

POPULATION PATTERNS

LESSON OVERVIEW

Summary of Lesson:	Students will research patterns of population growth and create graphs of various population growth types. They will then research how the presence of non-native species can affect population growth and write a persuasive newspaper article that outlines the dangers that invasive species pose to an ecosystem.
Focus Questions:	Why is the balanced population growth of all species critical to the success of an ecosystem?
Grade Levels:	9-12
Discipline/Subject:	Science/Earth and Space Science
Duration:	75 minutes to 2 hours
Materials Needed:	Graph paper
Resources Needed:	<i>Gale In Context: Science</i>
Alternate Resources:	<i>Gale In Context: High School, Gale In Context: Canada</i>

LEARNING OUTCOMES

Students will be able to:

- interpret basic population graphs and suggest scenarios about different population growth patterns in an ecosystem.
- outline the dangers that invasive species pose to an ecosystem.

SKILLS USED

Students will use their **research skills** to gather information about population growth and invasive species from an online database. Students will create **graphs** of various population growth types. Students will **write a persuasive** newspaper article about the dangers that invasive species pose to an ecosystem.

LESSON SEQUENCE

OPENING ACTIVITY

Suggested timing: 15-20 minutes

- Lead a discussion on population growth patterns and how the patterns depend on specific environmental conditions.
- Have students access *Gale In Context: Science*.
- Students should research the three following forms of population growth: exponential, logistic, and boom and bust. A common article, such as “Linear vs. Exponential Growth” (see “Sources”), can provide a useful starting point for students.

ACTIVITY

Suggested timing: 10-20 minutes

- Once students understand the concept behind each pattern, direct students to construct graphs that illustrate these patterns.
- After students construct their graphs, ask them to create scenarios that would demonstrate

- how a population follows each of these patterns.
- Direct students to share their scenarios with their classmates.
- Collect students' graphs and scenarios to review while they complete the next segment. Return the students' work before they begin the writing sequence.

RESEARCH

Suggested timing: 20-25 minutes

- Explain to students how the presence of non-native species can affect population growth in an environment.
- Direct students to the “Invasive Species” (see “Sources”) topic page in *Gale In Context: Science*.
- Once students understand what invasive species are, have them research invasive species in their home state and determine how the introduction of these species has affected other species.
- Direct students to research the reasons why humans might introduce a non-native species to an environment.

WRITING

Suggested timing: 20-40 minutes

- Direct students to use their research to compose a persuasive newspaper article that addresses the dangers of introducing new species into an area. Remind students to explain to readers how and why the introduction of invasive species is harmful to an ecosystem, but also why humans have introduced non-native species to various environments.
- If pressed for time, students should work on their newspapers articles until class is over, resuming and completing their articles the following class period.

CLOSING ACTIVITY

Suggested timing: 10-15 minutes

- Encourage students to share the final versions of their newspaper articles with the class.
- Finally, collect students' graphs, scenarios, and newspaper articles.

SOURCES

Gale In Context: Science

LaPensee, Kenneth Travis. “Linear vs. Exponential Growth.” *Human Geography: People and the Environment*, edited by K. Lee Lerner, et al., vol. 1, Gale, 2013, pp. 101-104. *Gale In Context: Science*, <https://link.gale.com/apps/doc/CX2062300043/SCIC>

McGrath, Jennifer. “Invasive species.” *The Gale Encyclopedia of Science*, edited by K. Lee Lerner and Brenda Wilmoth Lerner, 5th ed., Gale, 2014. *Gale In Context: Science*, <https://link.gale.com/apps/doc/CV2644031224/SCIC>

HOMEWORK/ASSESSMENT

ASSESSMENT:

Students will be measured on their abilities to interpret population graphs and to suggest scenarios to explain what the graphs represent. Evidence will be taken from students' graphs and scenarios.

ASSESSMENT:

Students will be measured on their abilities to explain the dangers invasive species pose to an ecosystem. Evidence will be taken from students' newspaper articles.

DIFFERENTIATING INSTRUCTION

To accommodate your classroom's range of learning styles and personality types, here are some suggested modifications and strategies for this lesson. Implement as many or as few of these modifications to the lesson as deemed necessary.

Struggling Learners	
Opening Activity	<ul style="list-style-type: none">• Provide students with a list of “pre-approved” articles rather than requiring them to find the articles.
Research	<ul style="list-style-type: none">• Allow students to conduct research with a partner.
Writing	<ul style="list-style-type: none">• Allow students to create any piece of persuasive writing (e.g., a speech, an advertisement, or something more creative, like a break-up letter) rather than requiring them to write a newspaper article.

Advanced Learners	
Research	<ul style="list-style-type: none">• Create partner assignments to ensure that struggling learners are paired with a more advanced peer.
Writing	<ul style="list-style-type: none">• Allow students to create any piece of persuasive writing (e.g., a speech, an advertisement, or something more creative, like a break-up letter) rather than requiring them to write a newspaper article.

RELATED ACTIVITIES

This lesson can easily connect to the following subject(s):

English/ Language Arts	<ul style="list-style-type: none">• Students create a fiction or nonfiction short story, poem, or play about an overpopulated world and the crisis that will/would arise. Or, students free write on the following prompt: “Should humans be considered an invasive species?”
Mathematics	<ul style="list-style-type: none">• Provide students with data that breaks down a country's or given area's population by the ratio of males to females or within particular age ranges. Students can then create a matrix and a histogram of this data.
Global Studies	<ul style="list-style-type: none">• Students construct population pyramids using population data and examine population trends in different countries and examine the reason for the trends in certain areas.

ALTERNATE DATABASES

Gale In Context: High School

McGrath, Jennifer. “Invasive species.” *The Gale Encyclopedia of Science*, edited by K. Lee Lerner and

Brenda Wilmoth Lerner, 5th ed., Gale, 2014. *Gale In Context: High School*, <https://link.gale.com/apps/doc/CV2644031224/SUIC>

Gale In Context: Canada

McGrath, Jennifer. "Invasive species." *The Gale Encyclopedia of Science*, edited by K. Lee Lerner and Brenda Wilmoth Lerner, 5th ed., Gale, 2014. *Gale In Context: Canada*, <https://link.gale.com/apps/doc/CV2644031224/CIC>

COMMON CORE STANDARDS

Standard Source: *Common Core State Standards Initiative* (2010)

Grades 9-10

- **CCSS.ELA-Literacy.RST.9-10.2** Determine the central ideas or conclusions of a text; trace the text's explanation or depiction of a complex process, phenomenon, or concept; provide an accurate summary of the text.
- **CCSS.ELA-Literacy.RST.9-10.4** Determine the meaning of symbols, key terms, and other domain-specific words and phrases as they are used in a specific scientific or technical context relevant to grades 9-10 texts and topics.
- **CCSS.ELA-Literacy.RST.9-10.5** Analyze the structure of the relationships among concepts in a text, including relationships among key terms (e.g., force, friction, reaction force, energy).
- **CCSS.ELA-Literacy.RST.9-10.10** By the end of grade 10, read and comprehend science/technical texts in the grades 9-10 text complexity band independently and proficiently.
- **CCSS.ELA-Literacy.WHST.9-10.4** Produce clear and coherent writing in which the development, organization, and style are appropriate to task, purpose, and audience.
- **CCSS.ELA-Literacy.WHST.9-10.7** Conduct short as well as more sustained research projects to answer a question (including a self-generated question) or solve a problem; narrow or broaden the inquiry when appropriate; synthesize multiple sources on the subject, demonstrating understanding of the subject under investigation.
- **CCSS.ELA-Literacy.WHST.9-10.9** Draw evidence from informational texts to support analysis, reflection, and research.
- **CCSS.ELA-Literacy.WHST.9-10.10** Write routinely over extended time frames (time for reflection and revision) and shorter time frames (a single sitting or a day or two) for a range of discipline-specific tasks, purposes, and audiences.

Grades 11-12

- **CCSS.ELA-Literacy.RST.11-12.2** Determine the central ideas or conclusions of a text; summarize complex concepts, processes, or information presented in a text by paraphrasing them in simpler but still accurate terms.
- **CCSS.ELA-Literacy.RST.11-12.4** Determine the meaning of symbols, key terms, and other domain-specific words and phrases as they are used in a specific scientific or technical context relevant to grades 11-12 texts and topics.
- **CCSS.ELA-Literacy.RST.11-12.5** Analyze how the text structures information or ideas into categories or hierarchies, demonstrating understanding of the information or ideas.
- **CCSS.ELA-Literacy.RST.11-12.8** Evaluate the hypotheses, data, analysis, and conclusions in a science or technical text, verifying the data when possible and corroborating or challenging conclusions with other sources of information.
- **CCSS.ELA-Literacy.RST.11-12.9** Synthesize information from a range of sources (e.g., texts, experiments, simulations) into a coherent understanding of a process, phenomenon, or concept, resolving conflicting information when possible.
- **CCSS.ELA-Literacy.RST.11-12.10** By the end of grade 12, read and comprehend science/technical texts in the grades 11-CCR text complexity band independently and proficiently.

- **CCSS.ELA-Literacy.WHST.11-12.4** Produce clear and coherent writing in which the development, organization, and style are appropriate to task, purpose, and audience.
- **CCSS.ELA-Literacy.WHST.11-12.7** Conduct short as well as more sustained research projects to answer a question (including a self-generated question) or solve a problem; narrow or broaden the inquiry when appropriate; synthesize multiple sources on the subject, demonstrating understanding of the subject under investigation.
- **CCSS.ELA-Literacy.WHST.11-12.9** Draw evidence from informational texts to support analysis, reflection, and research.
- **CCSS.ELA-Literacy.WHST.11-12.10** Write routinely over extended time frames (time for research, reflection, and revision) and shorter time frames (a single sitting or a day or two) for a range of tasks, purposes, and audiences.

NGSS STANDARDS

Standard Source: *Next Generation Science Standards* (2013)

- **HS-ESS3-6** Use a computational representation to illustrate the relationships among Earth systems and how those relationships are being modified due to human activity.
- **HS-LS2-6** Evaluate the claims, evidence, and reasoning that the complex interactions in ecosystems maintain relatively consistent numbers and types of organisms in stable conditions, but changing conditions may result in a new ecosystem.
- **HS-LS2-7** Design, evaluate, and refine a solution for reducing the impacts of human activities on the environment and biodiversity.
- **HS-ETS1-3** Evaluate a solution to a complex real-world problem based on prioritized criteria and trade-offs that account for a range of constraints, including cost, safety, reliability, and aesthetics, as well as possible social, cultural, and environmental impacts.