Learning A–Z	level **U**	Multi-level	N/A
Grade	4	Word Count	1,183
Lexile	1000L	Nonfiction • Informational	

Refer to the Focus Question on page 2 of this title to guide discussion and support additional learning connected to the text.

Earth's surface contains a vast variety of communities, environments, and extremes. **Tundra** provides students a comprehensive look at this unique biome where animals, plants, and humans have to adapt to survive. Students will learn about the many distinctive features that shape one of Earth's harshest biomes. The book can also be used to teach students how to determine cause and effect and how to recognize dashes. This book is part of the Brilliant Biomes series.

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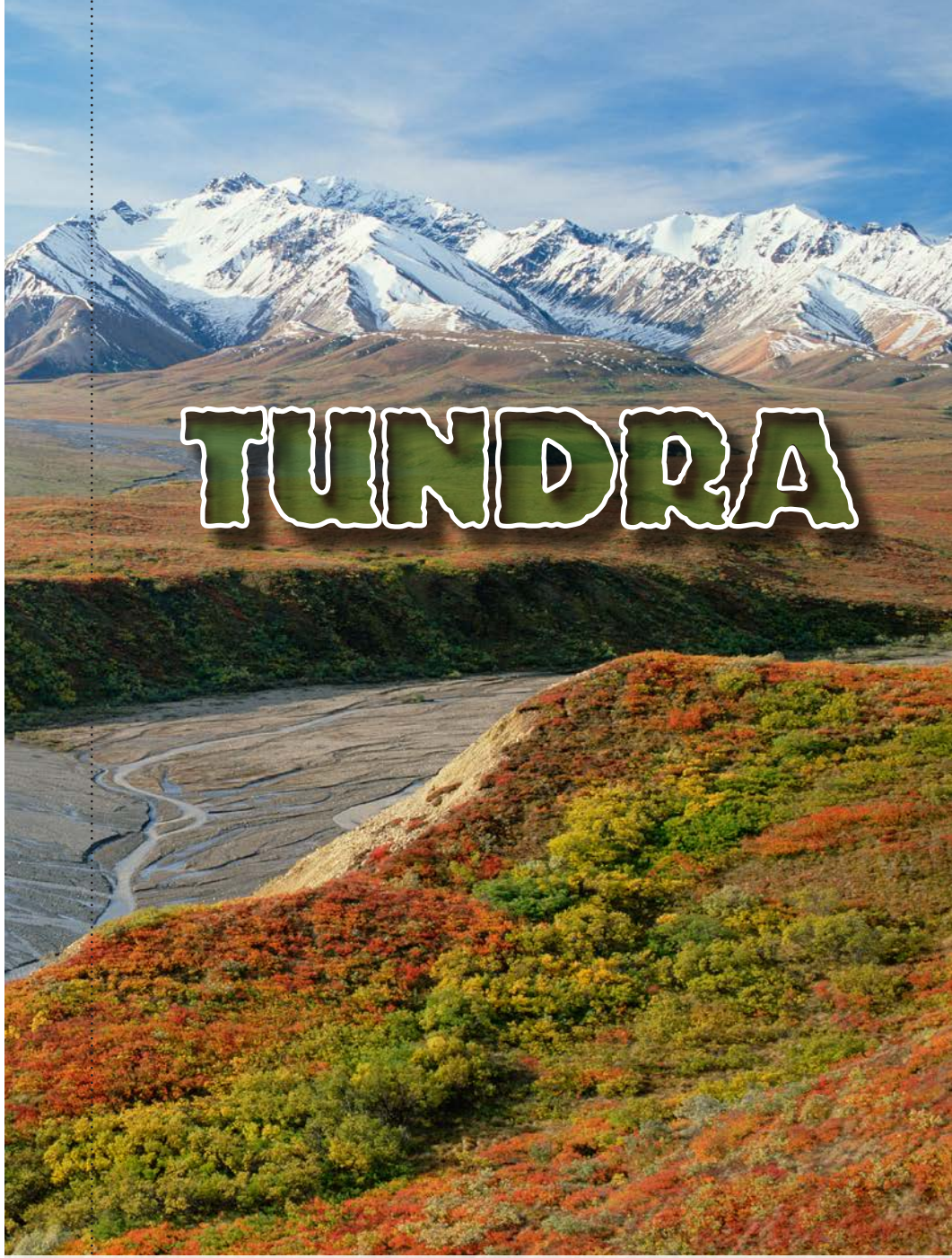
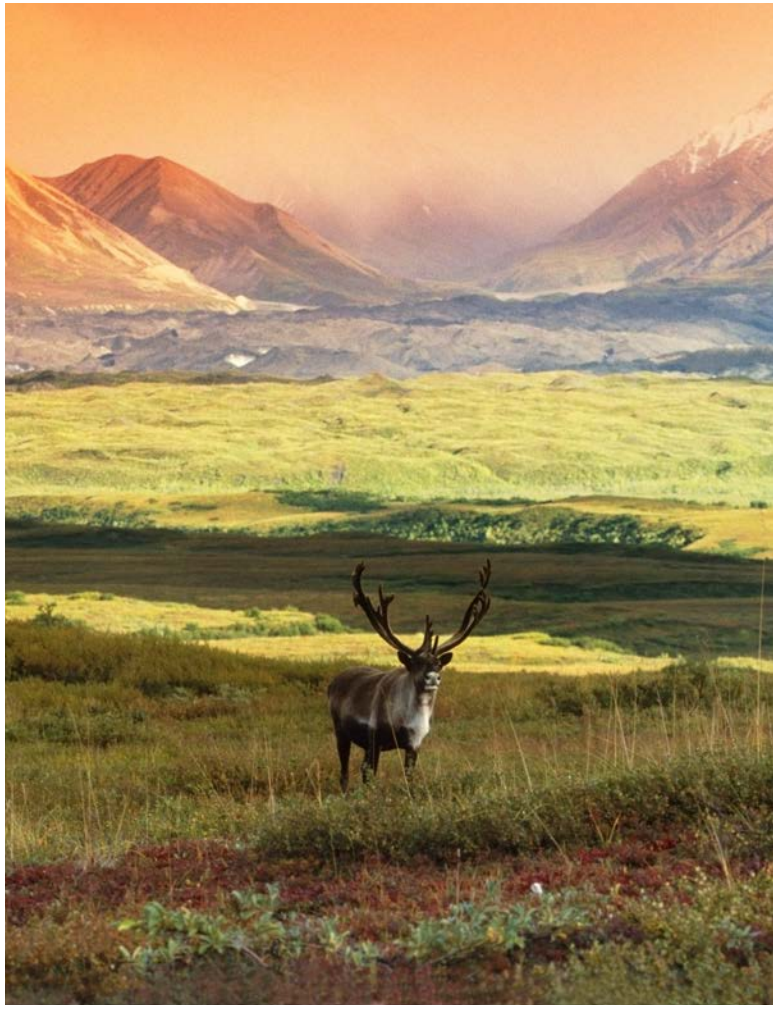


Written by Kira Freed

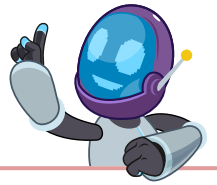
TUNDRA



Written by Kira Freed

Focus Question

What are the features of the tundra biome?



Words to Know

adaptations	migrate
alpine	nomadic
fragile	permafrost
global warming	photosynthesis
hibernate	precipitation
lichens	remoteness

Connections

Writing

Write a haiku about the tundra using information in the book.

Science

Research the biome in which you live. Then compare and contrast it to the tundra biome using a Venn diagram.

Table of Contents

Wildflowers in the tundra in Denali National Park, Alaska

Cold, Treeless Plains

The tundra is a land of extremes. It's a place of howling winds, freezing temperatures, and vast empty plains where no trees grow. Moss and other tiny plantlike life forms hug the rocks, and snow covers the ground for part of the year. In late spring and summer, however, the tundra erupts in brilliant colors when wildflowers bloom.

Most of the tundra has never been explored because of its **remoteness** and unique challenges. Even so, plants and animals—including humans—have developed different ways of surviving in this harsh world.

Word Wise

The word *tundra* most likely comes from the language spoken by the Sami people of northern Scandinavia and northwestern Russia. It means "elevated wasteland," "marshy plain," or "high-topped hill."

The Tundra Biome

Different types of environments cover Earth's surface. These regions and the communities of plants and animals that live there are called *biomes*. Desert, grassland, rainforest, and ocean are examples of biomes. So is the tundra.

Many factors play a part in creating Earth's biomes. Two important ones are latitude—how far a location is from the equator—and elevation, or height above sea level. Both affect how warm or cool a place is. Climate, land, and water are also important elements of biomes, as are plants and animals.

The tundra biome is located in cold regions of the world. It contains flat land or gentle hills and valleys. The ground has no trees. It is bare and rocky with patchy areas of low plants and other plantlike organisms. Limited kinds of animals live there.

tundra ground cover

The tundra is home to a group of plants and animals, including musk oxen, that make up a community.

Most of Earth's tundra is in the Arctic, which is north of the Arctic Circle. Tundra is also found in **alpine** settings—high up on tall mountains. About one-tenth of Earth's land is tundra, and about one-third of that is alpine tundra.

Most of the tundra biome is in the Northern Hemisphere. In part, that's because there is much less land near the South Pole. Also, ice covers most of Antarctica, which is mainly considered a cold desert. However, some tundra plants grow in milder areas along its coasts.

The main regions of Arctic tundra (shown in white) are located in northern Canada, Alaska, Russia, and Scandinavia as well as some areas of Greenland and Antarctica. Alpine tundra (shown in gray) is mainly found in Asia, Europe, and the western sides of North, Central, and South America.

In parts of the Arctic tundra, the Sun never sets in summer.

Climate and Soil

The climate in the tundra can vary a great deal. The Arctic tundra is colder. Temperatures can be as warm as 4°C (about 40°F) in summer and as cold as –32°C (–25°F) in winter. Temperatures in the alpine tundra are milder. Summers are usually 3–12°C (37–54°F), and winters are rarely colder than –18°C (0°F).

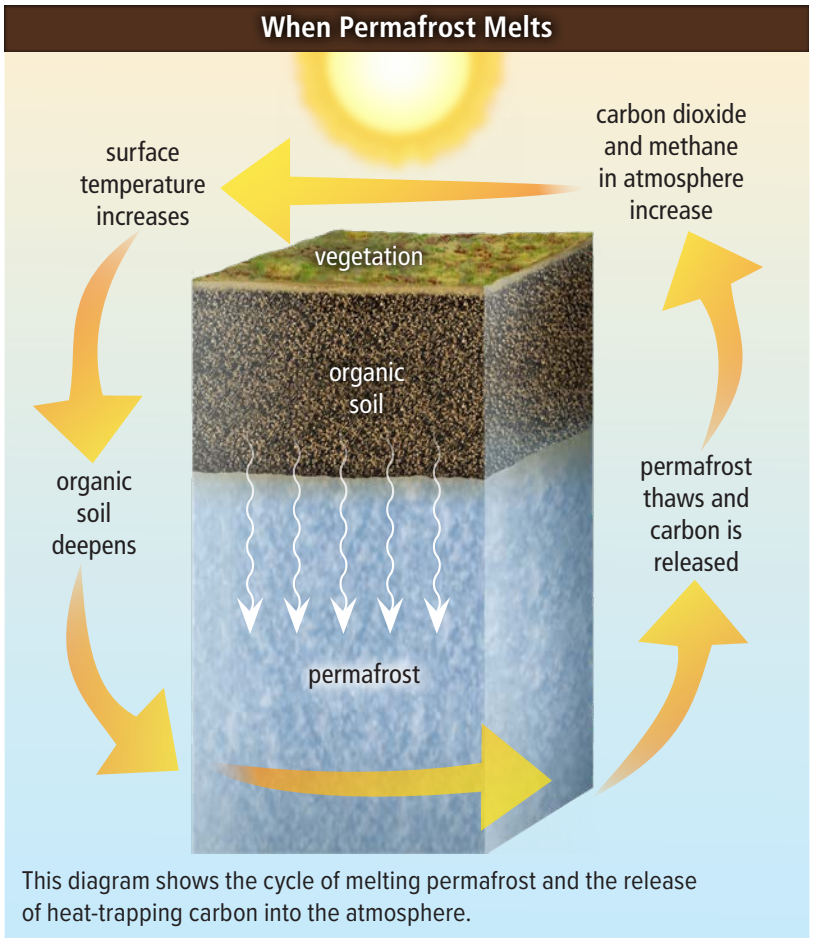
Both kinds of tundra have little **precipitation**—up to about 25 centimeters (10 in.) a year. About two-thirds of the precipitation falls as rain, but snow can build up. For the most part, the Arctic tundra is less windy but gets more precipitation than the alpine tundra.

Permafrost is usually covered by organic surface soil and vegetation, but sometimes it can become exposed along rivers or near roads.

A key feature of the Arctic tundra is a layer of permanently frozen ground, called **permafrost**, below the surface soil. The surface soil thaws every summer and freezes again every winter. The frozen ground underneath can trap water, preventing it from draining. As a result, low areas of the Arctic tundra become boggy in summer, and waterlogged soil can slide down slopes.

While the alpine tundra has no permafrost layer, the soil still freezes and thaws with the seasons. Surface water usually drains quickly down the steep land.

Permafrost contains the frozen remains of dead plants and animals. These remains hold large amounts of carbon. If the permafrost stays frozen, the carbon stays trapped. However, if the permafrost thaws, carbon dioxide and methane escape into the air. These gases contribute to **global warming**. The permafrost in the southern Arctic is melting as a result of climate change.



This diagram shows the cycle of melting permafrost and the release of heat-trapping carbon into the atmosphere.

Many areas of tundra are bordered by cold forests, called *taiga*. The tree line, or timberline, marks the boundary between these two biomes.

Tundra Plants

Plant growth in the tundra is affected by many factors. These include wind, cold temperatures, permafrost, nutrient-poor surface soil, and a short growing season of fifty to sixty days.

No trees grow in the Arctic tundra, in part because frozen ground prevents roots from growing deep into the soil. Only plants with shallow roots can grow there. In the alpine tundra, no trees grow because of high winds and cold temperatures.

Several important **adaptations** allow plants to grow in the tundra. Plants and other plantlike organisms usually grow low to the ground for protection from high winds. These include algae, fungi, **lichens** (LY-kunz), mosses, herbs, grasses, and dwarf shrubs.

Woolly louseworts grow a thick layer of "hair" for protection from the cold and wind.

Arctic poppies rotate throughout the day to face the Sun and absorb as much sunlight as possible.

Tundra plants only grow from two to four months each year. They have adapted by completing their life cycle in a short period of time. Many produce flowers a few days after the snow starts melting, and some produce ripe seeds in only a month. Many tundra plants gather and store nutrients for several years before producing seeds.

In the alpine tundra, there is less carbon dioxide gas because the air is thinner. Plants there have adapted to use carbon dioxide more efficiently during **photosynthesis**.

The Antarctic Tundra

The Antarctic tundra is limited to parts of the Antarctic Peninsula and several islands. Algae, mosses, lichens, and two kinds of flowering plants grow there. No animals live there, although marine birds and mammals live in nearby coastal waters.

Some Arctic tundra animals, such as the arctic fox, change color during winter to blend in with their snowy surroundings.

Tundra Animals

The limited variety of tundra plants restricts which animals can live there since fewer types of food are available. The cold temperatures and high winds are also challenges to animals. For the animals that do make the tundra their home, physical adaptations help them survive.

Musk oxen and reindeer (called *caribou* in North America) have a thick winter coat to keep warm. Their hooves help them walk on slippery ground and dig through snow to get food. Arctic foxes and hares have compact bodies with short ears and tails to hold in body heat. Polar bears stay warm with both fur and a thick layer of fat called *blubber*.

Circumpolar Animals

Arctic tundra animals probably first appeared in Asia, migrating to Europe and later to North America. As a result, many are circumpolar—living all around the North Pole. Circumpolar mammals include polar bears, reindeer, arctic wolves, arctic foxes, snowshoe and arctic hares, lemmings, and least weasels. Circumpolar birds include ptarmigan and snowy owls.

Adaptations in behavior also help animals live in the tundra. Among year-round residents, grizzly bears and arctic ground squirrels **hibernate** to survive the winter. Lemmings and voles, two small rodents, instead store enough food to last during the coldest months. A blanket of snow helps keep their nests and tunnels warm. Some tundra animals, including reindeer and snow geese, leave during the coldest time of year. They **migrate** to warmer places where more food is available.

In the alpine tundra, many animals migrate by traveling to lower, forested areas in winter. These include wildcats, some bird species, and three goat relatives—mountain sheep, chamois, and ibex. Marmots and ground squirrels hibernate in winter. Tiny rabbit relatives called *pikas* stay awake in winter and eat food they have stored until spring.

pika

People in the Tundra

People have lived in the tundra for many thousands of years. At first, some of these groups were **nomadic**, moving with the seasons. Their livelihoods included hunting, fishing, and herding. Today, most of these peoples' lives have changed. Many now live in towns and villages but still work to preserve their traditions.

Nenets child in Siberia, Russia

In recent years, modern settlements have appeared in parts of the tundra because of exploration for oil, gas, and minerals. Many people also travel to the tundra for outdoor activities such as skiing, hiking, and wildlife viewing.

People of the Tundra

More than forty groups of native peoples have a long history in the tundra. These include:

- the Inuit of Greenland and the Canadian Arctic
- the Aleut, Inupiat, and other groups in Alaska
- the Innu of northern Labrador and Quebec, Canada
- the Nenets of the northern Russian Arctic
- the Sami of northern Scandinavia and northwestern Russia

A reindeer grazes in the barren tundra of Norway.

A Place of Wonder

If you visit the tundra, especially during the colder months, you might think it's a wasteland. Frozen, empty plains or barren, windy slopes stretch for miles in every direction. However, the tundra has its own unique beauty.

Look closely at the tiny plants. Although they look **fragile**, they are strong enough to live in one of Earth's harshest places. Tundra animals, from lemmings to caribou, must also be tough to make their homes here. The wonder of this place lies in the amazing ways that plants and animals survive in this vast, frozen world.

Glossary

adaptations *(n.)* page 10
changes in an organism or species that allow it to survive better in its environment

alpine *(adj.)* page 6
of or relating to high mountains or things above the tree line

fragile *(adj.)* page 15
easily damaged or broken; delicate

global warming *(n.)* page 9
an increase in Earth's average temperature, especially one great enough to change the climate

hibernate *(v.)* page 13
to go into a state of deep sleep, often during winter

lichens *(n.)* page 10
crusty organisms that grow on rocks and trees

migrate *(v.)* page 13
to move from one habitat or region to another at a certain time each year

nomadic *(adj.)* page 14
moving from place to place without a permanent home

permafrost *(n.)* page 8
a layer of soil in a cold region that stays frozen all year long

photosynthesis *(n.)* page 11
the process by which chlorophyll in plant cells transforms sunlight, water, air, and nutrients into food

precipitation *(n.)* page 7
water that falls to the ground, such as hail, sleet, rain, or snow

remoteness *(n.)* page 4
the state of being distant or isolated