

# WHAT IS LIFE LIKE IN THE OCEAN AND ON THE TUNDRA?

## UNIT 6: Ecosystems Lesson 15 — Grade 2 INSTRUCTIONS



### Overview

In this lesson, students will learn about the characteristics of ocean and tundra ecosystems and how they are alike and different.

### Objectives

On successful completion of this lesson, students will be able to:

- sort animals and plants into the ocean or tundra ecosystem they live in;
- identify the conditions needed in the ocean and on the tundra for animals and plants to live;
- create food chains for the ocean and the tundra; and
- draw pictures of life in the ocean and the tundra and state how they are the same and different.

### Alaska Standards

#### Alaska Science Standards / Grade Level Expectations

- [3] SA1.1 The student demonstrates an understanding of the processes of science by asking questions, predicting, observing, describing, measuring, classifying, making generalizations, inferring, and communicating.
- [3] SA1.2 The student demonstrates an understanding of the processes of science by observing and describing the student's own world to answer simple questions.
- [3] SA3.1 The student demonstrates an understanding that interactions with the environment provide an opportunity for understanding scientific concepts by observing local conditions that determine which plants and/or animals survive.
- [3] SC3.1 The student demonstrates an understanding that all organisms are linked to each other and their physical environments through the transfer and transformation of matter and energy by identifying examples of living and non-living things in the local environment.
- [3] SC3.2 The student demonstrates an understanding that all organisms are linked to each other and their physical environments through the transfer and transformation of matter and energy by organizing a simple food chain of familiar plants and animals.

### Alaska Cultural Standards

- [D] Culturally knowledgeable students are able to engage effectively in learning activities that are based on traditional ways of knowing and learning. Students



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who meet this cultural standard are able to:

- [D1] acquire in-depth knowledge through active participation and meaningful interaction with Elders.
- [D3] interact with Elders in a loving and respectful way that demonstrates an appreciation of their role as culture-bearers and educators in the community
- [E] Culturally knowledgeable students demonstrate an awareness and appreciation of the relationships and processes of interaction of all elements in the world around them. Students who meet this cultural standard are able to:
  - [E2] understand the ecology and geography of the bioregion they inhabit.

## Bering Strait School District Scope and Sequence

2nd grade sequence #8: Ecosystems

- B. Understand the characteristics of life in the ocean.
- D. Understand the characteristics of life in the tundra.
- E. Use scientific processes and inquiry to directly support the concepts of the ecosystems

## Materials

- *What If There Were No Lemmings?: A Book about the Tundra Ecosystem* by Suzanne Slade
- Picture cards of plants and animals that live in the ocean and on the tundra
- Chart paper
- Markers
- Scissors
- String
- Student Worksheet: Ocean and Tundra Ecosystems

## Additional Resources

*Discovering the Arctic Tundra (World Habitats)* by Janey Levy

*Tundra Food Chains* by Kelley Macaulay

*Arctic Tundra (Food for Life)* by Kate Riggs

*Oceans: Underwater Worlds* by Laura Purdie Salas

*What If There Were No Sea Otters?: A Book About the Ocean Ecosystem* by Suzanne Slade and Carol Schwartz



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*Life in an Ocean* by Carol K. Lindeen

*Polar Sea Life* by Jinny Johnson

## Activity Preparations

1. Create a chart with three columns and three rows. Label the columns ecosystems, non-living, and living. Label the rows tundra and ocean. Tape a piece of paper over the word ocean. Make the chart long enough to allow most of the non-living and living components of the ecosystem to be listed.

Ecosystem	Non-living	Living
Tundra		
Ocean		

2. Ask a local culture bearer to visit the class and explain the importance of sea ice to the community and the animals that live on and near the ocean.

## Whole Picture

An ecosystem is a community of living (biotic) and nonliving (abiotic) things that interact in the same environment. Biotic organisms include things like plants, animals, microbes, and people; abiotic components include things like rocks, minerals, and water. Ecosystems can be vast, like the tundra or the ocean, or they can be small, like a classroom terrarium. In either case, each component of the ecosystem depends on the others for survival. When one part is disrupted, it can throw the entire system out of balance.

The primary ecosystem in the Bering Strait School District (BSSD) region is called “tundra.” Low-lying shrubs, mosses, sedges, and lichens carpet the valleys and hills of a tundra ecosystem. In the coastal plains region, the area is covered with small lakes and ponds and the surrounding landscape is decorated with geometric patterns caused by frost heaving.

The primary feature of the tundra is its lack of trees. Scientists identify several reasons for this, including a short growing season, strong winds, and permafrost. Due to the small amount of precipitation that a tundra receives, it is sometimes called an “arctic desert.” Nevertheless, the wetlands in the area provide tundra plants and animals with ample



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water, and allow for an abundance of animal life, including moose, caribou, arctic foxes, and Alaska hares, not to mention the many riverine species including river otter and an abundance of fish: five species of Pacific salmon, Dolly Varden, Arctic grayling, Bering cisco, and Alaska blackfish. In the spring, after a long, bitter winter, the tundra explodes with plant and insect life, and migratory species arrive at the area to rear their young. Swans, terns, geese, ducks, loons, shorebirds, phalaropes, and songbirds arrive en masse from the United States, Mexico, Argentina, and even as far south as Antarctica.

Another type of ecosystem found in the BSSD region revolves around ice — specifically, sea ice. “Ice in the Arctic environment consists of both ‘fast ice’ and ‘pack ice.’” (ADFG, “Sea Ice Habitats,” p. 1). Shore-fast ice is attached to the coastline or to other large ice floes that are grounded. This type of ice forms annually in winter and melts during the summer months. “Pack ice is not anchored to land and moves with the ocean’s currents and winds” (ADFG, “Sea Ice Habitats,” p. 1). Pack ice grows annually, but does not completely melt each year; it may include old sea ice, or icebergs and floes that have moved from other locations. Sea ice provides important habitat for nine mammal species in Alaska. “These are the arctic fox; polar bear; beluga and bowhead whales; the walrus; and the bearded, ringed, spotted, and ribbon seals. Each species of marine mammal requires a certain type of sea ice for resting, molting, socializing, breeding, rearing, migration, and access to prey” (ADFG, “Sea Ice Habitats,” p. 2).

Other animals also depend on the sea ice, though somewhat more indirectly. For example, in the summer, as fish and small marine prey-species move north following the ice retreat, so do the animals that depend on them, like sea birds, larger fish, and marine mammals. Thus, the availability of sea ice is vastly important for the survival of these species, as well as for the people who subsist off of them.

One animal that depends on both the terrestrial and marine ecosystems in the region is the human — Iñupiaq, Yup’ik, and Siberian Yupik people have called the area home for thousands of years. A key component of the Alaska Native philosophy toward the ecosystem is to respect and maintain its delicate balance. People recognize that they are active players in the system and that certain ways of caring for the system are required in order to maintain the natural cycles (Kawagley, 2006). One such example of maintaining balance is the Yup’ik Bladder Festival, where seal bladders are sent back to their watery world in order to “help insure the rebirth of the yuit, or ‘persons,’ of the animals” and ensure continued abundance of the seals the following season (Fienup-Riordan, 1994, p.256). Similarly, in many Iñupiaq communities ceremony practices dictate that when a marine mammal is harvested and brought to land, it should be given a sip of fresh water. By respecting the animals in this way, the animal spirit will go back to others of its kind and encourage them to give themselves for harvest, as well.

Nevertheless, as the climate changes, many arctic ecosystems are in danger. Especially along the coast, once stable habitats are eroding, and animal behavior and plant timing



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are changing unpredictably and are disturbing other components of the system. Community members and scientists alike are working together to find reasons, solutions, and adaptations for these changes. Consider working with elders and community members in your area to better understand the local ecosystem changes.

### Vocabulary

<b>consumer</b>	a living organism that eats plants or other animals
<b>dead</b>	formerly a living organism that no longer reacts or interacts with other components of the ecosystem
<b>decomposer</b>	an organism that breaks down dead plants and animals, returning nutrients to the soil
<b>ecosystem</b>	the interactions and relationships of all living and nonliving things in a specified area
<b>food chain</b>	a model that shows one-to-one links between producers and consumers
<b>living organism</b>	a plant or animal
<b>nonliving things</b>	landforms, rocks, water, soil, air, sunlight
<b>producer</b>	a plant that changes the sun's radiant energy into chemical energy
<b>sunlight</b>	primary source of energy in an ecosystem

### Activity Procedure

1. Read *What If There Were No Lemmings?* and discuss the book as it is being read.
2. Review the vocabulary words with definitions.
3. Ask students what the components of an ecosystem are? Identify them as living and nonliving things. Ask the students for examples from the book and list them in the columns on the chart in the row labeled tundra.
4. Tell the students you would like them to think about another large ecosystem in their community. Ask them to think about the ocean (Norton Sound and Bering Sea). Ask: What are the components of an ocean ecosystem? Remove the paper over the word "ocean" on the chart if a student answers living and nonliving. If not, explain that the components in the ocean are similar to those in the tundra. Ask the students for examples that they know or can think of and list them in the columns on the chart in the row labeled ocean. Ask: Where would the living organisms get their air to breath when they live in water?
5. Divide the students into groups of four and explain that they are going to be



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given some string and some pictures of plants and animals. Instruct them to create a two circle Venn diagram, labeling one circle tundra and the other circle ocean. After the group has created the Venn diagram they are to sort the plants and animals into the ecosystem they belong to.

6. Ask:
  - a. How were the groups of animals the same?
  - b. How were they different?
  - c. Were there any animals or plants that lived in both ecosystems?
  - d. How would a plant or animal survive in both ecosystems?
  - e. How do the plants and animals interact in the tundra?
  - f. How do the plants and animals interact in the ocean?
  - g. In the book we read about lemmings. What would happen if one of the plants or animals in the ocean was not there?
  - h. How could the nonliving components affect the ecosystems?
7. Invite a local culture bearer to visit the class and explain the importance of sea ice to the community and the animals that live in and near the ocean. (What animals depend on the sea ice, how has the sea ice changed, how has that affected the animals and plants, how has that affected the community, etc.)
8. Have students take the Student Worksheet: Ocean and Tundra Ecosystems home to complete. Tell them to return the worksheets the next day to share with the class.

## Extension Activities

- Create simple food chains of the living components of an ocean ecosystem and a tundra ecosystem. Have them indicate where the nonliving components would be included.
- Write a short paragraph describing what would happen to a tundra or ocean ecosystem if one of the nonliving components changed or was missing.

## Answers

3. Living and nonliving things; answers will vary
  - a. nonliving: sun (energy), air, water, rocks, soil
  - b. living: plants, lichen, algae, shrubs, moss, lemmings, arctic fox, caribou, moose, wolves, bears, swans, ducks, geese, arctic terns
4. Living and nonliving things



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- a. Answers will vary.
  - b. nonliving: sun (energy), air, water, rocks, soil
  - c. living: plankton, worms, algae, seaweed, moss, crabs, whales (beluga and bowhead), seals (ringed, bearded, ribboned), salmon, polar bears, walrus
  - d. Some animals like whales and seals will swim to the surface for air; other animals filter air out of the water using their gills
5. Answers will vary depending on the animals they get; some animals that live in both ecosystems (polar bears will be in the middle where the circles intersect).
- 6.
- a. Answers will vary but should include producers, consumers, decomposers, predators, and prey
  - b. One has water, one has land and rivers and lakes; different animals; answers will vary
  - c. Answers will vary but should include salmon, insects, algae, polar bears, birds
  - d. Plants and animals would have to be adaptable and be able to change; answers may vary.
  - e. Plants convert energy from the sun into energy that animals can eat. Animals rely on plants and other animals by eating them. Decomposers eat dead things in order to survive and plants benefit from the soil the decomposers provided; answers may vary in details.
  - f. Plankton, algae and single-celled organisms convert energy from the sun into energy that animals can eat. Animals rely on plankton, algae and one-cell organisms and other animals by eating them. Decomposers eat dead things in order to survive and worms, sponges, and smaller organisms benefit from the nutrients the decomposers provide. Answers may vary in details.
  - g. Answers may vary in details. Consumers who feed on an animal or plant that is no longer there would begin to die, which could then impact all the other animals, and plants, which could then begin to die. The ecosystem would begin to change.
  - h. If a nonliving component like the sun, air, water, or soil was absent, weakened, or polluted, the environment might change and this could impact the animals and plants. They would have to adapt to the changes or they might die. Answers will vary with details.



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**Name two ways that the tundra and ocean ecosystems are alike.**

1. Both have living and nonliving components.
2. Producers, consumers, and decomposers are in both ecosystems.

Note: Answers may vary depending upon the drawings.

**Name two ways that the tundra and ocean ecosystems are different.**

3. Many of the plants and animals in the ocean live in the water continuously, while the plants and animals of the tundra live on land.
4. Plankton are converting energy from the sun into edible energy for other organisms in the ocean, while on land, plants convert energy from the sun.

Note: Answers may vary depending upon the drawings.

**Briefly explain what animals and plants need in order to live and survive.**

5. In order to live and survive, plants and animals need food, shelter, air, and water. They must be able to protect themselves, to reproduce, and to grow. Plants and animals must also be adaptable, so if there is a change in their ecosystem then they will be flexible enough to make changes in order to adapt and survive.

Note: Answers may vary on details provided.

**Draw a simple food chain of either the ocean or tundra ecosystem.**

Drawings will vary depending upon the ecosystem chosen. Drawings should include at least one example of a producer, a consumer, and a decomposer. They could also include the nonliving component of sunlight.



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## References

- Alaska Department of Fish and Game [ADFG]. "Wildlife Action Plan Appendix 5: Sea Ice Habitats." Accessed from: [http://www.adfg.alaska.gov/static/species/wildlife\\_action\\_plan/appendix5\\_sea\\_ice\\_habitats.pdf](http://www.adfg.alaska.gov/static/species/wildlife_action_plan/appendix5_sea_ice_habitats.pdf).
- Fienup-Riordan, Ann, and Alice Rearden. (2012) Ellavut: Our Yup'ik World and Weather. Continuity and change on the Bearing Sea Coast. Seattle and London: University of Washington Press.
- Kawagley, Angayuqaq Oscar (2006). A Yupiaq Worldview: A Pathway to Ecology and Spirit. Long Grove: Waveland Press.



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## Student Worksheet: Tundra and Ocean Ecosystems

Name \_\_\_\_\_

Draw a picture of life on the tundra in the first box.

A large, empty rectangular box with a thin black border, intended for a student to draw a picture of life on the tundra.

Draw a picture of life in the ocean in the second box.

A large, empty rectangular box with a thin black border, intended for a student to draw a picture of life in the ocean.

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## Student Worksheet: Tundra and Ocean Ecosystems

Name \_\_\_\_\_

Answer the following questions:

Name two ways that the tundra and ocean ecosystems are alike.

1. \_\_\_\_\_

2. \_\_\_\_\_

Name two ways that the tundra and ocean ecosystems are different.

3. \_\_\_\_\_

4. \_\_\_\_\_

Briefly explain what animals and plants need in order to live and survive.

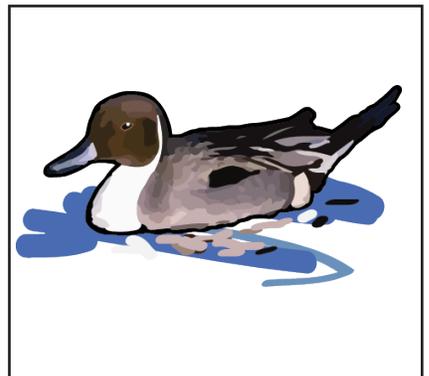
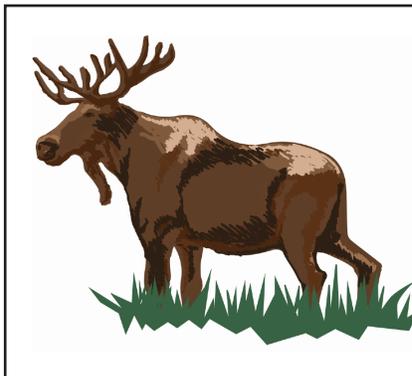
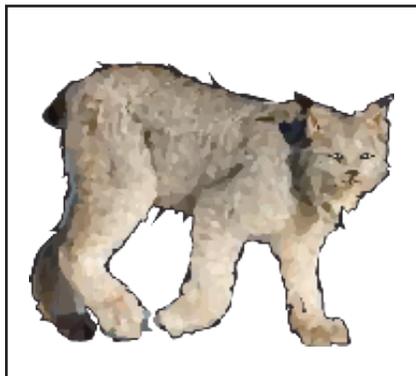
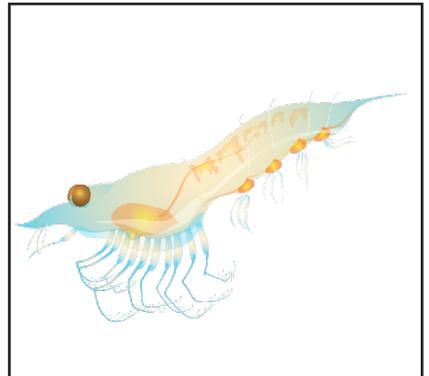
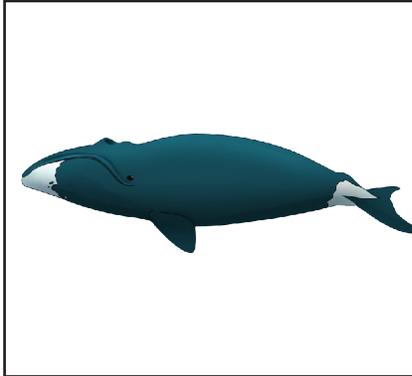
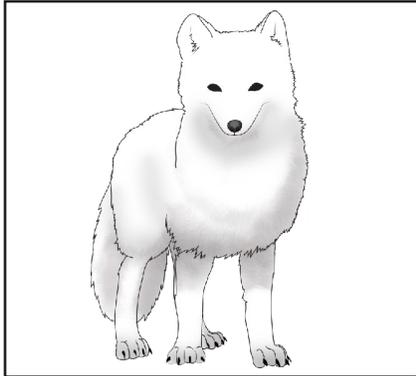
5. \_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

Draw a simple food chain of either the ocean or tundra ecosystem.

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