Return of the wolves: Isle Royale National Park

"Lessons from the wilderness"

Lesson 2

This lesson is designed to be used after students have viewed Part 2 of "The Return of the Wolves: Lessons from the Wilderness" long video and completed Lesson 1 as well as the student video viewing guide for Parts 1 and 2. Download Video Pt. 2

NGSS Connection:
MS-LS2-2 Construct an explanation that predicts patterns of interactions among organisms across multiple ecosystems.

Key Disciplinary Ideas:

- Predatory interactions occur between organisms within an ecosystem.
- Predatory interactions may reduce the number of organisms or eliminate whole populations of organisms.

Key Practices and Crosscutting Concepts:

- Use patterns to construct explanations that identify cause and effect relationships.
- Small changes in one part of a system can cause larger changes in another part.

Time: Three class periods

Materials:

- Projector for videos
- Copies of Wolf/Moose graph from this Scholastic Science World article
- Materials for playing the chosen simulation game
  - Wolf and Moose cards for Deer Me
  - Boundary markers for Predator-Prey Tag
  - Tables for recording populations after each round in the games
- Copies of the Lesson 2 assessment (Appendix A)

Engage	Remind students that they've partially constructed a food web for Isle Royale. Ask them to predict: Do other ecosystems have food webs? Show students the 4:14 minute Exploring Ecosystems: Coastal Food Webs video from the California Academy of Sciences. **Stop at the 2:58 point** to allow

	students to look for patterns in the graph. Ask questions such as: - Do you see any relationships between the population of sea otters, the sea urchins, and the kelp? - What does that relationship look like? Do their populations grow at the same time or at different times? - Continue watching to 3:20. Ask students to predict: How does a drop in the population of sea otters change the food web? - Which species populations might grow? - Which species populations might shrink? - Complete the video. Ask students if they can predict any similarities with the Isle Royale food web. What questions do they have? What do they need to find out to answer their questions?

Explore	Students will participate in a simulation to collect data about wolf/moose population relationships. WolfQuest provides two activities that would work to collect this data, and teachers may choose which would be best in their classroom environment:
	- Predator-Prey Tag is a simple “freeze tag” game that requires a gym or outside area (substitute moose for elk.)
	    - Set up “ecosystem” boundaries in a large area (basketball court size, in a gym or outdoors.)
	    - All students line up on one end of the area.
	    - Select two students to be wolves. The rest are moose. The recorder (teacher or student) counts how many moose and wolves to start.
	    - Students run from one end of the area to the other. If a wolf tags them, they “freeze” in place.
	    - The recorder counts how many moose made it to the other side. The “frozen” moose become wolves. The recorder counts the total number of wolves, and then the next year (round) begins.
	    - Play continues through multiple rounds. Any wolf that doesn’t tag a moose becomes a moose in the next round. The recorder counts wolves and moose at the beginning of each round.
	    - Play at least ten to fifteen rounds.
	
	- Deer Me can be played while students are seated in table groups, but requires the preparation of wolf and moose cards (substitute moose for deer.)
	
	In either case, students collect data on wolf and moose populations through at least ten to fifteen rounds, using a table similar to this:

Year	Number of Wolves	Number of Moose
1		
2 etc.		

Students should then work in small groups, using poster paper or whiteboards (or they may use Excel or Google Sheets) to create double line graphs showing the populations of moose and wolves over the course of the rounds. (Students may need assistance or scaffolding in designing double line graphs with different y-axis scales, which will make the patterns more apparent.)

Explain

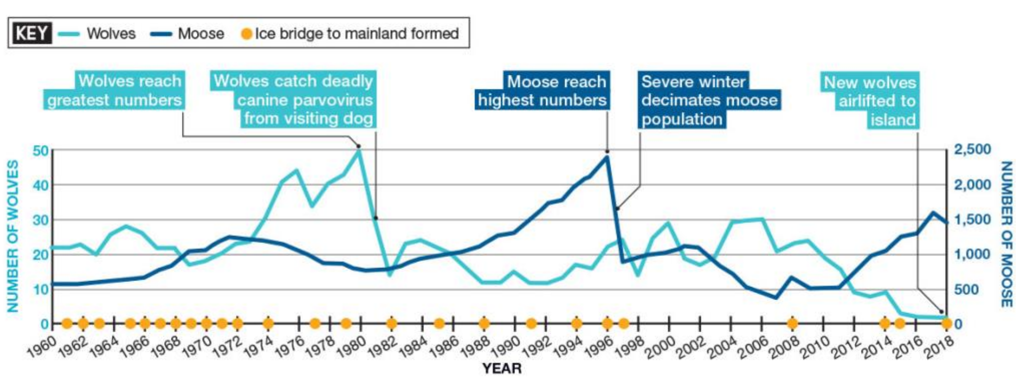
Student groups display their graphs and students view them in a gallery walk, looking for patterns in the data.

The teacher conducts a consensus discussion regarding the patterns, using questions such as:

- What do you notice about the lines on the graphs?
- Is there a pattern?
- What is the pattern?
- What might be causing the pattern?
- What evidence do you see in the graph that supports the pattern?
- Was this ecosystem a closed system?
- What would happen if more moose or wolves could enter from outside the system?
- Does that happen on Isle Royale?

Elaborate

Students analyze the Isle Royale wolf/moose population graph from this [Scholastic Science World] article.



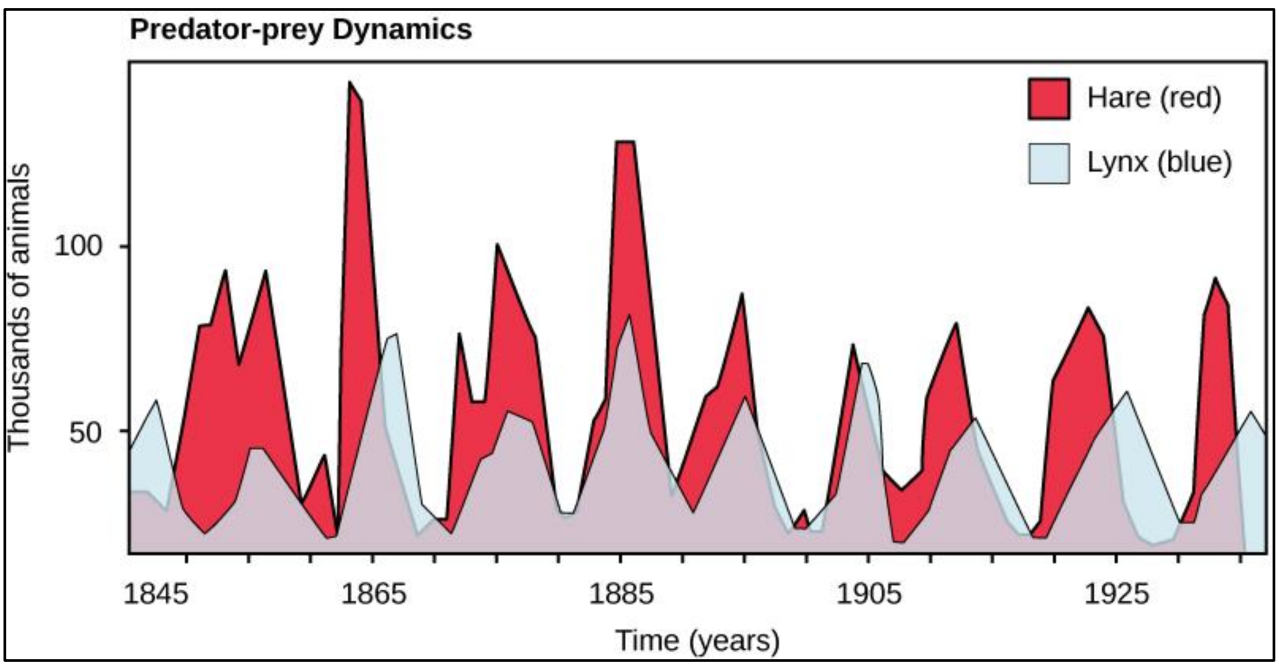
	In small groups, students consider these questions. ∉ What pattern(s) do you see? ∉ How are these patterns similar or different to the wolf/moose pattern in your simulation graph? ∉ What evidence is there that the wolves and moose have a predator/prey relationship? ∉ Thinking about the sea otters, sea urchins, and kelp. The sea otter population had an effect on the kelp population, because the sea otters eat sea urchins, which eat kelp. How is the relationship between wolves, moose, and balsam fir similar? ∉ Why do you think the presence of an ice bridge is noted on this graph? (We'll find out in the next lesson.) The teacher asks small groups to share their thoughts, conducting a class discussion where consensus is reached that wolves and moose have a predator/prey relationship and that their populations affect the population of balsam fir on Isle Royale.
Evaluate	Ask students to complete the brief assessment below in Appendix A. (If you or your students are unfamiliar with Claim, Evidence, Reasoning statements, you may consider reading this resource.)

Appendix A
Lesson 2

The Hudson Bay Company was a fur trading company based in Canada over a hundred years ago. The data in the graph below comes from their records of the numbers of pelts of Snowshoe Hares and Canadian Lynx during eighty years of fur trading.

Canadian Lynx

Snowshoe Hare



Creative commons: https://commons.wikimedia.org/wiki/File:Figure_45_06_01.jpg

Construct an explanation of the relationship you see between the Snowshoe Hare and Lynx.

Claim: The interaction between the Snowshoe Hare and the Lynx shows a ______________________ relationship.	
Scientific Principle: Patterns can be used to identify relationships in ecosystems.	
Evidence: (Data from the graph)	Reasoning: (How does the data from the graph, combined with the scientific principle, support your claim?)

Teacher Version

Student Answers May Vary

Construct an explanation of the relationship you see between the Snowshoe Hare and Lynx.

Claim: The interaction between the Snowshoe Hare and the Lynx shows a __predator-prey____________________ relationship.

Scientific Principle: Patterns can be used to identify relationships in ecosystems.

Evidence: (Data from the graph)

- When the hare population goes up, the lynx population goes up a year or two later.
- When the lynx population goes up for several years, the hare population goes down.
- When the hare population goes down, the lynx population goes down a year or two later.

Reasoning: (How does the data from the graph, combined with the scientific principle, support your claim?)

The pattern in the Hare/Lynx graph shows a predator-prey relationship, because when the prey (hare) population increases, the predator (lynx) population also increases shortly afterwards. When the predator population goes up, the prey population starts to go down. This pattern repeats itself over 80 years of data.