

LESSON 3: EXPLORE THE ECOSYSTEM OF NORTHERN MONGOLIA

THE RING OF DARHAD

LENGTH: 60 MINUTES

GRADES/AGES: GRADES 3-7

Lesson Overview:

Learn more about the Darhad region ecosystem and how its species are interconnected through games and diagrams. Explore how the wolverine's survival depends on the health of the entire Darhad ecosystem through research.

LEARNING OBJECTIVES

Students will be able to:

- 1. Diagram the Darhad region's ecosystem using a pyramid model.
- 2. Compare and contrast ecosystem structure with other organizational structures.
- 3. Describe important characteristics and behaviors of wolverines.
- 4. Explain the relationships wolverines have with other species of the Darhad region's ecosystem.
- 5. Assess the importance of the wolverine in the Darhad region's ecosystem.

DIRECTIONS:

1. Introduce the Darhad Region ecosystem.

- Tell your class that the Darhad region is an ecosystem similar to the northern Rocky Mountains. The Darhad Region is filled with over 800 different types of plant species and hundreds of animal species. The wolverine is dependent upon the health of the entire ecosystem for its survival.
- Show your class pictures of the Darhad region.
 Briefly compare and contrast this ecosystem to your hometown. Have students hypothesize the types of plants and animals they would expect to find in the Darhad region.

2. Diagram an ecosystem's organizational structure.

- a. Tell your students that scientists have developed different methods to show how an ecosystem is organized and how different species within an ecosystem are related. Have your students use the following method to model an ecosystem. This can be done individually or as a class depending on students' familiarity with the concept.
- b. Using the **Ecosystem Pyramid worksheet**, have your students complete a diagram of the levels of organization within an ecosystem using the Darhad region ecosystem as an example.
 - Review the vocabulary terms: organism, population, community, ecosystem, biome, biosphere.
 - Have students label each level of the Ecosystem Pyramid with the appropriate term based on the example provided.
 - Review student answers for understanding.
- c. Have students demonstrate their understanding of ecosystem structure by applying this pyramid model to a restaurant. Have students think of all the elements of a restaurant and complete the **Restaurant Ecosystem Pyramid worksheet**.
- d. Have students compare and contrast the Darhad region ecosystem and restaurant diagrams through small group discussion.
- e. Ask your students the following questions and have them record their answers on their worksheet: How are ecosystems organized the same as other things? How is the organization different?
- 3. Review the elements of the Darhad region ecosystem by playing a card game.
- a. Tell your class that they are going to explore the different levels of the Darhad region ecosystem by playing a card game.
- b. Divide your class into pairs. Pre-cut and mix-up the Ecosystem Cards provided. (Two levels of difficulty are provided based on your students' previous knowledge of ecosystems.) Provide each pair with four to eight copies of the cards (24-48 cards total per pair).



- c. Show your students each of the six cards and explain that they will be playing a card game similar to "War."
 - Each player will start with an equal number of cards.
 - The object of the game is to have all the cards in your possession.
 - Each player shuffles their cards and holds them in a stack face down.
 - Both players flip over their top card and place it face up on the playing surface.
 - The "higher" card (most general and incorporates the most organisms) wins.
 - The player that put down the "higher" card picks their card back up and the losing card and places them at the bottom of their stack of cards.
 - If players put down the same card, they will "go to war." Each player will then set down a second card face down. They will both place a third card face up. The "higher" third card wins all the cards laid down on the playing surface.

4. Research a species of interest: Wolverine

- a. Tell your students that before a research team travels to the field to study one species of an ecosystem, they first research everything that is already known about that habitat and species.
 Explain to your students that they are going to learn more about the wolverine by researching what is known about this animal.
- b. Have students use the internet (including information from National Geographic and the Wolverine Foundation) or other resources to research and describe the wolverine using the Species of Interest: Wolverine worksheet.
- c. After completing this brief research project, as a whole class, have students identify the importance of the wolverine and its connected species in this ecosystem by answering the following questions in a group discussion.
 - What role does the wolverine play in the Darhad region's ecosystem?
 - From what you read while researching, what other animal and plant species does the wolverine depend upon for its survival?
 - Why is the wolverine important?

Tips and Modifications:

To adapt this lesson to a different age group, use the following modifications:

2.c. For older students, you can provide a blank pyramid, which can be completed using any other system including the human body or their school.

4.b. Older students can write a brief report on the wolverine instead of filling in the provided worksheet.

Assessment:

Review students' ecosystem diagrams and restaurant comparison for completion and accuracy.

Review students' wolverine research for completion and accuracy.

Have students write their answers to the discussion activity in 4.c. and review for completion and accuracy.

Extending the Learning:

Complete Activity 3 of Lesson 7 of the unit. This activity has students diagram the ecosystem in their schoolyard.

Complete Lesson 5 of the unit in which students learn more about the other species in this ecosystem.

Study more about trophic levels and energy movement throughout an ecosystem.

Do a food web activity where each student is a species. Have students stand in a circle. Give a ball of yarn to one student. Have the student hold on to one end and pass the yarn to another student who is directly connected to his or her species. Continue until all species are connected, creating a web. Discuss how all species in an ecosystem are connected.

Using the models presented in this lesson, study trophic levels by labeling the trophic level of each part of the pyramid (producers, consumers, etc.) and introduce what percentages of energy are transferred from each level to the next. (Consumers at each level generally only convert about 10% to biomass.)

PREPARATION:

MATERIALS YOU PROVIDE Pencils

RESOURCES PROVIDED

Audio and Video None

Images Darhad Region photos (see Lesson 2)



Handouts and Worksheets

- Darhad Ecosystem Pyramid Worksheet (one per student)
- Restaurant "Ecosystem" Pyramid Worksheet (one per student)
- Darhad Ecosystem Playing Cards (2-4 copies per pair of students)
- Species of Interest: Wolverine worksheet (one per student)

REQUIRED TECHNOLOGY

- Internet Access: Required
- Tech Setup: Several computers for student research

Other Notes

Lesson 7 of this unit, "Schoolyard Biodiversity Study," provides an opportunity for students to participate in all the steps of the Ring of Darhad Mongolia Wolverine Expedition. This lesson may be completed in portions at the end of the first six lessons to reinforce each lesson's major ideas.

BACKGROUND AND VOCABULARY:

Background Information

An ecosystem includes all of the living and non-living components of a geographic area. All biotic (living) and abiotic (non-living) components of an ecosystem impact every other factor either directly or indirectly. Changing climate will affect the plants that are able to survive in a specific ecosystem, which will in turn affect the animals that depend on these plants as a food source or for shelter. Ecosystems can range in size from a tiny hot spring in Yellowstone National Park to the entire rainforest. Smaller ecosystems combine to form the world's biomes. Biomes are large and can be identified by the general type of biotic and abiotic factors they include. Within each biome are several smaller and varied ecosystems.

Learn more about ecosystems from National Geographic:

http://education.nationalgeographic.com/education/ encyclopedia/ecosystem/?ar_a=1

As human populations grow and expand, we continue to impact the world's ecosystems – sometimes in destructive ways. Scientists from around the world



Term	Part of Speech	Definition
Abiotic	Adjective	Non-living (including water, soil, and temperature).
Biome	Noun	A large geographic area with similar ecosystems and climate.
Biosphere	Noun	All ecosystems on the Earth.
Biotic	Adjective	Living (including plants and animals).
Carnivore	Noun	A meat-eating organism
Community (ecological)	Noun	Two or more different species of organisms that interact in the same geographic area.
Ecosystem	Noun	All of the living and non-living components of a geographic area that interact.
Herbivore	Noun	An organism that feeds on plants.
Omnivore	Noun	An organism that feeds on both plants and animals.
Organism	Noun	An individual plant, animal, or other form of life.
Population	Noun	Many organisms of the same species in one geographic area.
Predator	Noun	An animal who hunts its food.
Prey	Noun	An animal who is hunted by other animals for food.
Scavenger	Noun	An animal that feeds on carcasses abandoned by other predators.
Trophic level	Noun	A position in a food chain or ecological pyramid model filled by organisms with similar feeding roles.



study individual ecosystems in order to learn how these systems work and how human actions affect nature. Montana State University and The University of Montana are working together to enhance environmental and ecosystem science research, education, and engagement across the state and beyond via the Montana University System (MUS) Institute on Ecosystems.

Learn more about ecosystem research from the Institute on Ecosystems: <u>http://montanaioe.org/</u>

Wolverines are the largest member of the weasel family although they more closely resemble a small bear rather than other members of the weasel family. Wolverines are scavengers and can smell carcasses of animals and dig these remains up from under 8 – 10 feet of snow . These animals are poorly known because they are incredibly hard to study. Wolverines live in the most rugged environments on earth. They move over long distances and they are naturally rare. Wolverines are tied to cold environments. They den in the snow and they require cool summer temperatures in order to survive. Wolverines require deep spring snow to den, they are likely to lose habitat as the climate warms. Learn more about the wolverine from

- National Geographic: <u>http://animals.</u> <u>nationalgeographic.com/animals/mammals/</u> <u>wolverine/</u>
- The Wolverine Foundation
 <u>http://wolverinefoundation.org</u>
- The Wolverine Blog http://egulo.wordpress.com
- The PBS Nature film "Wolverine: Chasing the Phantom" http://video.pbs.org/video/1642358743/

Prior Knowledge

Ecosystems

Recommended Prior Activities

Lesson 1 of the Ring of Darhad unit: Meet the Team Lesson 2 of the Ring of Darhad unit: Discover the Darhad



Name:___

SPECIES OF INTEREST RESEARCH: WOLVERINE

Before a research team travels to the field to study one organism of an ecosystem, they first research everything that is already known about that habitat and species. Help the members of the ASC team by researching the wolverine for the Ring of Darhad Mongolia Wolverine Expedition.

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Common name: Scientific name: Family: Type of habitat: Range:

Physical characteristics:

Looks like what other animal:	
Length:	
Weight:	
Color:	

Circle the term(s) that best describe this species:

Carnivore	Omnivore	Herbivore
Predator	Prey	Scavenger

Diet:

Draw a picture of the species:

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ANSWER KEY

SPECIES OF INTEREST RESEARCH: WOLVERINE

Before a research team travels to the field to study one organism of an ecosystem, they first research everything that is already known about that habitat and species. Help the members of the ASC team by researching the wolverine for the Ring of Darhad Mongolia Wolverine Expedition.

Common name: Wolverine Scientific name: Gulo gulo Family: Weasel (largest member) Type of habitat: boreal forests, taiga, and tundra Range: northern latitudes of Europe, Asia, and North America.

Physical characteristics:

Looks like what other animal: small bear
Length (including tail): Head and body, 32 to 44 in (84 to 111 cm)
Weight: 24 to 40 lbs (11 to 18 kg)
Color: mostly dark with light areas along their sides and top of their face

Circle the term(s) that best describe this species:

Carnivore	<u>Omnivore</u>	Herbivore	
Prodator	Prov	Saavandar	
Predator	Prev	Scavenger	

Diet: Some plants and berries, in the summer season but mostly meat. Prey includes smaller animals, such as rabbits and rodents, but sometimes animals many times their size, such as caribou, if the prey appears to be weak or injured. Wolverines also scavenge carrion—the corpses of larger mammals, such as elk, deer, and caribou.

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Draw a picture of the species:









DARHAD ECOSYSTEM CARD GAME (EASY)

Cut out the following cards for the Ecosystem Card Game. Each student will need two to four copies to play.











