussel, purple loosestrife, sea lamprey, ruffe, round goby, rusty crayfish, white perch, flowering rush, curly-leaf pondweed, snakehead fish;
 - a variety of insects (e.g., ladybug, spiny water flea);
 - viruses (e.g., West Nile Virus, SARS).
- Have each student select a species as a topic for his or her report. You must approve the choice. Ensure that students' choices are geared to the availability of information.
- If time permits, have students begin the research on their selected topics. As a guide, have students use the Appendix: Research Organizer.

Day 2

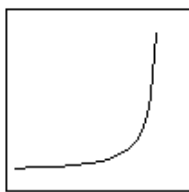
- Remind students of the final product requirements.
- Have students begin/continue their research.

Day 3

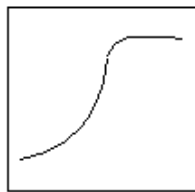
- Have students continue their research and begin to formulate an organizational style for the report.
- Provide individual feedback and advice as students work through the task.

Day 4

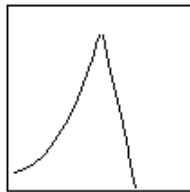
- Have students write a first draft of the report, including all original tables, charts, and graphs. Depending on their topics, students may find the following sketches helpful. They show the shapes of graphs of population versus time for different types of population change.



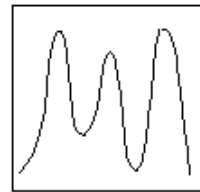
Exponential growth



Sigmoid population growth



Exponential growth with extinction



Fluctuating population

Day 5

- Have students use the task-specific rubric to edit their work and make any necessary revisions.
- Have students write a final draft of the report, as described under Final Product.
- Have students key in the report at school, at home, or in another facility.
- Allow sufficient time for students to edit and proofread the keyed report before submission.
- Ask students to include the bibliography and the rubric with the report.
- Have students submit the report.

Appendix: Research Organizer

Note: These headings are a suggested framework only. You may choose other headings, depending on the topic you have selected. In your final report on an invading species, you may present information in a combination of paragraphs and point form, if you wish. You must use appropriate scientific language in your report. You may either incorporate graphs, charts, and tables into your text or include them as appendices. If you use appendices, please refer to them in your text.

Name of Species: _____

1. Key characteristics

List a number of characteristics of the invading species, and indicate relevant pre-adaptations to the current environment.

2. Scientific analysis of the problem

Include population data, if available, for the invading species in the new environment. Create original charts or graphs, if you wish, and accurately cite all sources of information.

a) Biotic and/or abiotic factors at risk

Identify biotic and/or abiotic factors that may be affected by the invader in the new environment.

b) Impact on the human population and/or the environment in Ontario

Immediate	Long-term

3. Predictions for the future

Include at least one original table/chart/graph in this section, as well as a written explanation of the predictions.

4. Recommendation to the Ministry of the Environment or the Ministry of Health

Develop a well-organized, logical course of action to deal with the invading species. Justify the proposed course of action.

5. Bibliography

Ensure that you record all sources used.