Ecosystems, Human Activity, and Interactions—Oh My!

Human-Environment Interaction

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Grade Level	5th Grade	**Time Frame**	2-3 class period(s)
Subject	Science	**Duration**	120 minutes
Course	Environmental Science		

Essential Question

As a scientist, what would you recommend as a solution to the presence of predators in an ecosystem?

Summary

In this lesson, students learn about the story of the near extermination and subsequent re-introduction of the Gray Wolf of Yellowstone National Park. Through this narrative, students learn about apex predators, keystone species, and ecosystems. They learn to form cause and effect statements, analyze data, and create presentations that pose solutions to a scientific problem. This lesson includes optional modifications for distance learning. Resources for use in Google Classroom are included.

Snapshot

Engage

Students use a choice of apps to create a Word Cloud of key terms associated with ecosystems.

Explore

Students construct cause and effect statements based on snippets of data from a graphic about Yellowstone wildlife relationships.

Explain

Students role-play as scientists, recommending solutions to problems by presenting their data. These solutions are presented digitally.

Extend

Students examine new charts and data from the U.S. Fish and Wildlife Service to make observations and draw inferences about how human/environment interaction problems can be approached.

Evaluate

Students use a range of data presented in this lesson to demonstrate understanding of the concept of apex predators and keystone species.

Standards

Next Generation Science Standards (Grade 5)

5-LS2: Ecosystems: Interactions, Energy, and Dynamics
5-ESS3-1: Obtain and combine information about ways individual communities use science ideas to protect the Earth's resources and environment.

Attachments

- Lesson-Slides-Ecosystems-Human-Activity-and-Interactions-Oh-My.pptx
- Wolves-Keep-Yellowstone-in-Balance-Infographic-Ecosystems-Human-Activity-and-Interactions-Oh-My.pdf
- Yellowstone-Species-Cards-Ecosystems-Human-Activity-and-Interactions-Oh-My - Spanish.docx
- Yellowstone-Species-Cards-Ecosystems-Human-Activity-and-Interactions-Oh-My - Spanish.pdf
- Yellowstone-Species-Cards-Ecosystems-Human-Activity-and-Interactions-Oh-My.docx
- Yellowstone-Species-Cards-Ecosystems-Human-Activity-and-Interactions-Oh-My.pdf

Materials

- Yellowstone Species Cards (attached; one set per pair or small group of students)
- Wolves Keep Yellowstone in Balance Infographic (attached; one per student)
- Lesson Slides (attached)
- Internet-enabled student devices

Engage

Teacher's Note: Word Cloud Prep

To prepare for the Word Cloud activity detailed below, test the following Word Cloud apps and one to use in class:

- Word It Out
- Word Art

You may want to create your own word cloud to use as an example.

You may choose to modify slide 5 and slide 14 to reflect your choice of Word Cloud application.

Display **slide 3** of the attached **Lesson Slides** to introduce the essential question: *As a scientist, what would you recommend as a solution to the presence of predators in an ecosystem?*

Display **slide 4** to review lesson objectives:

1. Demonstrate a deeper understanding of the forces that impact apex predators.
2. Illustrate an understanding of the importance of keystone species in an ecosystem.

Display **slide 5** to introduce the concept of a Word Cloud. Direct students to visit a your selected word cloud generator.

Once students have gained access, have the students create a Collaborative Word Cloud of key terms related to the lesson theme ***human-environment interaction.***

Instruct students to use **ECOSYSTEM** as their first word. Have them individually brainstorm other relevant words. Discuss the connections among the words in the Word Cloud on slide 5 or draw one on the board to illustrate the concept.

Explore

Teacher's Note: Activity Prep

Print out a set of the attached **Yellow Species Cards** for each pair or small group of students. Print cards and cut or fold so that each card has a front side (photograph) and a back side (write-up). This way, each card should show a photograph of an animal native to Yellowstone on one side and data regarding that animal on the other. Tape sides together or laminate.

Separate each set of cards using paper clips, envelopes, or similar. From the remaining cards in each set, select one particular card of your choice to hand out to each pair or group. Be sure **not** to select the gray wolf card. To start the activity, you will hand out **only this particular card** to each group. Keep the remaining card sets nearby for later distribution.

Group students in pairs or small groups.

Display **slide 6**. Pass out your selected card from the attached **Yellowstone Species Cards** to each small group.

Instruct your students to create an **effect statement**, as shown on the slide, using the data on the back of the card. This effect statement should use the following format:

Because _____, then _____.

After enough time has passed for students to do so, have each group share out.

Possible Student Responses: Effect Statements

To form effect statements, students should theorize an effect from the data included in the picture. This effect should be drafted based on the data provided, context clues, and prior knowledge they have about ecosystems, species, and predator/prey relationships.

For example, on the elk card, the data reads "Elk populations exploded, resulting in severe overgrazing of willows and aspen needed by beavers for food, shelter, and dam building." A sample student cause statement for this might be, **"Because the trees that the beavers needed were gone when the elk overgrazed, the beaver populations started to go down because they couldn't find food or make their homes."**

Optional Modification for Distance Learning

This lesson works well with Seesaw and Padlet. For distance learning, consider setting each activity and task in the lesson in these or similar platforms where students can continually post their responses in one collective online space. Download all attachments to use in this lesson into Google Classroom.

Display **slide 7** and give each group a full set of prepared Yellow Species Cards. Ask students to organize their cards to create a relationship map.

Resist giving students hints at how to structure their relationship maps. Challenge them to organize the cards in ways that make sense to them. It's likely that students will organize the cards in predator/prey hierarchy, by habitat or physical features, or by diet. Encourage students to think creatively about relationships among the animals on their cards.

After groups have completed their relationship maps, have each group or pair share out. After all groups have shared their maps, have students individually revisit their effect statements from their first animal data card.

Display **slide 8**. Have students examine the data on the back of all the animal cards. Ask them to identify any different causes from the data set that relate to their first effect statement.

Ask students, "What are the problems in this **ecosystem** described in your effect statements?"

Possible Student Responses: Problems in the Described Ecosystem

Possible responses that students might share could include "Some of the animal populations got too big," "There weren't enough dead animals left for scavengers to eat," and "The land got overgrazed when there were too many animals to eat on it."

Explain

Display **slide 9.** Propose the following question to the class:

"As a group of scientists, what would you recommend as a solution to the problems presented in this data?"

Give students enough time to analyze and write down an answer to the question.

Possible Student Responses: A Solution?

Student responses will vary, but many students will jump to the answer that the wolves should be killed in order to save the rest of the animals. Play devil's advocate here and prompt students to think about whether they have all the information needed about the wolves of Yellowstone.

Once each group has written down an answer, pass out copies of the attached **Wolves Keep Yellowstone in Balance Infographic** (or distribute the following link: Wolves in Yellowstone in Balance PDF) to pairs or small groups of students. Give groups a few minutes to read through the infographic.

Teacher's Note: Infographic

The infographic includes the animals on the cards students used to create their relationship maps and shows the importance of keeping predators in balance. The information illustrates why the gray wolf, an apex predator, should not be exterminated.

Display **slide 10.** Using the questions below, ask students to examine the data in the infographic and the relationships among the animals.

- What do you notice about the individual species?
- What do you notice about the relationship between the species?
- What do you wonder about the Gray Wolf as an apex predator?
- Has your recommended solution to the problems presented in the data changed? How so?

Teacher's Note: Activity Prep

Decide how you want students to demonstrate their prior and new knowledge. Choose a platform that meets your expectations for student deliverable and insert a link or the name of the platform in the brackets on slide 11.

Platforms that would be strong choices for these presentations might be Padlet, Popplet, iBrainstorm (IOS app only), and/or through Google Slides.

Display **slide 11.** Challenge students to address the problems and concerns that scientists and ecologists in Yellowstone faced: *What is the right thing to do when an apex predator is affecting other species?*

Instruct students to present their solution digitally using your selected app(s). These presentations should include the following three elements, and should be structured as a CER (Claim, Evidence, Reasoning) statement:

- One problem
- Evidence
- Reasoning

Have students present their solutions.

Optional Modification For Distance Learning

For distance learning, have students use your selected app (such as Padlet, Popplet, iBrainstorm, or Google Slides) as directed. Download all attachments to use this lesson in Google Classroom.

Extend

Optional: Further Details on Gray Wolf Extermination and Reintroduction

After students have presented their solutions, you will share the details of the government's efforts to exterminate the Gray Wolf population of Yellowstone and the ultimate outcome when other animal species in the park dwindled (this is detailed below). Note that students may have discussed these effects, and may even have touched on them in their presentations. Note, however, that not only were animal species affected, but so were the landscape and ecosystem.

Check out the US Fish and Wildlife Service's page on the gray wolf for additional details on the return of the gray wolf to Yellowstone. You may choose to share this with students who are interested in further research on the influence of the gray wolf (*Canis lupus*). Other sources include the following US Fish and Wildlife Services pages: Wolf Restoration; 25 Years of Wolves in Yellowstone

Display **slide 12**. Show students either the video on the slide ("Wolves of Yellowstone"), found on the National Geographic Resource Library online, or the video linked below ("How Wolves Change Rivers"). Both address how the reintroduction of the wolves changed the physical aspects of Yellowstone National Park for the better.

Embedded video
https://www.youtube.com/watch?v=ysa5OBhXz-Q

After viewing one or both of these videos, ask students what their theories are regarding how the impact of the wolves affected the health of Yellowstone.

Display **slide 13.** Introduce the concept of **keystone species**. Have students write down the definition of keystone species: *a species that is integral to the ecosystem and food chain.* Have students identify how the Gray Wolf is a keystone species.

Ask students to discuss any other animal they are aware of that might have changed the shape of the land where that animal lives.

Optional: Additional Reading

Additional books that can extend this lesson are *Sea Otter Heroes: The Predators that Saved an Ecosystem* and *The Wolves Return: A New Beginning for Yellowstone National Park.*

Evaluate

Teacher's Note: Next Steps

After students have examined and discussed *apex predators, keystone species,* and *ecosystems* and have created cause and effect statements through examining data, it's time to evaluate the lesson by analyzing how their understanding has changed.

Since the lesson began with a Word Cloud, ask students to revisit the notion of reflecting relationships through a Word Cloud. Using the same platform used in the Engage section (Word It Out or Word Art), have them create a new Word Cloud that reflects their new knowledge

Display **slide 14** and the prompt ***human-environment interaction.*** Advise students that their first word must be the term **ECOSYSTEM.** After students have had time to work in pairs or small groups on their new Word Clouds, display them one at a time or have volunteers display their Word Clouds. Ask them to identify and explain any new terms they have added.

Resources

- Earthjustice. (2020, June 29). Wolves keep Yellowstone in the balance. [Infographic]. https://earthjustice.org/features/infographic-wolves-keep-yellowstone-in-the-balance
- Farquhar, Brodie. (2020, June 30). Wolf reintroduction changes ecosystem in Yellowstone. Yellowstone National Park Trips. https://www.yellowstonepark.com/things-to-do/wolf-reintroduction-changes-ecosystem
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- K20 Center. (n.d.). Collaborative Word Clouds. Strategies. https://learn.k20center.ou.edu/strategy/103
- K20 Center. (n.d.). Google Classroom. Tech Tools. https://learn.k20center.ou.edu/tech-tool/628
- K20 Center. (n.d.). iBrainstorm. Tech Tools. https://learn.k20center.ou.edu/tech-tool/634
- K20 Center. (n.d.). Padlet. Tech Tools. https://learn.k20center.ou.edu/tech-tool/1077
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- Miller, Brian J., et al (2012) Trophic cascades linking wolves (Canis lupus), coyotes (Canis latrans), and small mammals. Canadian Journal of Zoology, 90(1),70-78. https://lycographos.blogspot.com/2012/09/trophic-cascades-linking-wolves-canis.html
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- US Fish and Wildlife Service. (n.d.). Gray wolf. https://www.nps.gov/yell/learn/nature/wolves.htm#7C8BA5D2026AE8871A08BE87F66AE072
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- Sustainable Human. (2012, February 13). How wolves change rivers. [Video]. YouTube. https://www.youtube.com/watch?v=ysa5OBhXz-Q