

Return of the wolves: Isle Royale National Park

“Lessons from the wilderness”

Lesson 3

This lesson is designed to be used after students have viewed Part 3 of the video and completed Lessons 1 and 2 as well as the student video viewing guide. [Download Video Pt. 3](#)

NGSS Connections:

[MS-LS2-4 Construct an argument supported by empirical evidence that changes to physical or biological components of an ecosystem affect populations.](#)

[MS-LS2-5 Evaluate competing design solutions for maintaining biodiversity and ecosystem services.](#)

Key Disciplinary Ideas:

- ⌘ Climate change from human activities has resulted in changes to the physical and biological parts of the ecosystem.
- ⌘ Changes to abiotic or biotic parts of an ecosystem affect its populations.
- ⌘ An ecosystem’s biodiversity is often used as a measure of its health.
- ⌘ People can design solutions to maintain biodiversity.

Key Practices and Crosscutting Concepts:

- ⌘ Explain how small changes in one part of a system may cause large changes in another part.
- ⌘ Analyze and interpret data to provide evidence of anthropogenic climate change.
- ⌘ Engage in argument from evidence about the appropriateness of the solution chosen by the National Park Service to maintain biodiversity on Isle Royale.

Time: Four class periods

Materials:

- ⌘ Projector for video
- ⌘ Copies of Lake Superior Ice Coverage and Isle Royale Ice Bridge data (Appendix A)
- ⌘ Graph paper, whiteboards, or poster paper with markers as needed
- ⌘ Copies of the Compass Points student guide (Appendix B)
- ⌘ Copies of the Four Actions Considered (Appendix C)
- ⌘ Copies of the Claim, Evidence, Reasoning graphic organizer assessment (Appendix D)

Engage	<p>Students complete the viewing guide for Part 3 of the video and participate in a “vote with your feet” activity in which they take a position on the appropriateness of the NPS decision to relocate wolves to Isle Royale, or acknowledge that they are still unsure and would like more information.</p> <p>Assuming there are students in each of the three designated areas (or at least two), offer to provide more information to help them evaluate the NPS decision.</p> <p>To further explore some of the arguments for and against the decision to introduce new wolves to Isle Royale, students view this 14 minute National Geographic video titled “Quest for Survival.”</p>
Explore	<p>Ask students to respond to some of the evidence they heard in the National Geographic video, both pro and con for wolf restoration.</p> <ul style="list-style-type: none"> ⊄ What is the evidence to support human intervention in the Isle Royale food web? ⊄ What is the evidence that supports the prediction of fewer ice bridges in the future? ⊄ Are ice bridges a biotic or abiotic part of the ecosystem? ⊄ How do abiotic parts of the ecosystem affect the biotic parts? ⊄ What is the consensus in the scientific community regarding causes of climate change? <p>Students analyze Lake Superior ice coverage over the past 50 years, along with the data for ice bridges forming between the mainland and Isle Royale, to look for evidence of a trend.</p> <p>Using Appendix A, assign one six-year segment of Lake Superior Ice Coverage and Ice Bridge data to each of eight small groups. (Data may be broken into larger segments if you have fewer groups in your class.)</p> <p>In small groups, students create a bar graph of the percentage of ice coverage for their span of years. They should indicate years that had an ice bridge by adding a dot, color, or other symbol (as decided upon by the class) to the bar for that year.</p> <ul style="list-style-type: none"> ⊄ Students may use regular graph paper, poster-sized graph paper or whiteboards with graphing grids, or Excel or Sheets to create the graphs. ⊄ Students should use pre-determined axes scales with a common format, so that when the graphs are combined, the longitudinal data is easy to analyze. <p>Each group looks for trends in their group graph. (Trends may or may not be</p>

	present...that's okay.)
Explain	<p>Starting with the earliest data, each group presents their graph and notes any trends if present. After sharing, groups place their graphs in a common area, in chronological order, to create a larger graph of the entire time span.</p> <p>When all the graphs are combined, students are asked to evaluate the whole class graph for trends in a consensus discussion.</p> <ul style="list-style-type: none"> ⌘ Is there a trend? ⌘ What is the trend? ⌘ How could this abiotic part of the ecosystem affect the biotic (living) parts? ⌘ Does the data support the scientists who recommended adding wolves to Isle Royale because it's unlikely there will be enough ice bridges in the future to sustain the wolf population and its genetic diversity?
Elaborate	<p>In this activity, students evaluate the four solutions initially proposed by the NPS.</p> <p>In small groups, students use the Project Zero Visible Thinking Routine "Compass Points" (Appendix B) to record their thoughts as they examine one of the four Actions Considered by the NPS (summarized in student language in Appendix C.)</p> <p>After groups have evaluated the actions that were considered by the National Park Service, students provide a brief summary of the action and then their evaluation of the action, based on their responses to the Compass Points. This could be presented using whiteboards or poster paper, a short slide presentation, or simply a quick verbal presentation.</p> <p>Consider using groups of three or four students and assigning the same solution to two groups to get a total of eight groups evaluating the four solutions. This allows for comparative discussions of the solution evaluations when presented.</p> <p>Use Productive Talk techniques during the presentations to encourage students to provide evidence for their evaluations.</p> <p>Finally, ask students to again "vote with their feet" if they agree or disagree with the NPS decision to add wolves to Isle Royale.</p>
Evaluate	<p>Students complete the Claim, Evidence, Reasoning statement (Appendix D.) They may choose to use evidence collected in their Student Viewing Guide for</p>

	Part 3 of the video as well.
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Appendix A
Lake Superior Historical Maximum Ice Coverage
 (Rounded to nearest 5%)

Year	1973	1974	1975	1976	1977	1978
% Ice Coverage	70	75	65	50	95	90

Year	1979	1980	1981	1982	1983	1984
% Ice Coverage	95	80	85	85	20	90

Year	1985	1986	1987	1988	1989	1990
% Ice Coverage	80	90	15	65	80	80

Year	1991	1992	1993	1994	1995	1996
% Ice Coverage	90	70	75	95	30	100

Year	1997	1998	1999	2000	2001	2002
% Ice Coverage	90	10	20	35	50	10

Year	2003	2004	2005	2006	2007	2008
% Ice Coverage	95	50	55	20	55	60

Year	2009	2010	2011	2012	2013	2014
% Ice Coverage	95	30	35	10	40	95

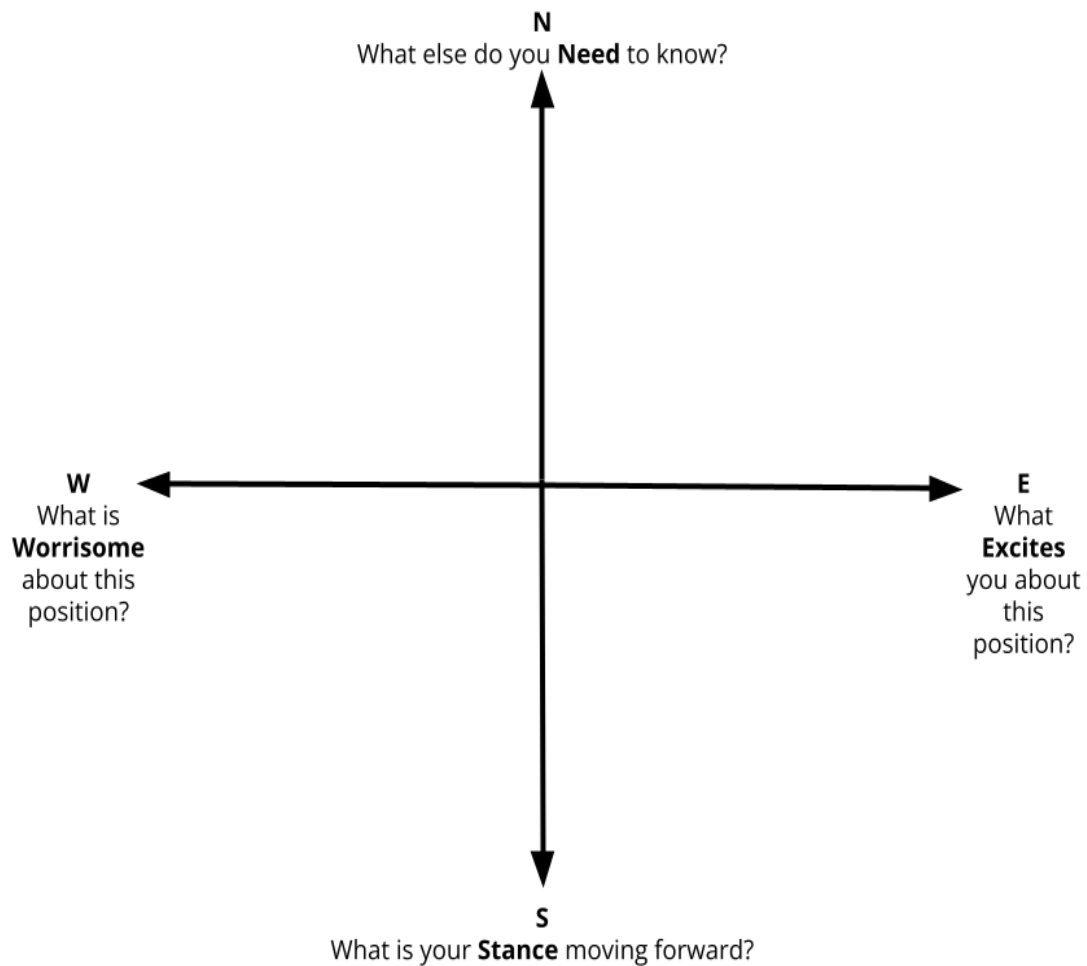
Year	2015	2016	2017	2018	2019	2020
% Ice Coverage	95	20	20	80	95	20

Ice Bridges

Decade	Years
1970	1970, 1971, 1972, 1974, 1977, 1979
1980	1982, 1985, 1988
1990	1991, 1994, 1996, 1997
2000	2008
2010	2014, 2015, 2018

Appendix B

Compass Points



Appendix C Actions Considered

Alternative A: No Action	<p><i>Under the no-action alternative, wolves would not be introduced to the park.</i></p> <p>Pro: Least impact to wilderness.</p> <p>Cons: Island Ecosystem: broad changes to forest composition and structure could be further influenced by climate change and increased plant consumption.</p> <p>Moose: Without wolves, moose population would likely increase and could deplete their food source. A large-scale starvation event could possibly occur.</p> <p>Wolves: Original population would likely disappear from the island. Presence of wolves on the island would depend on natural immigration, which is unlikely due to reduction of ice bridge formation because of global climate change. Wolf reproduction would be unlikely because of low genetic diversity and inbreeding.</p>
Alternative B: Immediate, limited introduction of new wolves	<p><i>Under alternative B, the park would introduce wolves over a 3-year time period. After the third year, if an unforeseen event occurred (disease or mass deaths), wolves may be supplemented for an additional 2 years. No wolves would be introduced after 5 years from the first introduction.</i></p> <p>Pros: Island Ecosystem: Restore an apex predator and the process of predation to the island. Retain forest components.</p> <p>Wilderness: Restore an ecological function (predation) on the island and benefit the natural quality.</p> <p>Moose: Reintroducing predation to the ecosystem would reduce the fluctuations of the moose population.</p> <p>Wolves: Island wolf abundance and distribution would increase. Genetic variation would increase with the aim to delay any potential future inbreeding problems</p> <p>Cons: Wilderness: The wilderness character of the island would be impacted. This alternative includes the use of radio collars and mechanized transport that impact the untouched and undeveloped qualities of wilderness.</p>

<p>Alternative C: Immediate introduction of new wolves, with potential addition of more wolves in the next 20 years</p>	<p><i>Under alternative C, wolves would be immediately introduced with the possibility of more introductions over a 20-year period.</i></p> <p>Pros: Island Ecosystem: Restore an apex predator and the process of predation to the island. Retain forest components. Wilderness: Restore an ecological function (predation) on the island and benefit the natural quality. Moose: Reintroducing predation to the ecosystem would reduce the fluctuations of the moose population. A smaller number of wolves would be introduced, allowing some predation. Future introductions of wolves would be allowed to manage the moose population as needed. Wolves: Relocating a lower number of wolves would best reflect a natural migration event. This would result in a lower genetic diversity in the short term. The NPS would have the ability to relocate wolves and increase diversity as needed.</p> <p>Cons: Wilderness: The wilderness character of the island would be impacted. This alternative includes the use of radio collars and mechanized transport that impact the untouched and undeveloped qualities of wilderness. Additional impacts to wilderness could occur depending on the number of introduction events.</p>
<p>Alternative D: No immediate action, with allowance for possible future addition of wolves</p>	<p><i>Under alternative D, the park would continue to monitor conditions and take no immediate action but allow for future introductions of wolves to Isle Royale.</i></p> <p>Pros: All pros are depending on if future action occurs. Pros would be similar to alternatives B and C. Wilderness: If action did not occur, nature would be allowed to take its course without human influence. Cons: All cons depend on if future action occurs. Wolves: A delayed response could lead to the original wolf population disappearing and new wolf relocations would possibly establish a new, genetically different, population. Moose: A delayed response could lead to the moose population continuing to increase until a possible moose population collapse due to starvation or winter moose ticks causing illness. Wilderness: If action occurred, the wilderness character of the island would be impacted. This alternative includes the use of radio collars and mechanized transport that impact the untouched and undeveloped qualities of wilderness. Additional impacts to wilderness could occur depending on the number of introduction events.</p>

Appendix D
Claim, Evidence, Reasoning Statement

Claim: The National Park Service's decision to bring new wolves to Isle Royale in 2019 was _____ because:

Scientific principles:

- ☒ Climate change from human activities has resulted in changes to the physical and biological parts of the ecosystem.
- ☒ Changes to abiotic or biotic parts of an ecosystem affect its populations.
- ☒ An ecosystem's biodiversity is often used as a measure of its health.

Evidence: (List the important facts about climate change and Isle Royale populations that you recorded above.)

Reasoning: Use your evidence AND the scientific principles above to explain why your claim is correct.

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Claim, Evidence, Reasoning Statement

Teacher Version

Student Answers May Vary

Claim: The National Park Service’s decision to bring new wolves to Isle Royale in 2019 was correct
because: **wolves are necessary to ensure biodiversity on Isle Royale.**

Scientific principles:

- Climate change from human activities has resulted in changes to the physical and biological parts of the ecosystem.
- Changes to abiotic or biotic parts of an ecosystem affect its populations.
- The completeness of an ecosystem’s biodiversity is a measure of its health.

Evidence: (List the important facts about climate change and Isle Royale populations that you recorded above.)

- Climate change means fewer ice bridges to allow new wolves to come to the island.
- Without new wolves, the wolf pack is inbred and shrinking.
- If the wolves don’t kill some of the moose, the moose population will increase.
- If the moose population increases, there can be over foraging and damage to the balsam fir population.
- Without balsam fir, many organisms in the forest ecosystem suffer from lack of habitat and food.
- This reduces biodiversity and the health of the ecosystem.

Reasoning: Use your evidence AND the scientific principles above to explain why your claim is correct.

Humans have caused climate change, which has caused fewer ice bridges and less likelihood of new wolves entering the Isle Royale population. Fewer healthy wolves on the island mean fewer moose are killed. When the moose population increases, the moose overeat the plant community, especially the balsam fir. As the balsam fir and other plants struggle, the animals that rely on them for food and shelter struggle. This results in less biodiversity. Good biodiversity levels are a sign of ecosystem health, while a reduction in biodiversity may indicate a failing ecosystem. Since people caused the climate change that affected the wolf population, it is reasonable that people take steps to improve the wolf population by introducing new wolves to Isle Royale. Therefore, the National Park Service did the right thing.