

Ecosystem Investigators (EI)

Grade Level: 5th grade

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Film to be used: The Return of the Wolves long version with segments (segment 2)

[Download Full Video](#) | [Download Segment 2 Only](#)

Additional Material: Embedded video links; 4 worksheets (Highlighted in red starting with EI_#; and EI_Vocabulary and Background paper

Next Generation Science Standards:

Ecosystems: Interactions, Energy, and Dynamics

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

Core Ideas

- LS2.A: Interdependent Relationships in Ecosystems
- LS2.B: Cycles of Matter and Energy Transfer in Ecosystems

<p><i>Essential Vocabulary</i></p> <p>Producer Herbivore Carnivore Predator Prey Food Chain Food Web Ecosystem Abiotic Biotic</p>	<p>Lesson Overview:</p> <p>This series of activities explores the relationships between components of an ecosystem, using Isle Royale National Park as a focus. After reviewing basic ecological concepts, students will build ecological models and participate in role play as they investigate Isle Royale species dynamics.</p> <p>Four to five class periods (plus individual research time) will be required to complete the entire series.</p>
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<p><i>Engage</i></p>	<p>E1_Day in the Life</p> <p>Essential Question: What are the relationships between the components of an ecosystem?</p> <p>Duration: 30 – 40 minutes</p> <p>Materials:</p>
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<p><i>Engage</i></p>	<ul style="list-style-type: none"> • Projector for movie • EI_1_Day_in_the_Life worksheet for each student • EI_2_Day_in_the_Life_Isle_Royale character for each student • Art supplies (colored pencils, crayons, markers) <p>Have students close their eyes and have them visualize their favorite wild animal. Where does it live? What does it need to survive? What does it eat? Who eats it?</p> <p>Distribute EI_1_Day_in_the_Life worksheets. Give students two minutes to make a quick sketch of their chosen species. Then have them use the word bank to write a brief story about the day in the life of their animal.</p> <p>Have students share stories in small groups (3 students is ideal). Use a compliment or question strategy. After a student reads, each other student gives either a compliment or asks a question.</p> <p>Then have students discuss the meanings of the terms in the word bank. Are these words familiar? Unfamiliar? Share out with the entire class to assure that all students are acquainted with these terms.</p> <p>Invite students to “travel” to an isolated ecosystem, a group of islands in Lake Superior that make up Isle Royale National Park. (Show geographical location on a map.) Have students wonder what kinds of animals (and plants) live there and what their days might be like?</p> <p>Play Part 2 of the movie: “Return of the wolves Lessons from the Wilderness”. While watching, have students refer to their word bank and consider how these terms apply to Isle Royale.</p> <p>After viewing, split into their small teams and hand each person one organism page from EI_2_Day_in_the_Life_Isle_Royale. Have them design a poster that shows how their species relates to the terms in the word bank. Share student posters within the group. How are the species connected to one another?</p>
<p><i>Explore</i></p>	<p>Moose on the Loose!</p> <p>Essential Question: How do components of the ecosystem affect one another?</p> <p>Duration: 30 to 40 minutes</p> <p>Location: Open classroom, gymnasium, or field</p>

Materials

- Portable dry erase board, dry erase markers and eraser
- Graph Paper and Pencils

Ask the students if they know what animals need. Give them hints until they list all four parts of habitat: water, food, space, and shelter.

Split the students into two teams, moose, and habitat. For a group of twenty students make two moose and 18 habitats. Adjust accordingly for other group sizes. Explain to students that these two moose represent the original moose to come to Isle Royale. These moose will find an island free of predators and full of food.

Have both teams agree on easily recognizable actions for the four habitat requirements. For example, space could be holding one's arm stretched all the way out, shelter could be using your arms to make a "V" shaped hut over one's head, food could be rubbing one's belly, and water could be mimicking the action of drinking water out of a glass.

Position the two groups across from one another in single file lines (as in Red Rover). Have the students face away from one another. While facing away have everyone start making one of the habitat signs. When the leader calls "Moose on the loose!" the students turn around. Moose students run to the habitat student line, (still holding up their sign) and tag someone making the same sign. Then the moose and habitat return to the moose line. Each round equals one year.

Habitat not selected by moose remains habitat for the next round. Habitat selected by moose becomes a moose in the next round. Any moose that cannot select a matching habitat dies, decomposes, and becomes habitat in the next round. The round is over when either all moose have selected a habitat and returned to the moose line or no habitat remains.

At the beginning of each round, record the number of moose. Graph the information with number of moose on the y-axis and round (year) number on the x-axis. Play enough rounds to experience a population crash.

Explain that the Isle Royale moose population really did crash in the 1930's. Use a quick think/pair/share strategy to discuss the following:

- Why do you think so many moose died?
- What might have prevented the moose crash from happening?

Explain to students that moose population rebounded after the fire before beginning the next round. Play until another crash is a round or two away.

	<p>Then make two of the moose into wolves. The moose and habitat act the same as in the previous rounds. At the beginning of the round, the wolves are free to be anywhere between the moose and habitat. Once the round begins, the wolves need to try to tag a moose. Each wolf may tag one moose per round. Moose that are tagged become wolves in the next round. Wolves that do not tag a moose become habitat in the next round. If the wolves are too successful it may help to have them link arms to “hunt as a pack.”</p> <p>Record population data for habitat, moose, and wolves for each round, but do not graph. After eight or nine rounds return to the classroom with the data. have student trios work together to graph the data. One team member graphing habitat, one moose, and one wolves. As a team, compare the three graphs and discuss:</p> <ul style="list-style-type: none"> • How did wolves affect the moose population? • How did wolves affect the habitat? • How does the habitat affect the wolf population? • What patterns do you see on the graphs? <p>After discussion on the game results, give the students the real population data for Isle Royale in 2017 when population estimates were 2 wolves and 1600 moose. Have student pairs discuss their predictions on what would happen in the ecosystem based on what they have learned. Then have them connect with another pair and compare ideas. Continue to use this snowball strategy until the entire class is in the discussion group. End by briefly discussing that the National Park Service decision to bring 20-30 new wolves to Isle Royale.</p> <p style="text-align: right;">Adapted from Project Wild “Oh Deer”</p>
<p><i>Explain</i></p>	<p>Web Effects</p> <p>Essential Question: Are some species more important to the ecosystem than others?</p> <p>Duration: 30–40 minutes plus time for student research.</p> <p>Materials</p> <ul style="list-style-type: none"> • Large ball of yarn (softball sized or larger) or string • Index cards: each labelled with an Isle Royale “citizen” • Art materials for poster project <p>Procedure</p> <p>1. Create web cards. Each student draws an index card. Each card has a specific plant or animal species from the Isle Royale ecosystem (see EI_3_Isle_Royale_Citizens_List). There are a total of 16 species, so you may need to divide the class to make two “webs” and you will need a second leader to help facilitate. The cards are arranged in the approximate order of importance, so be sure to use the first few cards.</p> <p>Have students use resources to investigate their chosen species:</p>

- What habitat does it live in?
- What does it eat?
- What eats it?
- What are two adaptations that help it survive?

Information should be brief and must fit on the back of the index card. Keep the species a secret from other students

2. Write the names of all the Isle Royale "citizens" on the board or supply the list to students another way.

3. Have students sit in a tight circle (or two circles if you have two webs) and play the "Who am I?" game, using the list of "citizens" for reference. Have students go one at a time and read one fact from their card. Then they should wait for the group to guess their "identity" after each descriptive sentence. Encourage the person whose turn it is, to share anything else they know about the "citizen" in question. Use tape to convert index cards to "citizen name tags" for each student.

4. After all citizens have been introduced, pick a student at random and give them the ball of yarn. They should look at all of the cards and choose one that the "citizen" on their card may need, under any circumstances, directly or indirectly. They then toss the ball to the "citizen" they need (keep holding the end of the yarn.)

5. Before they toss the yarn, they must explain the ways they need the "citizen" they are about to toss the yarn to.

6. Every time the ball is tossed, the receiving "citizen" repeats the process, holding the end of yarn they just received. At first, have them try to include every person by explaining their relationships and tossing to someone who has yet to be included. The receiving person tightens the yarn connection before proceeding. Have them continue to weave the web until all the connections are included for each citizen. (It is conceivable that every person could be connected to everyone else if the students are astute about indirect connections.)

7. Ask students: Is there anyone in the web who you think is especially important? Why? If a human were included in the web, would anyone need them? Who? Why?

8. Announce that the Isle Royale wolf population has dramatically declined to just two animals. Have the wolf drop all its yarn. Then have all those who directly depend on wolf to drop their yarn.

9. Continue the process. Discuss what happened. Who is affected most by the decline of wolves? Why? Is anyone in the web not affected? Explain what a "keystone" species is. Relate the meaning of "keystone species" back to the web and inter-relationships.

Extension: Have students research the importance of another keystone species: (beaver, hummingbird, snowshoe hare, starfish, bees, prairie dogs, grizzly bears, sea otters, and sharks are just a few other North American keystone species.) Work in groups to create a poster that illustrates that species' importance to its ecosystem. Do a gallery walk to view other students' species.

<i>Elaborate</i>	<p>Quick Draw</p> <p>Essential Question: How do energy and matter move through an ecosystem?</p> <p>Duration: 20-30 minutes</p> <p>Materials:</p> <ul style="list-style-type: none">• Sketchbooks or paper on clipboard (one per student)• Pencil or colored pencils <p>In this activity, groups of four students will work cooperatively to create artwork that represents an imaginary ecosystem. Gather each group in a circle. It is best to do this while sitting on the ground with notebooks or sketchbooks.</p> <p>Each student has approximately one minute to draw their contribution. Words may be written on the paper to describe their drawings. Each student will start a drawing, then pass it and add a contribution to someone else's picture.</p> <p>Give students one to two minutes to complete each phase of their drawing. Then say "pass" and remind students of the next thing they are to draw. Students should pass drawings to the person on their left.</p> <p>Specify whether students may use real or imaginary plants and animals. If imaginary, require that appropriate adaptations be included. Each plant/animal must fit into the ecosystem.</p> <p><i>Drawing Phases</i></p> <ol style="list-style-type: none">1. Abiotic (non-living) Characteristics: Draw the abiotic characteristics of your landscape. Include all the characteristics that will help the other students know how to draw the organisms in your landscape: land, topography, water, clouds, sunlight, rocks, etc.2. Primary Producers: Draw the producers that live in the landscape picture you just received. The producers you add to the drawing should be designed to survive in this landscape (e.g., palm trees shouldn't be placed in an arctic environment, unless they have a special adaptation.)3. Herbivores: Draw herbivores that specifically feed on the type of plants illustrated by the previous student. Be sure that you draw at least two different types of herbivores.4. Carnivores: Draw a carnivore appropriate to your ecosystem. <p>After the final session, the 'artwork' should be passed around the circle until everyone receives their original paper. Have students examine their pictures and invent a story about what is happening in the scene or come up with a description of their ecosystem and its inhabitants.</p> <p>Share ecosystems within the group or with the larger class group by using an inside-out circle (Have ½ students form a circle and face outwards. Have other ½</p>
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	<p>of students form a circle around them.) Share ecosystems with the student they are facing. Then teacher calls for outside students to move three people left, or inside students move two people right, etc. Students share with new partner.</p>
<p>Evaluate</p>	<p>Wild Words:</p> <p>Duration: 15 - 20 minutes</p> <p>Materials:</p> <ul style="list-style-type: none"> • EI_4_Wild_Words_A-RAFT worksheets <p>Write the word bank terms from EI_1_Day_in_the_Life on the board.</p> <p>Let students know that their time on Isle Royale is ending. As they leave, they are going to write a letter to the National Park Service showing what they have discovered and learned. But their letter will NOT be from them. They will be writing for one of the Isle Royale citizens.</p> <p>Review the A-RAFT format and have students circle their choices before they begin. Remind students to use at least four of these terms in their letter. They may want to draft their letter on a separate paper before writing on their worksheet.</p> <p>Have students work individually or in pairs to complete the EI_4_Wild_Words_A-RAFT. Create a gallery wall and allow students to appreciate each other's ideas.</p>