

## NATURE FOR NEW MINNESOTANS

# Climate, Seasons, & Biomes

### Module Overview

In comparison to the rest of the world, Minnesota has a truly unique climate; few places on Earth have both -10 F days and 100F days in a typical year and even fewer have the human population that embraces these extremes with gusto. It is these very extremes that can make Minnesota equal parts challenging and beautiful to live in.

Yet, many new Minnesotans moving from around the world may be alarmed by the dramatic temperature swings, howling blizzards, summer thunderstorms, and the changing of the leaves that are staples of the four distinct seasons that we enjoy. This module not only introduces the climate of Minnesota, but also provides some explanation of *how and why* Minnesota's climate is unique from others.

In lessons 1-2, students will explore what the term 'climate' means (and why people use climate and weather interchangeably!), and will learn how the natural tilt of the Earth in relation to the sun can influence the climate of a region. In lessons 3-4, students will look at climatic patterns around the world and make connections between temperature, precipitation, and the plants and animals that are most likely to be found in an area. In the final few lessons, students will learn about the four distinct biomes of Minnesota and have the opportunity to research and visit a Minnesota state park that represents a biome of their choice:

Lesson 1	<b>What is Climate? How is it different from weather?</b>
Lesson 2	<b>Why do different areas of the globe have different climates?</b> i. What is latitude? ii. What is axial tilt?
Lesson 3	<b>How does climate impact the types of plants and animals that live in a place?</b> i. What is a biome/habitat?
Lesson 4	<b>What are the biomes of Minnesota? Why are they different from each other?</b> i. Biome/precipitation/temperature maps of Minnesota
Lesson 5	<b>How can I experience the different biomes of Minnesota?</b> i. How can I access the state parks website?
Culminating Experience	<b>Visit a park in the Twin Cities metro area – See “Experiences” section for a list of options</b>

### Hybrid Option

*If your classroom is limited by time, you can shorten this module: Complete the 'climate vs. weather' activity in lesson one, followed by the 'what is a biome' activity from lesson three. With this information, students will have the skills necessary to complete lessons four and five.*

# Experiences



This section highlights places in Minnesota where you can take students to visit great examples of the various biomes of the state of Minnesota. For experiences that require travel outside of the city, contact Nature for New Minnesotans; funds are available to classrooms interested in travel.

## **Powderhorn Park – Minneapolis, MN**

**WHAT** Powderhorn Park is a large metropolitan park in south Minneapolis. It has numerous paved walking trails surrounding a small lake and adjacent ball-fields. The lake has a small fishing pier, and there is a playground and splash pool for younger visitors. This park is closest to the deciduous forest biome.

**WHEN TO VISIT** Powderhorn Park is open year-round from sunrise to sunset and is open to the public.

**GETTING THERE** The park can be accessed by numerous bus routes that connect to downtown Minneapolis. The number 5 and number 14 bus runs north/south along Chicago avenue and Bloomington avenue, respectively, and have stops that are two blocks from the parks entrance. Check the Metro transit website for route details.

**COST** Bus-fare is \$2.00/person for rides (\$2.50/person during rush hour) throughout the metro area. Check the Metro transit website for pricing changes. The park is free to the public.

**ACCESSIBILITY:** Powderhorn Park has many paved walking paths throughout the park. Additionally, there are benches and picnic tables for classes to rest. The park is relatively shaded. Overall, this park is very accessible for people with physical constraints.

**TIE-IN TO LESSONS** Like many of the parks across the Metropolitan area, Powderhorn park has plants and animals that are common in the deciduous forest biome. To enhance students experience, bring copies of the Urban Linnaeus list (see attachments). Practice identifying common plants and animals using the list on a short hike through the park

- NOTE: We encourage you to visit *any* local park that is within walking distance or is easily accessible for your community. Work with the program coordinator at Nature for New Minnesotans to identify parks in the neighborhood and to assist with nature walk preparation.

## **The Bell Museum – St. Paul, MN**

**WHAT** The James Ford Bell Museum of Natural History was established by state legislative mandate in 1872 to collect, preserve, skillfully prepare, display, and interpret our state's diverse animal and plant life for scholarly research and teaching and for public appreciation, enrichment, and enjoyment. The Bell Museum moved to its new home on the University of Minnesota St. Paul Campus in 2018, and features a state-of-the-art planetarium, high-tech exhibits, dioramas that depict Minnesota's biomes, outdoor learning landscapes, the Touch & See Lab, and more.

**WHEN TO VISIT** The museum is open Tuesday–Sunday, 10 a.m.–5 p.m. Closed Mondays. Open late select Wednesdays; check website for details. Visitors are welcome year-round, however it can be best to go in the winter when outdoor activities are less feasible.

**GETTING THERE** The Bell Museum is located at the corner of Larpenteur and Cleveland Avenues on the University of Minnesota's St. Paul Campus, directly across the street from Gibbs Farm. It is accessible via public transit on the number 61 bus which runs east/west between Minneapolis & St. Paul

**COST** Admission is \$12/adult. If driving, there is an additional fee for parking on-site. Contact Natalie Kennedy ([nkennedy@umn.edu](mailto:nkennedy@umn.edu)), Director of Statewide Engagement for the Bell Museum, to inquire about special discounts for adult ELL classrooms affiliated with Nature for New Minnesotans

**ACCESSIBILITY:** The Bell Museum provides free wheelchairs and walkers for use anytime. Working guide and service animals are allowed. There is accessible parking and accessible seating and bathroom spaces, including a gender neutral bathroom with an adult lift table. The museum has a quiet room available for individuals and families with sensory-sensitivities, or for use as a lactation space, or a private space for prayer or meditation. Upon request, the Bell will provide assistive listening devices and open captioning for guests that are hard of hearing.

**TIE-IN TO LESSONS** This culminating experience provides students with an opportunity to learn about each of Minnesota's biomes in one place. The Bell Museum's dioramas depict typical plants and animals of Minnesota that are representative of the four biomes discussed in this module. Have students prepare questions related to specific biomes, and encourage students to keep a list of plants and animals that they found interesting for extension lessons.

### **Afton State Park – Hastings, MN**

**WHAT** Afton State Park's rugged, rolling landscape provides excellent hiking, horseback riding, and skiing opportunities, plus a swimming beach and spectacular scenic overlooks of the St. Croix River. The park is also home to a bluff prairie, which provides an interesting contrast of habitats for people to enjoy.

**WHEN TO VISIT** Afton State Park can be visited year-round. If your class is hoping to see a prairie biome, it is best to visit in the Fall, when many prairie flowers are blooming. If your class is interested in seeing a deciduous forest biome, it is best to visit in the Spring and Summer to view forest wildflowers. Summer is the busiest time of year for tours, so plan to make reservations 1-2 months in advance of your visit.

**GETTING THERE** Afton State Park is located approximately five miles east of Minnesota Highway 95 on 70<sup>th</sup> st. and 10 miles north of Point Douglas. There is no public transportation available to Afton State Park from the Twin Cities.

**COST** Entrance into all Minnesota state parks is \$7/vehicle. Nature for New Minnesotans has funds to cover transportation to and from Afton, as well as the vehicle permit. Contact Linda Radimecky ([linda.radimecky@state.mn.us](mailto:linda.radimecky@state.mn.us)) to schedule a visit.

**ACCESSIBILITY:** Some portions of Afton State Park have trails that are unpaved, steep, and can be challenging for less experienced hikers. Work with the staff on site to design an experience that is appropriate for the level of your students.

**TIE-IN TO LESSONS** Afton State Park is located less than 30 minutes from St. Paul and provides excellent examples of deciduous and prairie habitat for students to view. Linda Radimecky is a trained naturalist and DNR employee with 10+ years of environmental education experience. Teachers can work with Ms. Radimecky to tailor programming to students interests.

# Lesson 1: What is Climate?

**Overview:** Teachers and students will make a clear distinction between weather and climate as a concept by comparing and contrasting the weather and climate of Minnesota with that of their home country.

## Big Questions

1. What is the difference between weather & climate?
2. What is the climate of the Twin Cities?

## Objectives

1. Understand the difference between weather and climate
2. Visualize the climate of the Twin Cities using a temperature and precipitation line graph over time

## **Teacher Background**

The terms weather and climate are often used interchangeably by folks. Both weather and climate are concerned with temperature, precipitation, and humidity. But, although they are related to each other, they actually mean two different things! Weather is the temperature, precipitation, and humidity that we experience on a daily basis. If you watch the news on TV, the weather forecast will tell us if it will be sunny, rainy, snowy, or cloudy, and will give us the estimated temperature and percent chance of rain. Weather is a prediction based on information collected by something called a radar. Information from radar is used to create weather maps to help us understand what kind of weather to expect.

Climate on the other hand allows us to see long term patterns in weather data collected over many, many years. Climate can change slowly over time, but generally, an area's climate is predictable from year to year. Thus, the key difference between weather and climate is a matter of scale. In other words, weather impacts plants and animals on a daily perspective, while climate shapes an entire region's biodiversity, which is a measure of all the living things in the area. By monitoring the weather, scientists can create climate models to predict what weather will be like in years to come. Climate scientists today are using this modeling to better understand how climate change is impacting our world.

## **Student Background**

For this lesson to be successful, students should be aware of what a weather forecast is. One of the key concepts of this lesson hinges on the term 'average'. If students lack mathematic experience, it may be useful to review the concept of averages with students prior to this lesson.

## **Preparation**

Prior to the lesson, ensure that you have sufficient copies of student handouts for the day's lesson. If technology is available, be prepared to project weather and climate maps onto the board for students to compare. If you are completing the supplemental lesson, a calculator may be useful for students struggling with addition or division.

- If you are completing the extension graphing activity (see below), make sure that you have colored pencils, markers, or crayons available for students.

### Warm-up/Review

Ask students to form small groups and answer the question: *What is the weather today? Do you trust the weather forecast when you watch it? Why or why not?*

#### Activity Suggestion

Weather permitting, walk outside with your students. While outside, have students write down what the weather is in their notebooks.

When you return to class, show students the day's weather forecast (or have them look it up on their phones).

Use a conversation activity of your choice to have students discuss whether their description matches the forecast for the day. Draw up a list of questions that students have about weather forecasts.

#### Supports for learners

Provide a sentence structure for students:

- "The weather today is \_\_\_\_"
  - o For additional assistance, you can provide students with a list of weather descriptors to choose from (sunny, windy, rainy, etc.)
- "My weather description \_\_\_\_ (did/did not) match the weather forecast today"

#### Relevant Vocabulary

Weather, forecast, weatherperson/meteorologist, sunny, windy, rainy, humid, muggy, stormy, snowy, trust

### Compare and Contrast Climate and Weather

The purpose of this activity is to have students explore the issue of climate 'over time' vs. weather being a daily changing phenomenon.

#### Activity Suggestion

Split students into small conversation groups. In their groups, students will describe the characteristics of their home country: how hot or cold was it? How much did it rain? What times of the year did it happen? What would they expect the weather to be like at this time of year? Repeat this process with the Twin Cities.

Pass out copies of the weather and climate maps. Have students create a T-chart to compare and contrast the two maps.

Have students create their own definitions of weather and climate and complete the comprehension questions in the worksheet.

Have students share their definitions of weather and climate with each other in a conversation activity of your choice

#### Supports for learners

If students are struggling to understand the difference between climate and weather, look at the weather forecast for the day. Ask students to predict the weather forecast for the next ten days and ask them to explain their predictions. Their predictions are largely based on climate; we know that in winter, things are generally going to be cold and in summer, things are generally going to be hot. If you check the forecast, you might notice that some days are unnaturally cold, windy, or rainy. These daily variations are 'weather', while the average over time is the climate.

Another visual analogy to understand the difference between climate and weather is clothing; weather is the outfit you prepare for the day, climate is your closet full of outfits that change with the season.

Provide students with the short reading on weather and climate

Provide students with the Mark Twain quote: "Climate is what we expect, weather is what we get." Ask students to explain this quote to their

peers with their new understanding of weather and climate.

Relevant Vocabulary

Weather, climate, average, precipitation, temperature, prediction, pattern, generally, radar

**Extension – Making a climate line graph**

- Provide students with [historical climate data line graphs for precipitation and temperature](#)
- Provide unfinished climate graphs from the most recent year. Using the other graphs as a guide, have students sketch out the remainder of the climate graphs for the most recent year and have them explain their reasoning.

**Extension**

- Ask students to debate the following question: If you were attempting to describe the Twin Cities to someone who has never been here, would you choose to talk about the weather of the Twin Cities or its climate? Why?
- Ask students to comment on whether the climate maps for Minneapolis are changing over time. Are things getting hotter? Wetter?
  - Introduce the topic of climate change

# Lesson 2: Why do different areas of the globe have different climates?

**Overview:** Through a hands-on demonstration, students will use globes to demonstrate the impact of Earth's orbit and axial tilt on the world's climate.

## Big Questions

1. Why do different parts of the world have different climates?
2. Why do we have seasons?

## Objectives

1. Understand how the axial tilt of the earth impacts seasons
2. Interpret a globe and its different areas (northern/southern hemisphere, north/south pole, etc.)

## **Teacher Background**

The sun is the center of our solar system, and earth orbits the sun. It takes 365 days for the earth to make one full revolution around the sun. The reason the Earth revolves around the sun, and not the other way around, is because of the law of universal gravitation: big objects with more mass attract smaller objects and the sun is more massive than the earth. The earth spins on an axis at a 23.5-degree angle, although this angle has changed over time and wobbles even to this day! The cause for the axial tilt is related to Earth's collision with the moon a long time ago; the earth fully spins on its axis every 24 hours creating what we observe as night and day.

One of the great features of Minnesota is that we have four distinct seasons (even if spring and fall sometimes pass in the blink of an eye). Most of the changes in seasons can be attributed to changes in daily temperatures, which are a direct result of how much solar energy reaches us. Many people mistakenly believe that we are closer to the sun in summer and farther away in winter. This is completely false; in fact, the opposite is true. In the Northern Hemisphere, where Minnesota is located, we are actually closer to the sun in winter. So why is it hotter in the summer? It has to do with the tilt of the Earth and the angle at which the sun hits the surface of Earth. In the summer, the sun's rays hit us most directly and deliver their energy most efficiently (think about the position of the sun in summer and how it seems to be directly overhead). In the winter, the reverse is true. The sun's rays come at us at an oblique angle and their energy is diffused over a much greater area. In some ways, you can think of it in the terms of hammering a nail. A direct blow delivers a much greater amount of energy to the nail than a glancing one.

## **Student Background**

For this lesson, students should understand what climate is and how it differs from weather. If students were absent for lesson 1 (or lesson 1 was not completed), be sure to review the term 'climate' before beginning this lesson (see review section). If students are unfamiliar with a globe, or with the Earth's relation to the sun, be sure to complete the supplemental lessons with students and extend this lesson from one to two teaching days. Ideally, students have lived through a full year of Minnesota seasons to be able to compare and contrast weather conditions during each season.

## **Preparation**

Prior to the lesson start, set up globes around the room for students to easily access (one globe per 3-4 students), as well as flashlights. If flashlights are unavailable, students can use their phone flashlights to represent the sun. If technology is available, prepare a slide containing images of different seasons for students to discuss, additionally, access this [model](#) of the solar system for students to compare the size and location of the Earth in relation to the Sun.

## Review

Have students determine whether statements are examples of weather or climate:

- “It is going to rain tomorrow”
- “New York City has colder winters than Miami, Florida”
- “The forecast predicts that we will have snow in four days”
- “On average, St. Paul receives 30 inches of rainfall a year”

Conclude this review activity by transitioning into the day’s discussion of how climate can vary through the year. Inform students that they will be learning about why Minnesota has four seasons.

## Warm-up

<p><u>Activity Suggestion</u> Split students into small groups. Give each group a set of seasons pictures. Explain to students that the photos are of the same location at different times of the year.</p> <p>Students will work together in their groups to write sentences comparing the different seasons that they observe.</p> <p>Once students have completed writing their sentences, they will predict why places like Minnesota have seasons with different climates. The teacher will write these predictions onto the board, along with any student questions.</p>	<p><u>Supports for learners</u></p> <ul style="list-style-type: none"><li>- For this activity, students will need to use the comparative and superlative structures to discuss the four seasons. Provide students with sentence stems:<ul style="list-style-type: none"><li>o ___ is warm as ___</li><li>o ___ is colder than ___</li><li>o ___ is warmer than ___</li><li>o ___ is rainier/snowier than ___</li></ul></li><li>- After students have written their sentences, have students practice reading their work to other students</li></ul>
<p><u>Relevant Vocabulary</u> Seasons, climate, winter, spring, summer, fall</p>	

## Axial Tilt Demonstration

The purpose of this activity is to have students use a globe and a flashlight to demonstrate how axial tilt and orbit impact why we have seasons in Minnesota.

<p><u>Activity Suggestion</u> Split students into small groups of 3-4. Each group should have one globe and one flashlight. One member of the group will represent the sun and will hold the flashlight. The other group members should stand in a circle around the ‘sun’; one of the students in the circle should hold the globe.</p> <p>Prior to beginning the demonstration, teacher should review the different parts of the globe and point them out to students:</p> <ul style="list-style-type: none"><li>- The north/south pole</li><li>- The Equator</li><li>- The northern/southern hemisphere</li><li>- The Earth’s axis</li></ul> <p>Once familiar with the different parts of the globe, students will begin the demonstration. Follow the instructions on the student guide carefully; it is recommended that this activity be done with teacher supervision. Review this <a href="#">link</a> for more information.</p>	<p><u>Supports for learners</u></p> <ul style="list-style-type: none"><li>- Provide students with the ‘why do we have seasons?’ reading and use the strategy of your choice to have students read and answer comprehension questions.<ul style="list-style-type: none"><li>o For less proficient English readers, have students write down what they observe in the demonstration and compare their observations with other group members</li></ul></li><li>- For students struggling with the difference between ‘rotation’ and ‘orbit’, spin the globe once to represent a rotation, and pass the globe around the outside circle to represent an orbit.</li></ul>
<p><u>Relevant Vocabulary</u> North/south pole, equator, northern/southern hemisphere, axis, universe, affect, ray, orbit, rotation, tilt, angle, rotation</p>	

### Extension – Develop a presentation

Have students prepare 1-minute presentations based on their reading. Students will teach one of the following:

- How does the earth move around the sun?
- Why are daylight hours in MN long in the summer and short in the winter?
- Why does Indonesia experience summer in December, while the United States experiences winter in December?
- What do different parts of the world experience on the summer and winter solstices? Spring and fall equinoxes?

### Supplemental Lesson

#### What does our Solar System look like?

*When to implement this lesson:* If students are unfamiliar with the basic layout of the solar system, or if they do not know what the solar system is. Three common misconceptions of people are:

1. That the Sun revolves around the Earth
2. That the Sun is a planet
3. That the universe is just our solar system

To address these common misconceptions, it is easiest to share an image of the universe to students. There are many interactive models online, [such as this one](#).

Show students the model of our solar system. Explain to students that the sun is at the center of our solar system and that the sun is the nearest star to Earth, which is a planet. Scroll out using the mouse so that students can see the size of our Solar System in relation to the rest of the Milky Way Galaxy (which is as far out as you can zoom in the interactive linked above). Ask students to answer the following true/false comprehension questions:

- Earth and the Sun are planets
- The sun is the center of our solar system
- Our solar system is the only thing in space

Ask students to write down what they just observed in the interactive, and share with their peers. Students can also comment on what surprised them or what was most interesting.

# Lesson 3: How does climate vary around the world?

**Overview:** Students will use globes and climate maps to discover the pattern of biomes around the world and use it to predict the biome of Minnesota.

## Big Questions

1. Why are the world's tropical rainforests located around the equator, and not near the poles of the Earth?
2. What is the pattern between latitude and the location of biomes around the world?

## Objectives

1. Compare and contrast a global climate map with a global biome map
2. Explain the pattern of global biomes in relation to latitudinal lines on a globe

## **Teacher Background**

The earth is a sphere. Humans have developed ways of navigating the earth called latitude and longitude; while these lines are imaginary, they separate the earth into different areas. Latitude lines are horizontal and longitude lines are vertical. One of the most important latitudinal lines is the equator, which is a line that spans the center of the Earth and has a latitude of 0 degrees. The equator splits the earth into a northern and southern hemisphere; the north pole is in the northern hemisphere and has a latitude of 90 degrees while the south pole is in the southern hemisphere and has a latitude of 90 degrees.

A climate is defined by an average temperature and average precipitation and there are many different climate types around the world. These climates do not occur randomly, but can be related to their latitude: latitudes closer to the equator are warmer and wetter and latitudes closer to the poles are colder and drier. The reason for this is due to the axial tilt of the earth and its orbit around the sun. At the equator, very little tilt is apparent, so the region receives a lot of sunlight year-round. Closer to the poles, the axial tilt of the earth means that at certain parts of the year, the region receives less direct sunlight and is thus colder. In conclusion, there is a pattern across the globe that relates climate to latitude.

A biome is an area with distinct plant and animal communities; there are many different types of biomes around the world. Biomes are influenced by the climate of the area and because of this, biomes at similar latitudes tend to have similar climates and similar plants and animals. For example, around the equator, the dominant biome is tropical rainforest, while at 30 degrees latitude, the dominant biome is desert. The average temperature and precipitation of a region often can be used to predict the type of biome present.

## **Student Background**

This lesson is closely connected to lesson two in this module. Therefore, it is highly recommended that these lessons be taught in succession. Additionally, students should be aware that different habitats/biomes (forest, grassland, marsh) exist, although they need not know their exact names.

## **Preparation**

Prior to the lesson start, set up globes around the room for students to easily access (one globe per 3-4 students), as well as flashlights. If flashlights are unavailable, students can use their phone flashlights to represent the sun. If technology is available, prepare a slide containing images of the global climate map, as well as the global biome map. Have biome cards available for students that are unfamiliar with the names of biomes (see supplemental lesson).

## Review

In groups of 3-4, have students practice identifying different parts of a globe (northern hemisphere, southern hemisphere, north pole, south pole, axis, tilt, etc.). Introduce the concepts latitude, longitude, and equator, and have students find these on their globes as well.

- For additional practice, play a simple game (i.e., Simon Says) that allows students to practice pointing to the different parts of the globe learned in the previous lesson.

## Warm-up

<p><u>Activity Suggestion</u> Split students into small groups. Give each group a set of two biome pictures.</p> <p>Students will work together in their groups to describe the characteristics of different biomes. This activity can be repeated 2-3 times by rotating students around the room to different biome images.</p> <p>Once students have completed this activity, students will spend time sharing their thoughts with students in other groups. Following this conversation activity, students will come back to the whole group and write predictions on the board.</p> <p>Teacher will instruct students that the images represent specific biomes, and will define the word biome for students.</p>	<p><u>Supports for learners</u></p> <ul style="list-style-type: none"><li>- Students should try and answer the following questions about each biome image:<ul style="list-style-type: none"><li>o What is the climate of this place? How hot/cold do you think it is? How wet/dry do you think it is?</li><li>o Where in the world do you think this is? Use your globe.</li></ul></li><li>- Sentence stems can be provided to students to assist in their descriptions:<ul style="list-style-type: none"><li>o "This place looks like it is ___ (hot/cold) and ___ (wet/dry). I think that this place is found in ___"</li></ul></li></ul>
<p><u>Relevant Vocabulary</u> Climate, biome, habitat, globe</p>	

## Comparing Climate and Biome Maps

The purpose of this activity is to have students make conclusions regarding the pattern of climates and biomes around the world.

<p><u>Activity Suggestion</u> As a class, review the biome and climate maps. Explain to students how to read each map by using the colors and map legend.</p> <p>In small groups, have students answer comprehension questions and make a conclusion about the relationship between latitude, climate, and biome type.</p> <p>As groups complete this task, encourage students to assist each other in reaching this conclusion, or provide students with the reading 'biomes of the world'.</p>	<p><u>Supports for learners</u></p> <ul style="list-style-type: none"><li>- Provide students with the 'biomes of the world' reading and use the strategy of your choice to have students read and answer comprehension questions.<ul style="list-style-type: none"><li>o For less proficient English readers, have students write down their observations of the two maps and share their observations with peers.</li></ul></li><li>- For students struggling with the concept of different biomes around the world, ask them to imagine that they were driving a car in their home country, and what they would see. Then, have them compare it to what they see in Minnesota when they drive a car. Ask them to match what they see in both examples to a biome card image.</li></ul>
<p><u>Relevant Vocabulary</u> Latitude, equator, tropical rainforest, grassland/prairie, deciduous forest, coniferous/boreal forest, desert, tundra, climate</p>	

### Extension – What else impacts where biomes are found?

Have students brainstorm other factors that may influence biome characteristics. Ask them to think about what the impact of the following factors has:

- Elevation?
- Wind patterns?
- Ocean currents?

Stimulate this discussion by providing an example: “Many parts of India are very close to the equator; what climate and biome would we expect there? India also is home to the Himalayas, which are some of the tallest mountains in the world. These mountains are covered in snow year-round. How is this possible?”

### Supplemental Lesson

#### What are biomes?

*When to implement this lesson:* This lesson is particularly useful in classrooms where students are unfamiliar with the basic biomes of the world.

Attach the information card to each biome image that you have placed around the room. Instruct each group to read the information on the card and to *synthesize* this information for their peers. Students will create a small poster with information on each biome type, including:

- Name of biome
- Climate of biome
- Where the biome is most likely found around the world

After students have completed these posters, students can walk around to different groups and share what they have learned in a conversation activity of your choice.

To increase understanding, play a game with students in which they must predict the biome most likely to be found in a specific country and/or state. The teacher will suggest a country; students will find the country on their globe and use biome cards, as well as the climate and biome maps, to predict the most likely biome that would be found there. Some suggestions for countries and respective biomes are:

- Brazil - Tropical rainforest
- Egypt - Desert
- Germany - Grassland OR deciduous forest
- Canada - Coniferous/boreal forest

# Lesson 4: What are the biomes of Minnesota?

**Overview:** Students will use climate and biome maps of Minnesota to learn more about the four distinct biomes of the state.

## Big Questions

1. What are the biomes of Minnesota?
2. How does climate influence the types of biomes that are found in Minnesota?

## Objectives

1. Compare and contrast a state climate map with a state biome map
2. Explain the pattern of state biomes in relation to latitudinal lines on a globe.

## **Teacher Background**

Minnesota is home to four biomes: Coniferous Forest, Deciduous Forest, Prairie, and Aspen Parkland. Each biome has distinct temperature and precipitation characteristics, which influence the plants and animals that live there. The Twin Cities are located in the deciduous forest biome of Minnesota. Minnesota is unique in the United States to host a wide variety of biomes and this is due to Minnesota's location on the edge of the eastern deciduous forests, northern coniferous zone, and western prairies. As you move west to east in the state, you go from drier to wetter biomes. As you move south to north in the state, average temperatures drop. The western part of our state is drier and hotter, which prevents the growth of large forests, resulting in large swaths of grassland/prairie. The southeastern area of our state is warm and wet, which promotes the growth of deciduous forests. As you move north, colder average temperatures lead to a transition to boreal forest, which dominates the northeastern part of the state. The final biome, Prairie Parkland, is the newest to be identified and is dominated by Aspen trees; it is a mixture of prairie and deciduous forest.

## **Student Background**

Students should know what a biome is, as well as how to read a climate map. If instructor has selected the 'hybrid' version of this module, ensure that students have completed the 'compare and contrast climate and weather' activity from lesson 1, as well as the 'what is a biome' supplemental lesson from lesson 3. Students will have the most success in this lesson if they have already had practice comparing and contrasting a climate map with a biome map. Lastly, students should have a basic understanding of how to interpret the cardinal directions (see supplemental lesson).

## **Preparation**

Prior to the lesson start, ensure that you have enough copies of the Minnesota precipitation, temperature, and biome maps for students to use. It may be useful to have globes available for students as a point of reference and for review of previous lesson concepts. If completing the extension activity, students will need access to a computer, or will use their own smartphones to conduct research on a specific biome in Minnesota.

## Review

Play a game with students in which they must predict the biome most likely to be found in a specific country and/or state. The teacher will suggest a country; students will find the country on their globe and use biome cards, as well as the global climate and biome maps, to predict the most likely biome that would be found there. Some suggestions for countries and respective biomes are:

- Brazil - Tropical rainforest
- Egypt - Desert
- Germany - Grassland OR deciduous forest
- Canada - Coniferous/boreal forest

## Warm-up

### Activity Suggestion

Ask students to imagine that they are taking a walk in their neighborhood. Ask them to describe the types of plants and animals that they see with as many descriptive words as possible. Then, ask students to imagine that they are taking a walk in a prairie (provide an image of this space) and/or a coniferous forest (again, provide an image). Ask them to reflect on the same questions, and then encourage students to share.

Provide students with the biome cards for the four biomes of Minnesota. Read through these biome cards and reflect on student observations in comparison to the reading.

### Supports for learners

- Provide students with a conversation format and/or conversation starters:
  - o What types of animals do you see in your neighborhood?
  - o What kinds of plants do you see in your neighborhood?
  - o Are these plants or animals something that you were used to when you moved here?
- Students can respond to each question with a partner, summarize partner responses, and add their own follow-ups

### Relevant Vocabulary

Biome, habitat, climate, latitude, temperature, precipitation

## Comparing Climate and Biome Maps of Minnesota

The purpose of this activity is to have students make conclusions regarding the pattern of climates and biomes around Minnesota.

### Activity Suggestion

As a class, review the biome and climate maps. Explain to students how to read each map by using the colors and map legend.

As a class, make observations of the similarities and differences between the precipitation, temperature and biome maps of Minnesota.

In small groups, have students answer comprehension questions and make a conclusion about the relationship between latitude, climate, and biome type in Minnesota.

### Supports for learners

- Provide students with a comprehension worksheet that compares and contrasts the temperature and precipitation maps of the state:
  - o Ex) "The west part of the state is \_\_\_ (warmer/cooler) than the east part of the state"
- For more advanced learners, withhold the biome map and allow students to make predictions on what type of biome is most likely to be found in different regions of the state.

### Relevant Vocabulary

Prairie, deciduous/broadleaf forest, coniferous forest/boreal forest, biome, climate

### Extension – Biome Spotlight

Instruct students to navigate to the [Minnesota DNR website](#) on biomes. Divide students into groups and assign them a Minnesota biome. Students will select a plant or animal from their biome that they want to learn more about. Using a search engine, students will research their animal and answer the following questions:

- What is the name of your plant/animal?
- What biome is it found in Minnesota?
- Where does it live?
- Why did you want to learn more about your plant/animal?
- What is one interesting fact about your plant/animal?

Time permitting, students can create a poster with this information for display within the classroom and the opportunity to present their findings to the class.

### Supplemental Lesson

#### How to read a compass

*When to implement this lesson:* If students are unfamiliar with the cardinal directions (north, south, east, west), and how to use them to describe the location of something.

Project an image of a compass, or provide compasses (either physical or on smart phones) to students. Explain the purpose of compasses for navigation and how they are used to describe the location of things.

- Optional: Incorporate a lesson on Electromagnetism to discuss how a compass works!

In the classroom (or if weather is permitting, outside), place objects or people in various locations and ask students to describe their location using the cardinal directions.

- Ex) If the instructor is standing in front of students at the head of the classroom, the students would describe the instructor's location as 'north'.
- Ex) Instruct students to move to the 'west' of the middle of the classroom.

Alternatively, you could provide students with countries on the globe and ask them to describe their location in relation to Minnesota.

- Ex) What direction is Wisconsin in relation to Minnesota? Wisconsin is east of Minnesota

As students master the use of cardinal directions, add in items/locations that combine cardinal directions

- Ex) What direction is Kansas in relation to Minnesota? Kansas is southwest of Minnesota.

# Lesson 5: How can I experience different biomes of Minnesota?

**Overview:** Students will learn about the history of State Parks in Minnesota and use the Minnesota DNR's website to research a state park in the biome of their choice.

## Big Questions

1. How can I use the DNR state park website to visit areas that are representative of the different biomes of Minnesota?

## Objectives

1. Navigate the DNR state park website

## **Teacher Background**

Minnesota is home to 75 state parks and recreation areas, not to mention the countless regional and county parks, as well as nature centers that are open to the public. With so many options out there, it can be overwhelming for a Minnesotan to select where to go and what to do when they get there. The state's DNR website is full of information for people interested in getting outside, and is a useful tool to master. Some of the most notable programs that the DNR offers are:

- [State Park library pass](#) – A program geared towards people living in low-income communities across the state to visit state parks without the financial barrier of an entry fee. Offers free seven-day state park passes at participating libraries.
- [Fish for free in State Parks](#) – If you are a Minnesota resident, you can fish without a fishing license in most Minnesota state parks if you are fishing from shore or fishing through ice.
- [iCan programs](#) – The DNR has a suite of programs for first time campers, hikers, bikers, canoers, archery enthusiasts, and more. These programs are family friendly and provide participants with all necessary gear and instruction.

## **Student Background**

Students should be familiar with the different biomes of Minnesota to aid in their selection of a state park to visit. If they are unfamiliar, students can select a state park at random for this lesson. Students may have varying technical abilities to navigate and understand the DNR state park website. Provide support by pointing students to maps of state park distribution based on English reading level. For student success, it may be pertinent to have a computer assistant present to assist in this activity.

## **Preparation**

Prior to the lesson start, ensure that your classroom has a working internet connection or has access to a computer lab. Alternatively, ensure that students come to class and are able to use their smartphone or other device for research purposes. If you choose to complete the supplemental lesson, ensure that you have examples of 'natural resources' available for students to look at (either physical or images are sufficient).

## Review

Provide students with a blank biome map of Minnesota and ask them to fill in the location of the four distinct Minnesota biomes. Alternatively (or in addition) you can provide students with true/false questions that compare and contrast the different biomes:

- The deciduous forest is warmer than the coniferous forest on average (T/F)
- The prairie is the wettest biome in Minnesota (T/F)
- The coniferous forest is home to trees that stay green year-round (T/F)

## Warm-up

### Activity Suggestion

Ask students to imagine that they have the ability to create their very own outdoor park. They have an unlimited budget and can decide where to put it in Minnesota.

Students will use the activity worksheet to answer the following questions:

- What type of biome is your park in?
- What types of activities can you do in the park?
- Who is visiting your park? Families? No people?
- What types of plants and animals would you expect in your park?
- What is the climate of your park?
- If you are visiting, how would you get there? By car? By bike? Walking?
- Explain why your park is designed the way that it is.

\*\*\* Ultimately, students will have created an ideal park

### Supports for learners

- Students can be encouraged to draw an image instead of writing.
- This activity can be supplemented by a conversation activity of your choice in which students compare and contrast the different components of their parks.
  - o What is similar about our park? What is different?
  - o Why did you choose to make your park the way that you did?

Instructors can modify the activity worksheet to reflect the vocabulary that has been covered in class.

### Relevant Vocabulary

Climate, park, biome, activity

## Research a State Park

The purpose of this activity is to have students use the DNR website to research a state park of interest and to report this information to the rest of the class

### Activity Suggestion

Provide students with a brief history of the state parks in Minnesota. See the 'history of state parks in Minnesota' reading for more information.

- Explain who the Department of Natural Resources are (see supplemental lesson)

Explain to students that they will be researching a state park of their choice for the remainder of the class.

Spend some time navigating through the [DNR state parks website](#) with the entire class.

Students will work individually or in small groups through the 'planning a state park visit' activity.

### Supports for learners

- Prepare a completed activity and share with students or review it prior to independent work.

### Relevant Vocabulary

State park, Department of Natural Resources, protect, natural resources, conservation

### Extension – History of Minnesota State Parks

Using the reading activity of your choice, have students complete the reading 'history of state parks in Minnesota' and answer comprehension questions. This reading highlights the evolution of western conservation theory in the 20<sup>th</sup> century in Minnesota.

After the reading, ask students to discuss the following:

- Were there state/national parks from their home country that they are aware of? Were these parks set up for similar or different reasons than the ones in the United States?
- Are the state/national parks that are in the United States similar to the parks that students created in the warm-up activity? If so, in what ways? If not, why do you think that they are different?

### Supplemental Lesson

What is a natural resource?

*When to implement this lesson:* If students are unfamiliar with the DNR's purpose or what their role is in government. Alternatively, if students struggle with the concept of what a 'natural resource' is.

Place examples of natural resources around the room for students to observe. These can either be images or physical examples and can include trees (timber), deer or turkey or fish (game animals), coal (energy), metals (materials), plants (food). Ask students to go around to each image or object and explain what we use them for. Answers will vary; the purpose of the activity is for students to acknowledge that humans use these resources for something.

Define natural resources to students as things that humans use that are part of the environment. Ask students to brainstorm other examples of natural resources until mastery of the concept has been achieved.

Conclude the activity by saying that the Department of Natural Resources in Minnesota is the government agency responsible for managing our state's natural resources so that we do not run out.