STEM Lesson Plan:

Predators & Prey (Grade 5)

Purpose:

- Investigate the predator-prey relationship in nature at the macro and micro scales.

Next Generation Science Standard:

- 5-LS2-1: Develop a model to describe the movement of matter among plants, animals, decomposers, and the environment.

Time: 60 minutes

Disciplinary Core Ideas:

- **LS2.A: Interdependent Relationships in Ecosystems:** The food of almost any kind of animal can be traced back to plants. Organisms are related in food webs in which some animals eat plants for food and other animals eat the animals that eat plants. Some organisms, such as fungi and bacteria, break down dead organisms (both plants or plants parts and animals) and therefore operate as "decomposers." Decomposition eventually restores (recycles) some materials back to the soil. Organisms can survive only in environments in which their particular needs are met. A healthy ecosystem is one in which multiple species of different types are each able to meet their needs in a relatively stable web of life. Newly introduced species can damage the balance of an ecosystem. (5-LS2-1)

Crosscutting Concepts:

- Systems and System Models
  - A system can be described in terms of its components and their interactions. (5-LS2-1)
- Energy & Matter
  - Matter is transported into, out of, and within systems. (5-LS1-1)
  - Energy can be transferred in various ways and between objects. (5-PS3-1)

Science and Engineering Practices:

- Developing and Using Models: Modeling in 3–5 builds on K–2 experiences and progresses to building and revising simple models and using models to represent events and design solutions.
  - Use models to describe phenomena. (5-PS3-1)
  - Develop a model to describe phenomena. (5-LS2-1)

Materials:

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- Blocks, leaves, or small objects to represent plants (food for prey)
- Whistle
- Large open space or field
- Cones or markers to define the boundaries of the field
- Data Collection Sheet

STEM Rationale for Lesson:

Students will learn about predator-prey relationships and the importance of food availability in ecosystems through an interactive game. This simulation shows how the balance between prey, predators, and food supply can change over time

Lesson Activity Steps:

1. Engage (10 Minutes): Show pictures of predators, wolf, shark, lion. Ask “Are predators bad or good for our environment?”

Image Source Bing Copilot AI

   Ask students to vote using sticky notes. Post sticky notes on a bar graph labeled on the X axis: “Predators are good” and “predators are bad” Stack, do not overlap sticky notes.
2. Tell students they are going to learn about predators. Ask students to generate questions they have about predators, and questions they think they might be asked about predators. Have them write one question per sticky note and challenge them to generate as many questions as possible. Sort the questions, grouping like questions together and keep them posted for the lesson. Refer back to the questions as they are answered in the unit.

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3. Explore (30 Minutes):
4.

Simulation Game: Prey and Predators in the Field

Setup:

1. Define the Field: Use cones or markers to create a large rectangular field. Place food in a small area at the center of the playing field.
2. Starting Positions: Begin with 5 students as prey and 1 student as a predator. The rest of the students are prey that are waiting to be born (standing around the edge of the playing field).
3. Food Blocks: Place about 10 blocks at the center of the field to represent plants (food).
4. Teacher stands at center field near the food blocks. Teacher blows the whistle to freeze the game every 30 seconds and adds a piece of "food" for every piece of food left at the end of each round.
5. Collect data after each round.

Round	Starting Number of Prey	Starting Number of Predators	Surviving Prey	Surviving Predators	Prey Offspring	Predator Offspring
1	5	1				
2						
3						
4						
5						

Rules:

1. Tagging Prey: Prey and the teacher can tag other students along the edge of the field to join them as prey.
2. Food Collection: Every 30 seconds, the teacher blows a whistle. Prey must have a piece of food or return to the sidelines. Prey returns their piece of food to the teacher to remain in the game for the next round.
3. Food Addition: For every piece of food left on the ground, add another food to the field.
4. Running Out of Food: If a prey cannot find food when the whistle is blown, they "die" and must sit on the sideline until tagged by another prey.
5. Predator Tagging: If the predator tags a prey, the prey must return to the sideline and remain "dead" for the rest of the round. If the prey had food, the food is returned to the food supply at the center of the field.

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Note: Students playing “prey” may take all the food. If this happens, let the game continue another round. The prey will all be eliminated because there is no food. Stop and discuss why this happened. Explain that animals (except humans) do not take more than they need. Start over, but this time prey should each take only 1 piece of food per round.

Game Play:

Initial Setup will be as follows:

- Prey: 10
- Predator: 1
- Food: 10 pieces

1. Start the Game: Begin with 10 prey and 1 predator in the field. The rest of the students wait on the sidelines.
2. Adding Prey: For every 3 prey left alive at the end of a round, 1 prey is added to the game.
3. Adding Predators: For every 6 prey “eaten” by the predator, another predator is added to the game.
4. Whistle Blows: Every 30 seconds, the teacher blows the whistle. Prey must have a block of food. If a prey does not have food when the whistle blows, the prey dies and must return to the sideline until tagged again.
5. Food Addition: After each whistle, add more food blocks based on the number of blocks left on the ground.
6. Predator Hunting: The predator tries to tag prey. Tagged prey must sit down and remain “dead” until 3 prey survive to add them back into the game.
7. Predator Death: A predator who does not tag 3 prey during a round “dies” and returns to the sideline

Replay with Human Hunter:

1. Hunter Introduction: In the replay, introduce a new character – a human hunter. The hunter’s role is to “hunt” the predator.
2. Hunter’s Action: The hunter tags the predator, symbolizing that the predator has been “killed”. The game continues without a predator until the prey run out of food.
3. Impact on Prey: Discuss with the students what happens to the prey population now that the predator is gone. Do they find it easier to get food? What happens to the amount of food available? What happens to the number of prey?

Conclusion:

1. Discussion: Gather the students and discuss what happened during the game. Talk about the challenges the prey faced in finding food and avoiding the

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predator. Discuss how this relates to real-life predator-prey relationships and the importance of food availability in ecosystems.
2. Hunter's Impact: Discuss the impact of the human hunter on the ecosystem. What happens when a top predator is removed? How does it affect the balance of nature?

Lesson Assessment

Analyze Data (20 min)

1. Have students look at the data and describe what they see (observations).
2. Graph the data – you can use the free graph generator Create a Graph Classic-NCES Kids' Zone. Start by asking "What type of graph should we use to show changes in a population over time?" (Line graphs are used to show changes over time.)
3. Ask students to observe the graph and list what they see. (a scale showing the number of animals on the Y axis, rounds played on the x axis, a relationship between the predator and prey shown by the graph.
4. Ask students to discuss what the information on the graph means. (The graph will show a relationship between the number of prey and number of predators in the environment.)

Explain (30 Minutes)

1. Share the website 10 Incredible Blue Whale Facts with students. What classifies this giant animal as a predator?

2. Watch video: https://public.magnet.fsu.edu/Chen/ and discuss the following questions:
    a. Why did Dr, Chen call BALOs "The World's Smallest Hunter"? (BALOs hunt and kill bacteria. BALOs are extremely tiny.)
    b. Even though BALOs are smaller than the bacteria they eat they are called predators. What characteristics classify them as predators? (predator: an organism that primarily obtains food by the killing and consuming of other organisms: an organism that lives by the killing another living organism of another for food.)
    c. What is a BALO's prey? (bacteria)
    d. Why do scientists believe that using BALOs is safe for people? (They only attack bacteria)

3. Read aloud and discuss: Tracking the "World's Smallest Hunter" - MagLab
Before reading: Say aloud:
The scientist in the video we just watched studies BALOs at the National High Magnetic Field Laboratory in Florida. These tiny BALOs eat bad bacteria, which are germs that can make people sick.

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One day, a person got very sick because of some bad bacteria that regular medicine couldn't defeat. Scientists decided to send in the BALOs. These tiny predators found the bad bacteria, attached to them, and started eating them up. By doing this, the BALOs helped get rid of the bad bacteria, making the person feel better and saving their life.

The special tool they use to see these tiny BALOs is in the National High Magnetic Field Laboratory (Mag Lab) in Florida. Dr. Huan Chen is a scientist who studies BALOs using tools at the Mag Lab to have “Magnetic Vision”. These special magnetic vision machines are cylindrical magnets with a hallow core down the center. Dr. Chen puts her BALO experiments inside these magnets and is able to see how they move and behave. Her research will help to find a way to use BALOs to save people who are suffering from diseases caused by bacteria that the medicines we usually use will not defeat.

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Evaluate

Create a food chain diagram in which the predator is smaller than the prey, and a food chain in which the predator is larger than the prey. Include the sun and producers in your food chain diagram. Label the following parts of your food chain diagram: Sun, Producer, Prey animal(s), Predatory animal

Diagram Component	**You can make it better.**	**1 Almost There - you can make it better.**	**2 Good Work!**	**3 GREAT Work!**	**Score**
Labels	No labels	Most of the labels are included	All the required labels are included. Lines connect label to diagram part.	All the required labels are included and are easy to read. Lines connect label to diagram part.	
Elements Sun Producer Prey animal(s) Predatory animal	Missing a required element	3 of the 4 required elements are present and shown correctly. Arrows show the direction of the flow of energy.	All four of the required elements are present and shown correctly. Arrows correctly show the direction of the flow of energy.	All four of the required elements are present and an additional animal that is both a prey AND a predator is shown correctly. Arrows correctly show the direction of the flow of energy.	
Explanation	No explanation of diagram is written.	An explanation is given but is incomplete.	A complete explanation of the food chains is given. The explanation tells the story of the food chain shown, starting with the sun and ending with a predator.	A complete explanation is given and thoroughly summarizes the food chains shown. The explanation tells the story of the food chain shown, starting with the sun and ending with a predator.	

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Extension Activity:

Explain that in the 1930s humans hunted and killed the wolves in and around Yellowstone Park. The humans believed that the wolves were a threat to the deer and elk in the park and to the livestock of farmers and ranchers nearby. When the wolves were gone the overpopulation of deer and elk caused a lot of problems the humans did not expect. Watch this video and find out what happened.

Watch the video https://youtu.be/ysa5OBhXz-Q and then discuss:

- What problems occurred because the wolves were gone?
- How did bringing wolves back help the environment in Yellowstone Park?

Teacher Data:

Sample Data:

Round	Prey Alive	Prey Dead	Predators	Food Left on Ground	Food Added	Total Food
1	8	2	1	2	2	4
2	6	4	1	2	2	4
3	4	6	2	3	3	6
4	3	7	1	3	3	6
5	2	8	1	4	4	8

Click here to fill in a 1-line example using education data from NCES

Number of points you would like to display: 2-15

Number of lines you would like to display: 3

Title of Graph: Predators. Prey, and Producers

Title of X Axis: rounds

Title of Y Axis: number of organisms

	Line 1		Line 2		Line 3	
Line Title:	prey		predators		food	
Line Color:	*Default		*Default		*Default	
Point Color:	*Default		*Default		*Default	
Point Shape:	*Default		*Default		*Default	
Shape Size:	*Default		*Default		*Default	
	X Axis	Y Axis	X Axis	Y Axis	X Axis	Y Axis
Point 1:	1	8	1	1	1	4
Point 2:	2	6	2	1	2	4
Point 3:	3	4	3	2	3	6
Point 4:	4	3	4	1	4	6
Point 5:	5	3	5	1	5	8

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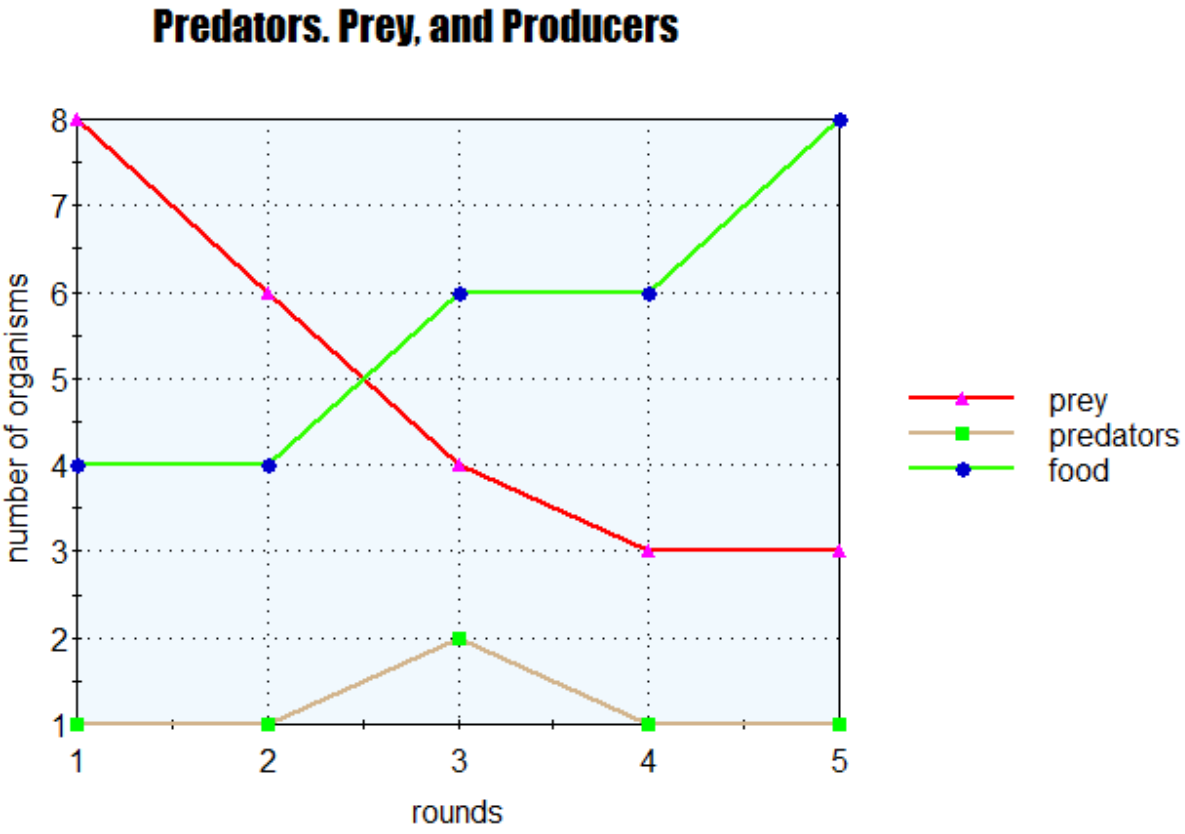

- Merriam Webster definition: **predator:** an organism that primarily obtains food by the killing and consuming of other organisms: an organism that lives by the killing another living organism of another for food.

Lesson by: Christine Danger
School: Hillsborough County Public Schools
Contact info: Christine.Danger@hcps.net

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