Using this Guide ......................................................... page 3
Zoo Map ................................................................. page 4
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Objectives of this Unit ................................................ page 9
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Unit Background ...................................................... page 11

PRE-VISIT ACTIVITIES

Activity 1: Minnesota’s Biomes .................................... page 14
Minnesota’s unique geologic history, climate, and vegetation types, make it home to three (or four) unique biomes. Learn about what defines each of these biomes and where they are located across the state.

Activity 2: Adaptations on the Prairie ........................ page 21
The prairie biome is home to a unique group of animals and plants. Students will read about the characteristics and history of this unique biome in Minnesota and learn to identify physical and behavioral adaptations in prairie species, which allow them to survive in this often harsh environment.

FIELD TRIP MINNESOTA TREK

Activity 3: Minnesota Trek Trail Guide ........................ page 30

POST VISIT ACTIVITIES

Activity 4: Our Changing Landscape .......................... page 31
Using vegetation maps, students will observe landscape changes that have occurred since the beginning of European settlement in Minnesota. They will focus on a particular biome and an animal species within that biome to make predictions about what might happen to the biome and the animal in the future.
Come to the Zoo and explore the Medtronic Minnesota Trail where you can observe some of the unique wildlife found across our state. Peer into a beaver pond and learn about how beavers are tied directly to European settlement in Minnesota. Walk alongside a northern forest glade and find a bird-watching perch in the treetops. Ponder the similarities and differences between coyotes and gray wolves and learn about the differences in the challenges they face. Visit the black bears as they rest in their den or observe the river otters swimming actively in the water. Find smaller Minnesota favorites like turtles and frogs, which are featured in the exhibit’s trailhead in the warm and welcoming lodge.

Minnesota Quest was designed to help bridge the gap for students between in-school learning and a Zoo field trip. It is intended for use with students in grades 6–8 but can be adapted to suit a variety of age groups. The lessons and activities included in the Minnesota Quest are designed to support Minnesota Academic Standards in science and social studies and to assist in developing your curriculum.

The first two activities, Minnesota’s Biomes and Adaptations on the Prairie, provide students with background information on Minnesota’s biomes as well as the unique physical and behavioral adaptations that allow wildlife to survive in environments that experience climate extremes unlike those found in other parts of the country. These are meant to be conducted by the classroom teacher at school before the Zoo field trip.

Activity 3, Minnesota Trek, is an on-site self-guided tour of the Medtronic Minnesota Trail that allows students to take the learning from the pre-lessons and apply it to the animals and exhibits at the Zoo. This activity focuses students and gives them the opportunity to observe animals that are found in each of Minnesota’s biomes and notice the adaptations that support their survival. The Minnesota Trek also provides a record of observations and information that students can bring back and use again in the classroom to further process the field trip experience.

Finally, the post-lesson, Our Changing Landscape, gives students the opportunity to take what they have learned about Minnesota’s natural environments and look at how humans have impacted those environments. They make predictions about how the landscape is likely to change in the future and how that may affect Minnesota wildlife.

Please visit mnzoo.org/teachandlearn for more information about field trips and other educational programs. We hope this packet helps to engage you and your students in learning about the landscape, flora, fauna, and people that make Minnesota unique.
**BEFORE YOU ARRIVE**

We recommend planning out your trip far in advance to consider how you will use the supportive materials found in this packet to ensure your time at the zoo is as rich as possible.

Teachers can request a free visit to plan an upcoming field trip. Please contact our field trip scheduler in advance to schedule a visit.

Check your confirmation sheet. If you have any questions or need to make changes call the scheduler at 952-431-9218 or email educate@mnzoo.org.

Be sure to use the field trip resources available on line at mnzoo.org/teachandlearn to view field trip information, use our social media sites, see Zoo maps, daily schedules, animal facts, Zoo scavenger hunts and may other teacher resources.

Please review this information and distribute any schedules to your chaperones to review before you leave your school.

Consider having adhesive tags for your students and chaperones with your school name for identification while at the zoo.

We require a minimum of one adult chaperone for every 15 students. **Chaperones are required to stay with students at all times.** Students misbehaving without chaperones will be asked to leave the Zoo and the lead teacher will be called to supervise them.

When meeting at the end of the day please select a gathering place away from the Zoo entry doorway so other schools can get to their buses on time. The MN Trail lodge, Tropics Trail plaza, Snow Monkey viewing hallway, Upper Plaza or Discovery Bay are good locations to gather large groups before you head to the exit. Let your students/adults know where this is **before** you leave school.

**ARRIVING AT THE ZOO**

When you arrive, have the bus drivers drop the students at the entrance or follow signs for “school bus” drop off at special times of the year. Please arrange for pick-up at the same place you were dropped off.

Be prepared to check in with Guest Services. The lead teacher must have an exact count of the number of students and adults & pay all Zoo fees at the time of admission. Make one payment by check (payable to Minnesota Zoo) bring the check with you (do not send in advance), cash, billing, or school charge card (you can call back to your school to get the card number if you cannot bring the card to the Zoo). Total fees will be calculated based on the number of students and adults with you when you arrive. Please review costs on our website mnzoo.org/education/schools-teachers/field-trips and make necessary adjustments to your total.

Adults should not check in separately, please collect admission fee from adults that need to pay and make one payment, including any parents parking fees. Admission for adults checking in individually $18.00.
**LUNCH**

Please encourage students to bring recyclable lunch containers instead of disposable items to reduce waste.

If you are bringing bag lunches pack them in a sturdy boxes or brown paper grocery bags and label with your school’s name. When you arrive at the Zoo, our staff will direct you to the lunch storage area. Your chaperones will have to carry the boxes to the lunch location. We recommend not packing the boxes too heavily. Chaperones may also carry lunches in backpacks during the day. You may eat at any picnic table on a first-come basis. Additional seating can be found on the Tropic Trail plaza.

Food service at the Zoo is available at the Call of The Wild food court and the Wild Java for coffee and snacks. Call 952-953-0667 for questions on ordering food.

If your program includes lunch pick up your lunches at the Zoo’s food court main level.

**ZOO STORE**

Students, accompanied by a chaperone, are welcome to visit the Zoo gift store in small groups. To speed up your visit, we suggest you shop before noon and allow time for check out. You may pre-purchase items by calling 952-431-3090.

**GREAT CLIPS IMAX THEATRE**

Upper South Walkway: Show times available at the IMAX box office or the Guest Services Desk. For reservations call 952-997-9714. Groups attending IMAX must check in at both the MN Zoo and IMAX, separate payment is required.

**TIPS FOR AN ENJOYABLE VISIT**

Plan to arrive at least 5–10 minutes before any scheduled program time.

Be aware that during inclement weather the animal shows, demos and other facilities may have adjusted schedules. Please check with Guest Services at the entry on inclement weather days for daily changes.

Guest Service staff is available to assist you at the main entry or volunteers at the desk in the Minnesota Trail lodge.

It takes 5–7 hours to adequately see the entire zoo. Unless you have that much time, don’t try to see it all. We ask chaperones to stay with the students at all times and encourage students to spend time observing the animals along the trails you have selected.

Volunteers are located throughout the zoo to help you enjoy your visit, stop and ask them any questions you have. Volunteers will be at the benches along the Zoo trails with interpretive artifacts throughout the day, schedules vary.

Be sure your group knows and has a plan for if/when students become lost.

Check at the entry desk for up-to-the-minute information on the daily schedule or see our web site at mnzoo.org the day before you arrive.
DAILY SCHEDULE

ZOO HOURS 9 A.M.–4 P.M.

The Zoo offers unscheduled animal enrichment demonstrations at various exhibits during the day. You may be surprised by a close encounter, a talk or a feeding. Watch for digital signage for times and locations while at the Zoo.

TROPICS TRAIL:
Travel through the lush “rain forest” featuring tropical hot spots—endangered regions in the world. You will see animals like Colobus monkeys, tapir, sloths, and tropical birds that make the Zoo their home. Can your students spot all 24 species of ducks on the gibbon’s lake? Tropical Reef dive show daily at 10:30 am, shark feeding daily 3:00 pm.

MINNESOTA TRAIL:
Begin discovering animals from around Minnesota at the warm and welcoming lodge with the smaller animal favorites like turtles, frogs and salamanders. Along the trail experience a variety of Minnesota animals and landscapes ranging from views into a beaver pond, a walk alongside a northern forest glade with animals like wolves, black bears, and river otters as well as a bird-watching perch in the treetops. Come see how your students measure up to our bears! Animal demos take place daily, check the schedule at the lodge desk.

SOUTH ENTRY/PENGUIN PLAZA:
Experience our social animals; Chinese macaques with little ones born this summer, and the 3M Penguins of the African Coast, featuring our colony of penguins in their exhibit resembling Boulder Beach, South Africa. Penguin feeding daily at 10:00 am and 2:30 pm.

DISCOVERY BAY:
Thousands of gallons of water make homes for sharks, coral and sea life. Shark talks Mondays & Wednesdays at 11:30 am.

NORTHERN TRAIL:
Amur Tigers, caribou, Dhole, moose and more species spend all seasons outdoors on our northern walk. When you see the pronghorn imagine them at top speed, 55 mph, they are the second-swiftest animal in the world. (total walk time 45–60 min.)

RUSSIA’S GRIZZLY COAST:
Experience Russia’s far Eastern coast, this region is located on the 45 parallel (just like Minnesota) See the similarities and differences as you find sea otters, brown bears, leopards and wild boar. Fun fact: Sea otters have the thickest fur of any animal. They have 10 times as many hairs in one square inch as you have on your entire head! Their fur helps them stay warm in chilly water. Trail begins from the Central Plaza. Sea Otter and Brown Bear enrichment schedule varies.

HAWAIIAN MONK SEAL TRAINING DEMONSTRATION:
Connect with these critically endangered marine mammals and their trainers in their new habitat in Discovery Bay, the only place to see these amazing animals outside of Hawaii. Daily 12:00 p.m. and 2:00 p.m.

WORLD OF BIRDS SHOW:
See amazing birds in flight during the 30 min World of Birds program. October–mid-April shows take place in the indoor Target Learning Center Theater, near the MN and Tropics trail. Shows M–F at 11:00 am and 1:00 pm. Late May–Labor Day weekend, shows take place at the Weesner Family Amphitheater at 11:00 am, 1:00 and 3:00 pm.

WELLS FARGO FAMILY FARM:
Farm animals are the highlight of this working farmstead. Did you know one pound of sheep’s wool can produce as much as 10 miles of yarn! Seasonal.

*PROGRAMS AND SCHEDULES CAN CHANGE BASED ON ANIMAL CARE NEEDS. PLEASE PLAN ACCORDINGLY!*

PLEASE CHECK THE WEB SITE AT MNZOO.ORG FOR SHOW SCHEDULES AS THEY MAY VARY.
1. The deciduous forest, prairie grassland, and coniferous forest are the three main biomes present in Minnesota. Each of these biomes defined by their dominant vegetation and prevailing climate, is home to a variety of Minnesota wildlife.

2. Adaptations, both behavioral and physical, allow Minnesota animals to survive and thrive in their habitats.

3. Over time humans have had a significant impact on Minnesota biomes and wildlife.
7TH GRADE SCIENCE

7.1.3.4.1 Use maps, satellite images and other data sets to describe patterns and make predictions about natural systems in a life science context.

7.4.3.2.3 Recognize that variation exists in every population and describe how a variation can help or hinder an organism’s ability to survive.

7.4.2.1.1: Identify a variety of populations and communities in an ecosystem and describe the relationships among the populations and communities in a stable ecosystem.

7.4.2.1.3 Explain how the number of populations an ecosystem can support depends on the biotic resources available as well as abiotic factors such as amount of light and water, temperature range and soil composition.

7.4.4.1.2: Describe ways that human activities can change the populations and communities in an ecosystem.

8TH GRADE SCIENCE

8.3.4.1.2: Recognize that land and water use practices affect natural processes and that natural processes interfere and interact with human systems.

6TH GRADE SOCIAL STUDIES

6.3.1.1.1: Create and use various kinds of maps including overlaying thematic maps, of places in Minnesota; incorporate the “TODALSS” map basics, as well as points, lines and colored areas to display spatial information.

6.3.6.6.1: Locate, identify and describe major physical features in Minnesota; explain how physical features and the location of resources affect settlement patterns and the growth of cities in different parts of Minnesota.

6.3.4.10.1: Describe how land was used during different time periods in Minnesota history; explain how and why land use has changed over time.

7TH GRADE SOCIAL STUDIES

7.3.1.1.1: Create and use various kinds of maps, including overlaying thematic maps, of places in the United States; incorporate the “TODALSS” map basics, as well as points, lines and colored areas to display spatial information.

8th grade Social Studies

8.3.1.1.1: Obtain and analyze geographic information from a variety of print and electronic sources to investigate places or answer specific geographic questions; provide rationale for its use.

8.3.2.3.1: Use appropriate geographic tools to analyze and explain the distribution of physical and human characteristics of places.
Three major biomes converge in Minnesota: the prairie grassland that covers much of the plains and western Minnesota, the deciduous forest which is found throughout the Midwest and eastern part of the U.S., and the northern coniferous forest which covers much of Canada and dips down into northern Minnesota. A biome is a biological community that is defined by its climate and its dominant vegetation. There is a fourth biome that has been recently identified in the northwestern corner of the state, the Tallgrass Aspen Parkland, but because it is a relatively small piece of the state and is not always identified as a major Minnesota Biome, we will focus on the other three for the purposes of this unit.

**CHARACTERISTICS OF THE THREE MAJOR BIOMES:**

- **Prairie:** At the time of the public land survey in the 1850s, prairie grassland covered one-third of the state, along the western edge and down across southern Minnesota. The prairie is relatively dry, with 18–33 inches of precipitation per year and warm with average temperatures 37–45 degrees F. Dominant vegetation includes Bluestem, Indian Grass, Prairie Cordgrass, Grama grasses, and Prairie Dropseed. Animals such as the Great Plains Toad, Pocket Gopher, Badger, Burrowing Owl, and Greater Prairie Chicken are found in the prairie biome.

- **Deciduous Forest:** The deciduous forest covers a swath between the prairie and coniferous forest, stretching from the southeast along the Mississippi River up to the northwestern corner of Minnesota. It has a more moderate climate, with average annual precipitation between 24–35 inches and average annual temperatures between 39–45 degrees Fahrenheit. Northern Red Oak, American basswood, Sugar maple, Bur Oak, and Pin Oak are some of the dominant vegetation in the deciduous forest. Eastern Spotted Skunk, Gray Fox, Eastern Pipistrelle Bat, Cerulean Warbler, and Timber Rattlesnake are all found in this biome.

- **Coniferous Forest:** The coldest biome is the coniferous forest with average temperatures ranging from 36–41 degrees Fahrenheit. Average annual precipitation is 21–32 inches per year. Black spruce, Jack Pine, Red Pine, Aspen, Birch, Balsam Fir, White Spruce, Red and White Pine are dominant vegetation in this biome. Moose, Gray Wolves, Black Bears, Wood Frog, and the Boreal Chickadee all have habitat in the coniferous forest.

Before European settlement began in the middle of the nineteenth century, these biomes in Minnesota were relatively undisturbed. Since that time the biological communities composing the three major biomes have been substantially altered. The prairie, which once covered a third of the state, has been reduced to one percent of its original size—much of it being plowed and cultivated for agriculture. The huge swath of deciduous forest known as the “Big Woods” has been reduced to a few small pieces of forest as much of this biome has been cleared for agriculture and/or developed into cities. The coniferous forest has changed and become fragmented through extensive logging and mining.

Due to habitat loss and fragmentation many of Minnesota’s wildlife species have struggled and in some cases populations have plummeted and even disappeared completely. Natural Resource managers, researchers, and citizens are working to understand the problems that face Minnesota wildlife and the larger biological communities within which they live. This unit gives students the opportunity to look at the changes that have occurred in our state over the last 150 years and think about how we should go forward, hopefully recognizing the importance of protecting Minnesota’s native plants and wildlife.
With our three different biomes, animals in Minnesota have unique adaptations that allow them to survive in one or more than one of them. Adaptations can be physical traits including coloring and size or behavioral such as hibernating through the winter, storing food, or building dams to pool water. Some animals have adaptations that allow them to easily move from one environment to another while others are so specialized that they cannot survive when there is a change in their habitat or they are forced to move. In this unit students will have the opportunity to practice identifying adaptations, recognize how they help animals survive in their habitat/biome, and think about how they contribute to an animal’s ability to cope with human impact on their environment.
BIOME MAP

MINNESOTA

TALL GRASS ASPEN PARKLAND

CONIFEROUS FOREST

DECIDUOUS FOREST

PRAIRIE GRASSLAND
Activity Overview: In this lesson students will be introduced to the term biome and use map data to determine the geographical boundaries and the vegetative and climatic characteristics of the three principle biomes found in Minnesota.

LEARNING OBJECTIVE:
Students will name the three principal biomes found in Minnesota and describe the defining characteristics of each.

MATERIALS:
One copy per student and one for projection of each of the following:

- Minnesota Early Settlement Vegetation Map
- Normal Mean Temperature Annual Map
- Average Annual Precipitation Map
- Biomes Data Sheet

PROCEDURE:
1. Pass out map “The Natural Vegetation at the Time of the Public Land Survey: 1847-1907 Map” and have the image projected on a smartboard/screen/monitor for students to see.

2. Think-Pair-Share: Ask students to look carefully at the map and think quietly to themselves about what they see. After a minute or so of quiet observation, they should share with a partner what they observe. Pairs can then share with their table groups or the whole class one thing that they know or observe about the map. Items of note include:
   a. The state of Minnesota
   b. The map shows the vegetative cover of the state between 1847 and 1907 when initial land surveys were conducted.
   c. The legend indicates different types of ground cover/forest type.
   d. Certain parts of the state are covered in distinct landscapes.

3. Look at the map as a class and go over anything that the student discussion missed or need to be reinforced. Make sure to point out the legend, compass, title, and scale. Ask students what was happening in Minnesota during the time that these land surveys were being conducted. This was a period of time during which Europeans were settling Minnesota. Ask if they notice any geographical trends in the vegetation type. Prairie is concentrated in southwestern part of state. Aspen-oak in the middle of the state. Coniferous forests in the northeast. Ask students to draw lines on their maps to separate Minnesota into three distinct vegetation groupings.

4. Introduce or review the term biome. A biome is a large community of plants and animals that occupies a distinct region and is defined by its climate and dominant vegetation. The three biomes that we will be focusing on for the purposes of this unit are coniferous forest, deciduous forest, and prairie. It should be noted that there is a fourth major biome that has been identified in northwestern Minnesota, the Aspen Parkland, but we will focus on the other three. Students should label the three biomes on their vegetation maps.

5. Hand out the Biomes Data Sheet and have students write the names of the three biomes in the appropriate spaces.

6. Using their vegetation maps students should identify at least 2–3 main vegetation types present in each biome and record in the appropriate spaces on their data sheet.
7. Hand out the *Normal Mean Temperature Annual* maps to students and give them a moment to figure out what the map is showing. Make sure that they see the key and understand how to use the colors to figure out the mean temperatures in various parts of the state. Use these maps to define the normal mean temperature range for each of the biomes and record on the data sheet.

8. Hand out the *Average Annual Precipitation* maps and give students a moment to figure out what this map shows. Once again, have them identify and record the range of average annual precipitation in each biome.

9. Students should now have a completed Biomes Data Sheet with biome names, dominant vegetation types, average precipitation ranges and mean temperature ranges. This can now act as a biomes reference for students as they move through the rest of the lessons in this unit.

**ASSESSMENT:**

1. Working in pairs, ask students to describe to each other what a biome is and name the three principal biomes found in Minnesota.

2. Next, ask students to look at maps and the Biomes Data Sheet and discuss with partners some generalizations about how things change as you move from one end of the state to the other such as “As you move from the southwest corner of Minnesota toward the northeast, it progressively gets wetter and cooler”.

3. Have pairs share with the group some of their generalizations.
NORMAL PRECIPITATION
ANNUAL

INCHES

State Climatology Office
DNR Division of Ecological and Water Resources
August 2012

This map was adapted by Barbara Coffin of the DNR, Natural Heritage Program from The Original Vegetation of Minnesota, a map compiled in 1930 by F.J. Marschner from the U.S. General Land Office Survey Notes and published in 1974 under the direction of M.L. Heinselman of the U.S. Forest Service. It was produced by the Cartography Laboratory of the Department of Geography, University of Minnesota.

Published by the Natural Heritage Program, Minnesota Department of Natural Resources, 1988 ©
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| Coniferous Forest | - Jack pine  
                     - Aspen  
                     - Paper Birch  
                     - Red and White Pine  
                     - Balsam Fir  
                     - White Cedar  
                     - White and Black Spruce  
                     - Black Ash  
                     - Hazel | 34–40 degrees F | 22–32 inches |
| Deciduous Forest | - Elm  
                     - Basswood  
                     - Sugar Maple  
                     - Red and White Oak  
                     - Bur Oak and Pin Oak  
                     - Hazel  
                     - Aspen | 38–46 degrees F | 20–32+ inches |
| Prairie         | - Bluestems  
                     - Indian grass  
                     - Needle grass  
                     - Grama grass  
                     - Cordgrass  
                     - Cattails  
                     - Rushes  
                     - Sedges | 38–46 degrees F | Less than 20–30 inches |
Activity Overview: Students will learn about how physical and behavioral adaptations allow animals to survive in their habitats and they will read an article about the prairie biome in Minnesota from which they can derive information about how prairie animals are uniquely adapted to their environment.

OBJECTIVES:

1. Students will name plants and animals found in the prairie biome.
2. Students will describe how land use in the prairie biome has changed since the arrival of European settlers.
3. Students will identify adaptations of prairie wildlife.
4. Students will distinguish between physical and behavioral adaptations.

MATERIALS

Copies for each student of

- Article: Little Habitats on the Prairie
- Adaptations on the Prairie Data Sheet

PROCEDURE:

1. Review information about biomes including the definition of biome and the characteristics of the three biomes covered in Lesson 1. Make three columns on the board and then write one biome name on the top of each one (coniferous forest, deciduous forest, prairie). As you discuss the biomes, write down a few characteristics of each under its name. The prairie is the driest biome and the dominant vegetation is various grasses. The deciduous forest is wetter and milder than the prairie. Dominant vegetation includes oak, elm, basswood, aspen, ash, maple). The coniferous forest is the coolest and wettest and dominant vegetation includes Jack Pine, Red and White Pine, Balsam Fir, White Spruce, Aspen, and Birch.

2. Ask students whether they think that animals that live in the coniferous forest would have to have different physical traits or behaviors than animals that live in the prairie. Why or why not?

Example: Animals in the coniferous forest would likely have the coldest snowiest winters. They may be able to survive at colder temperatures, they may have camouflage that makes them harder to see in the snow, they may have bigger feet that act like snowshoes for walking across deep snow. Accept all thoughts and contributions of students as they think through this and think about the differences between biomes and animals’ survival needs.

3. Introduce vocabulary:

   Adaptation: A characteristic or trait that allows an organism to be well suited to survive in its environment.

   Physical Adaptation: A structural feature that enables an organism to survive in its environment. Examples include beak type, claw type, coloring, size, wings, webbed feet, etc.

   Behavioral Adaptation: Something that an animal does that enables it to survive in its environment. Examples include swimming, diving, dam building, hibernation, stalking, hiding, etc.

4. Tell students that today the focus will be on the prairie biome—it’s the one least well represented on the Minnesota Trail at the Zoo. Pass out article, Little Habitats on the Prairie and give time for students to thoroughly read it. Provide reading support as necessary.
5. After students have had an opportunity to read the article, begin a group discussion on some of the history of the prairie biome since the arrival of European settlers:

   a. What was the prairie like when European settlers first arrived in Minnesota? 
   *Prairie was a sea of tall grasses, wildflowers, roaming bison. Native Americans lived here and relied on bison for many of their needs (clothing, food, tools, etc).*

   b. What is the difference between the way that European settlers farmed and the way that Native Americans traditionally farmed the area?
   *Native Americans planted squash, beans, and sunflowers in riverside woodlands. European settlers plowed prairie's rich, dark soil to plant crops.*

   c. What are the long-term effects of the way that the settlers farmed?
   *Resulted in the loss of prairie. Prairie once covered 18 million acres of Minnesota, but now only covers about 235,000 acres.*

6. Look at page 33 together and read the section entitled, *In the Shadow of Mountains.* Discuss the climatic conditions in the prairie and note how plants have adapted to these warm, dry conditions. They develop very deep roots allowing them to tap water and minerals deep in the ground. This is an example of a **physical adaptation** of prairie plants—a physical trait that enables the organism to survive in its environment. Use Adaptations on the Prairie Data Sheet to fill in the names of organisms, their adaptations, and how these adaptations help the organism survive.

7. Continue reading *Native Plants* and note any other examples of adaptations in prairie plants. Record them on data sheet.

8. Ask students to continue to read through the article another time, this time looking for examples of adaptations of prairie plants and animals. Fill out data sheet with as many examples as possible.

9. Ask: How can you tell the difference between a physical and a behavioral adaptation? Help students come to the conclusion that a physical adaptation is a trait (color, structure, size, etc) that helps the organism survive. A behavioral adaptation is something that the organism does that helps it survive (hibernation, maintaining internal temperature by moving between sun and shade, etc).

10. Students should go back to their data tables and write a P for physical or a B for behavioral next to each of the adaptations that they identified from the article.

11. Ask students to share with each other or the class how the prairie biome has changed in the time since European settlers first arrived in Minnesota?

12. Ask students to share with each other or the class one example of a physical adaptation and one example of a behavioral adaptation in prairie organisms.

**ASSESSMENT:**

Student reflections about changes in the prairie biome as well as data sheets from this activity will reflect student understanding of the characteristics of the prairie biome and the physical and behavioral adaptations of plants and animals native to the prairie.
Minnesotans have a wild place called Little Grass Prairie.

**Nature's Naturalists**

**By Kathleen Weeten**

**Illustrations by**

Veran Ming Womac

**The Little Praries**

The prairies of Minnesota are a unique and pristine ecosystem. The soil is rich in nutrients due to the presence of organic matter from the grasses that thrive here. These prairies are home to a diverse range of plants and animals, contributing to the biodiversity of the region.

The prairies are a vital part of the Minnesota landscape, providing habitat for many species of plants and animals. They are also an important source of pollinators for nearby crops and gardens.

The Little Grass Prairie is a beautiful and serene place, offering a peaceful retreat for nature lovers and photographers alike. It is a reminder of the importance of preserving our natural resources for future generations.

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*Image Credit: Minnesota Department of Natural Resources*
The problem is a puzzle, but the answer is simple. Sometimes it’s hard to see the big picture. Sometimes you need to step back and see the whole picture. If you can’t see the big picture, you may miss the point. Here’s how to do it:

1. Look at the hills where the grass grows.
2. Look at the big picture.
3. Look at the little picture.

The big picture is a puzzle, but the answer is simple. Sometimes it’s hard to see the big picture. Sometimes you need to step back and see the whole picture. If you can’t see the big picture, you may miss the point. Here’s how to do it:

1. Look at the hills where the grass grows.
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3. Look at the little picture.

By looking at the big picture, you can see the patterns and connections that are missed when you only look at the little picture. This is important in all areas of life, from science and mathematics to art and design. By looking at the big picture, you can see the patterns and connections that are missed when you only look at the little picture. This is important in all areas of life, from science and mathematics to art and design.
The setting sun paints the horizon orange and the sky above a vibrant blue. The wind whispers secrets to the trees, and the waves dance gently on the shore. It's a perfect evening for a stroll on the beach.

As the sun dips lower, the colors of the sky intensify, painting a canvas of pinks, purples, and oranges. The stars begin to twinkle, and the sea sparkles under their glow.

This is a moment to slow down and appreciate the beauty of nature. Let the rhythm of the waves and the songs of the seagulls guide you into a peaceful state of mind.

End of text.
Many Habitats

Termite mounds: Help small ants get air to breathe in the termite mound. Supply oxygen for the insects in the mound.

Eagle: Only has one eye. Can search for food with one eye. 

Eider duck: A large duck that lives in the Arctic. 

Heron: A long-legged bird that can walk on water. 

Porcupine: Has spines on its back. Can be dangerous to handle. 

Note to Teachers

The Prairie State Parks

Fold the book and draw a picture of a fox. 

Fold the book and draw a picture of a duck. 

Fold the book and draw a picture of a heron. 

Fold the book and draw a picture of a porcupine. 

Fold the book and draw a picture of a raven. 

Fold the book and draw a picture of an eagle. 

Fold the book and draw a picture of a termite mound.
Minnesota Quest 6–8th grades

Emily Dickinson

Home in the Range

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To make a prairie, it takes a cow and a bee.

The bee alone will not; she needs the cow to

help make the honeycomb that will sustain her

and her young. The cow alone will not;

she needs the prairie flowers to make her

milk sweet and nourishing. Together, they

make the prairie, the cow the soil and the

bees the sunshine. Prickly milkweed and sunflower

seeds are sown, and when they grow, they

become the prairie flowers that attract the bees

and sustains the cows. The prairie, in turn,

sustains the cows and the bees, completing the

cycle of life in the prairie.
<table>
<thead>
<tr>
<th>Organism Name (plant or animal)</th>
<th>Adaptation (description of trait or behavior)</th>
<th>Survival Advantage (how does the adaptation help the organism survive?)</th>
</tr>
</thead>
</table>
WHAT IS THE MINNESOTA TREK?
The Minnesota Trek is a self-guided tool for students to use as they explore the Medtronic Minnesota Trail. The Minnesota Trek was specifically designed to support the same academic standards that explore Minnesota’s biomes and animal adaptations as the unit’s pre- and post activities. The trail guide can also be used independently from the rest of the Minnesota Quest, if you choose. The Minnesota Trek is a separate document that can be downloaded and printed from mnzoo.org/teachandlearn.

WHAT WILL THE STUDENTS DO ON THE MINNESOTA TREK?
The Minnesota Trek requires students to use their observational skills and apply their previous knowledge about Minnesota biomes and animal adaptations at several exhibits along the Minnesota Trail.

HOW SHOULD I USE THE MINNESOTA TREK WITH MY STUDENTS?
Since the Minnesota Trek is free for the purpose of being a standards-based self-guided tour, how you use it is up to you! We do have a few suggestions on how to make the most of your Minnesota Trek experience. Below are some helpful tips on how to incorporate the Trek into your next field trip.

☐ Each guide is designed to be used independently, but also can be used in small groups or even a large group led by a chaperone.

☐ Give your students a chance to look over the Minnesota Trek the day before the field trip to help them become familiar to what they will be doing. Have students fill out the Minnesota Trek field trip page with important information such as meeting location or lunch times.

☐ Have chaperones lead small groups to facilitate each Minnesota Trek activity. Reading the text as a group would be a great way to make sure students get the background they need to perform the task. No need to be an expert, all information that is needed is available in the booklet and on the trail.

☐ We recommend traveling in smaller groups as well as designating a time for each group to start their Minnesota Trek so students have plenty of time to interact with each exhibit without feeling crowded.

☐ Each exhibit activity may take 5–10 minutes depending on the task. It is suggested to allow 45 minutes to 1 hour for students to make their way successfully through the Minnesota Trek.

To access the Minnesota Trek for this unit, please go to the education website via mnzoo.org/teachandlearn to download the free printable booklet.
**Activity Overview:** Students will compare and contrast the landscape of Minnesota at the time of European settlement with the land survey conducted in 1990. They will consider the reasons for the changes during this time and examine how human settlement and population growth have affected the wildlife in our state.

**Objectives:**

1. Students will describe how and why the landscape in Minnesota has changed since the beginning of European settlement in the middle of the nineteenth century.

2. Students will make predictions about the impacts of these landscape changes on biomes and the plants and animals within them.

**Materials:**

- Map: The Natural Vegetation of Minnesota at the Time of the Public Land Survey: 1847–1907
- Map: 1990s Census of the Land
- Animal Information Sheets (Moose, Burrowing Owl, Timber Rattlesnake)
- Our Changing Landscapes Worksheet

**Procedure:**

1. Remind students about the definition of biome, the names and locations of the three principle Minnesota biomes, and what distinguishes them from one another. Have them take out their Natural Vegetation of Minnesota at the Time of the Public Land Survey: 1847–1907 maps for reference during this discussion and for the rest of the lesson.

2. Large group discussion:
   a. What do you already know about how Minnesota has changed since 1847?
      *Ex: Arrival of many more people, industrialization, logging, mining, urbanization, agriculture, etc.* Accept a wide range of answers here to get students thinking.
   b. How do you think/know these changes have affected the land? Individual biomes? *Students may remember from lesson 2 that the prairie biome has been particularly affected by the changeover to agriculture. Very little still exists in MN.*

3. Pass out copies of the map: 1990s Census of the Land. Working in partners or small groups, ask students to look at this map together with the historical vegetation map and make some observations. Have groups share with the class some of the things they noticed.

4. Ask students to think about how plants and animals have been impacted by the changes that came with the arrival of many more people, urbanization, development, etc. What do you know for sure and what do you think?

5. Pass out Our Changing Landscape Worksheet. Either individually or in small groups, assign students a particular biome. They should use their historical vegetation map and the 1990s map to look closely at their biome and make careful observations about changes to their biome. Record this information on the worksheets.
6. Once they've had a chance to examine changes to their particular biome, tell students that in addition to landscape changes, there are many plants and animals whose populations have been impacted by human activities. They will have the opportunity to look closely at an example of an animal in Minnesota that is currently protected due to declining population in the state.

7. Pass out Animal Information Sheets. There are three different species profiled, each representing one of the major biomes, so make sure that students get the animal information that goes with the biome that they just examined. Ask students to read them quietly to themselves.

*Key to Animal Information Sheets: burrowing owl (prairie biome), timber rattlesnake (deciduous forest biome), moose (coniferous forest biome)*

8. Working on their own or in small groups of students with the same animal information, have students complete.

9. After students have had the chance to complete their reading and reflection, ask them to share what they learned. Guide the discussion by helping students understand the links between human development and activities and the decline of some species. Point out that there are things being done for all of these protected species to try to bolster their populations in Minnesota. Spend some time discussing what kinds of recommendations the students would make to state wildlife officials to help maintain healthy populations of these animals in the future. This could be an excellent springboard into an extension activity that includes research, solutions, and civic engagement.

**ASSESSMENT**

Reflective writing assignments at the end of the student activity will give an indication of the depth of understanding of the human impacts, both positive and negative, on the biomes and a few of the wildlife species in Minnesota.
Look carefully at the *Natural Vegetation of Minnesota at the Time of the Public Land Survey: 1847–1907* map and compare with the *1990s Census of the Land map*. You will be assigned one biome to focus on as you compare and contrast the two maps.

**BIOME NAME:**

**PRIMARY VEGETATION (HISTORICALLY):**

**SUMMARY OF LAND COVER IN 1990:**

1. Were there significant changes to the land in your biome between the original vegetation survey (1847–1907) and 1990? What do you think led to those changes?

2. What do you think the land cover in Minnesota will look like in your biome in 2050? Why?

Next you will receive an Animal Information Sheet with information about an animal in your biome that has special status in Minnesota due to struggling populations. Read the information carefully and answer the following questions.

**ANIMAL NAME:**

3. What evidence is there that this animal should have special status (endangered, threatened, special concern)?

4. How are changes in the landscape of your biome affecting this animal?
5. Using what you know so far, make a prediction about what will happen to the population of this animal over the next 50-100 years. Explain your answer.

6. Imagine that you have the opportunity to make recommendations to state wildlife officials about how to protect this animal and bolster its population in the future. What recommendations would you make? Explain your answer.
Minnesota Quest 6–8th grades 34

Mineral Quest

Urban/Rural Development (2.7%)
Cultivated Land (42.0%)
Hay/Pasture/Grassland (9.2%)
Bushland (2.5%)
Forest (26.7%)
Water (5.9%)

Map Key

Data Source: Mn. Dept. of Natural Resources. This data set integrates six different sources of data to provide a generalized overall view of Minnesota’s land use.

 Authorities: Mn. Game, Fish & Wildlife; Mn. Dept. of Natural Resources; Mn. DoT; Mn. Bd. of Regents

Map Production: Mn. Land Management Information Center; 3/11/05; JSM
Species Name: Burrowing Owl (Athene cunicularia)

Description:
The burrowing owl is very small, 9–11 inches high. It is brown with long legs, a short tail, and lack of ear tufts. It's most often seen perched on the ground or on top of a raised mound or fencepost. This species bobs up and down when it's agitated and will usually dive into its burrow instead of taking flight if it's approached too closely. They live and nest in underground burrows abandoned by mammals. They eat whatever prey they can catch including arthropods, small mammals, amphibians, and reptiles. They hunt by hopping along the ground or observing and pouncing from a perch, primarily at dawn and dusk.

Habitat and Range Description:
Summer habitat includes mixed grass prairies and grazed pastures in far western Minnesota. They tend to live in areas where there are badgers and Richardson’s ground squirrels as they are believed to be the primary burrow excavators of the burrowing owl. Areas of intensive agricultural use are usually avoided. These owls are migratory and are believed to winter in Texas.

Conservation Issues:
The burrowing owl is listed as endangered in Minnesota. The species once bred throughout the western prairie but only 10 breeding records were found in the state between 1965 and 1985. The loss of pastures and prairies is a huge factor in the decline of the species. Declining populations of badgers and ground squirrels in these areas seems to be related since the owls often use their burrows. The use of pesticides in agriculture seems to also be a factor in the population decline.

What's being done to help?
A reintroduction effort began in Minnesota in 1985 but it's success is still uncertain. Preservation of short-grass prairies is important as is the protection of Richardson’s ground squirrel populations and habitat. It is important to educate landowners in burrowing owl habitat about the importance of conserving burrowing owls and their habitat.
CONIFEROUS FOREST

Species Name: Moose (Alces alces)

Description:
The moose is Minnesota’s largest wild animal, averaging 950–1000 pounds. It is also the largest member of the deer family. Antlers can be up to five feet across and weigh up to 40 pounds. Moose have poor eyesight but excellent hearing and sense of smell. They have long legs and splayed hooves enabling them to move easily through marshy areas and along lakes and streams in northern Minnesota where they browse on aquatic vegetation and various types of trees and shrubs along the water’s edge. The main predators of moose are wolves and bears.

Habitat and Range Description:
Once present in much of northern Minnesota, moose are mostly found in the northeastern corner of the state now. There may be a few still in the northwestern part of the state. They prefer young forests that have been created by forest fires, windstorms, and logging and they spend much of their time in ponds, lake shores, and other wetland areas.

Conservation Issues:
In Minnesota, the moose population declined by more than 50% between 2006 and 2015. If this trend continues, few moose will be left in the state by the end of the decade. The moose was just listed as a species of special concern in the state of Minnesota.

What’s being done to help?
The reasons for the rapid decline of the moose population in Minnesota has stumped and alarmed researchers. Scientists are studying how warming temperatures, parasites, predation, and other factors may be influencing Minnesota’s moose populations.
DECIDUOUS FOREST

Species Name: Timber Rattlesnake (*Crotalus horridus*)

Description:
The timber rattlesnake is large, averaging 32–48 inches in length. It has a broad, triangular-shaped head and narrow neck and distinctive barred body pattern with gray to tan rattles on the tail. Coloring is gray to yellow to dark brown. The timber rattlesnake is one of two venomous snakes in Minnesota (the other is the Eastern Massasauga). Timber rattlesnakes are active between May and October and hibernate in den sites in the winter. They mainly eat small mammals, but have also been known to eat small birds, insects, and amphibians. They occasionally spend time in trees.

Habitat and Range Description:
Timber rattlesnakes have specific habitat needs. They prefer den sites on forested bluffs and rock outcroppings along the Mississippi River in southeastern Minnesota. They take advantage of surrounding forests, prairies, and agricultural fields for hunting grounds. Timber rattlesnakes usually use the same den year after year for hibernation and gestation of pregnant females.

Conservation Issues:
Surveys conducted in the 1990s and 2000s showed that populations have been substantially reduced or completely exterminated from areas where they occurred historically. The major cause of the timber rattlesnakes decline is willful destruction by humans who have often destroyed snakes and their den sites. This is not an aggressive species but because people have a lot of fear of rattlesnakes they have been systematically killed for more than 100 years. Habitat destruction, road mortality (being run over by cars), and collection for the pet trade are other major factors in the population's decline. Due to the fact that timber rattlesnakes have relatively long lifespans, low reproductive rates, and high juvenile mortality, the removal of any single individual from the population makes a significant impact.

What's being done to help?
Laws have been created that prohibit collecting or killing of timber rattlesnakes at den sites. Research is currently being conducted to monitor populations and study habitat needs in order to make recommendation for protecting their habitats. Education efforts have been important so that people understand that timber rattlesnakes are not an aggressive species and they are an important part of Minnesota's ecosystems and natural history.
WEB RESOURCES

Minnesota Department of Natural Resources ............... dnr.state.mn.us
Minnesota's Changing Climate ................................ climategen.org
Minnesota Historical Society ................................ mnhs.org
Minnesota State Climatology Office ......................... climate.umn.edu
Minnesota Zoo ........................................ mnzoo.org
Natural Vegetation of Minnesota ......................... files.dnr.state.mn.us/eco/mCBS/natural_vegetation_of_mn.pdf