

1

The Kansas Prairie

Class Introduction**Activity 1: Prairie Profile****Worksheet a: Prairie Animals****Worksheet b: Prairie Ecosystem****Activity 2: Prairie Soils****Activity 3: Water Movement****Activity 4: Warming Up!****Worksheet a: Temperature Records****Evaluation: Student Worksheet****What I Know About the Kansas Prairie****OUTCOMES**

The students will

- Separate land, air and underground animals.
- Observe soil compaction and water absorption.
- Observe water movement in plants.
- Measure and graph temperatures.

Educator Introduction

The North American prairie stretches from the foothills of the Rocky Mountains to the Mississippi River and from southern areas of Canada down into the state of Texas. High summer temperatures and light rains produce an abundance of grass in the prairie, but few trees. The land itself has a rippled surface, including both rolling hills and flat areas. Native prairies, grasslands that have never been planted to crops, are as rich in diversity of plants and animals as the rain forests.

Kansas is a prairie state. Nearly 40 percent of the total land area in Kansas is grassland — growing grass that feeds cattle, sheep, deer and other animals. This grassland is better suited to ranching than farming because the land itself is too rocky or rough for planting and growing crops. Nearly 250 different species of grasses grow in Kansas.

Prairie, rangeland and grassland are all words used to describe a type of land, dominated by grasses with only scattered trees and shrubs. Specific areas or parcels of land may be identified by the types of grasses grown there. Soils and rainfall amounts, as well as landscape features and geological history, determine which grasses and plants grow well in the different areas of the state. For example, Kansas has more tallgrass prairie than all the other prairie states combined. The Flint Hills in eastern Kansas is the largest re-

Unit 1: Introduction, *continued*

remaining area of tallgrass prairie in North America, with more than 50% of the remaining tallgrass prairie.

There are 2.5 million acres of permanent pasture in Kansas, grasslands that are enclosed by permanent fences and are used for grazing livestock. Most of these pastures are native with prairie plants and soils that have never been cultivated.

In addition to the 20 million acres of native grassland and tame pastures, Kansas farmers have planted more than 2.6 million acres of cropland to grasses through the Conservation Reserve Program (CRP). Among the 50 states, Kansas ranks fourth in the number of acres planted to CRP. CRP acres cannot be used to graze livestock or for hay, except in approved emergency situations.

GROWING GRASS

Grazing describes the movement of cattle, deer and other animals as they move and eat grass and other plants. Through grazing, food is produced from grass — a renewable resource.

Farmers and ranchers use management practices that protect the soil and grow healthy desirable plants in Kansas pastures and grasslands. Fire is one management practice that Kansas farmers and ranchers use, particularly in the Flint Hills and other areas in eastern and central Kansas. Since the early 1900s, prescribed burning has been used in the Flint Hills to produce more grass with higher nutritional value. The use of fire as a management practice discourages the growth of undesirable broadleaf and woody species.

Fences are used to control the movement of cattle and other livestock. Livestock are often rotated between pastures to give the grass an opportunity to generate new growth. The grass plants in a pasture will grow back when rested between grazing periods, if there is enough rainfall. The number of animals grazing in a pasture is also controlled to help maintain strong healthy plants. When grazing is managed properly, the prairie ecosystem is protected and enhanced.

PLANT GROWTH

Plants need soil, water, air and sunlight to grow. Plants produce food in their leaves using energy from the sun, carbon dioxide from the soil and water and nutrients from the soil to produce sugars and carbohydrates. This process is called photosynthesis.

Roots are important because they supply the plant with water and nutrients from the soil. Roots also anchor the plants in the soil. Stems allow the water and other nutrients to move back and forth between the roots and leaves.

KANSAS LIVESTOCK

The prairie grasslands are the foundation for the livestock industry in Kansas. One and a half million beef cows and their calves plus four to six million yearling animals depend on the prairie pastures and grasslands for high-quality feed each year. Other livestock, including dairy cattle, sheep, goats and horses also graze Kansas pastures. Deer, quail, prairie chickens, pheasants, wild turkeys and other wildlife share the prairie and water resources.

Kansas farmers and ranchers balance the needs of livestock while maintaining desirable habitat for plants and wildlife. These efforts ensure that Kansas will continue to be a prairie state.

RESOURCE BOOKS

*Teachers and Advanced Readers

THE PRAIRIE ECOSYSTEM

*Bannatyne-Cugnet, Jo. *A Prairie Alphabet*. Tundra Books of Northern New York, 1994. (0887763235) (1992, 0887762921)

———. *A Prairie Year*. Tundra Books of Northern New York, 2001. (0887765696) (0887763340)

———. *Heartland: A Prairie Sampler*. Tundra Books of Northern New York, 2002. (088776567X)

Bouchard, David. *If You're Not from the Prairie*. Simon and Schuster Children's, 1998. (0689820356) Orca Book Publishers, 1998. (1895714664)

———. *Prairie Born*. Econo-Clad Books, 1999. (061329498X) Orca Book Publishers, 1999. (1551431521)

Cole, Joanna. *The Magic School Bus, Wet All Over: A Book About the Water Cycle*. Scholastic, Inc., 1996. (0590508334) Spanish - Scholastic, Inc., 1996. (059085951X)

*Dvorak, David Jr. *A Sea of Grass: The Tallgrass Prairie*. Simon and Schuster Children's, 1994. (0027332454) Out of Print - Available through Interlibrary Loan.

*Fisher, Ron. *Heartland of a Continent: America's Plains and Prairies*. National Geographic Society, 1994. (0870448307) Out of Print - Available through Interlibrary Loan.

Fowler, Allan. *Living on the Plains*. Scholastic Library Publishing, 2000. (0516270540) (0516215655)

Geisert, Arthur. *Prairie Town*. Houghton Mifflin Company, 1998. (0395859077)

Glaser, Linda. *Wonderful Worms*. Millbrook Press, 1994. (15629473030 (1992, 1562940627)

Hinshaw, Dorothy Patent. *Life in a Grassland*. Lerner Publishing Group, 2003. (0822521393)

Johnson, Rebecca L. *Walk in the Prairie*. Lerner Publishing Group, 2000. (1575051532)

*Levy, Janey. *What Lives on a Prairie?* The Rosen Publishing Group, Inc., 2003. (0823937011)

Llewellyn, Claire. *Earthworms*. Scholastic Library Publishing, 2002. (0531148254) (0531146510)

Martin, Patricia A. *Prairies, Fields and Meadows*. Scholastic Library Publishing, 2001. (0531118592)

Rowan, James P. *Prairies and Grasslands*. Scholastic Library Publishing, 1983. (0516017063)

*St. Antoine, Sara, editor. *Stories from Where We Live - the Great North American Prairie*. Milkweed Editions, 2001. (1571316302)

Salzmann, Mary Elizabeth. *On a Prairie*. ABDO Publishing, 2002. (1577655680)

Siebert, Diane. *Heartland*. HarperCollins Children's Books, 1992. (0064432874) (1989, 0690047304) Econo-Clad Books, 1992. (0833590804)

*Silverstein, Alvin and Virginia. *Life in a Bucket of Soil*. Dover Publications, Inc., 2000. (0486410579)

Stone, Lynn. *The Prairie*. Rourke Publishing, LLC. 1996. (0865934207)

———. *Prairie Dogs*. Rourke Publishing, LLC, 1993. (086593284)

Taylor, David. *The Bison and the Great Plains*. Crabtree Publishing Co., 1992. (0865053669)

*Wallace, Marianne D. *America's Prairies and Grasslands: Guide to Plants and Animals*. Fulcrum Publishing, 2001. (1555919928)

Resources

RANCHING

Gardella, Tricia. *Just Like My Dad*. Boyd Mills Press, 2000. (1563979179) Econo-Clad Books, 2000. (0613299981)

*Morgenroth, Barbara. *Get Inside a Ranch*. Silver Moon Press, 1994. (1881889564)

Peterson, Cris. *Amazing Grazing*. Boyd Mills Press, 2002. (156397942X)

Scott, Ann Herbert. *Cowboy Country*. Houghton Mifflin Company, 1996. (0395764823) (1993, 0395575613)

———. *Someday Rider*. Houghton Mifflin Co., 2000 (0618040811) (1991, 039558115X) Econo-Clad Books, 1991. (061328075X)

*Talbert, Mark. *Holding the Reins: A Ride through Cowgirl Life*. HarperCollins Publishers, 2003. (060292563)

PRAIRIE HISTORY

*Bataille, Gretchen M. and Kathleen Mullen Sands. *American Indian Women: Telling Their Lives*. University of Nebraska Press, 1987. (0803260822)

Brenner, Barbara. *Wagon Wheels*. HarperCollins Children's Books, 1999. (0060206691) (0060206683) (1984, 0064440524)

Erickson, Paul. *Daily Life in a Covered Wagon*. Econo-Clad Books, 1997. (0613028384) Penguin USA, 1994. (0140562125)

*Fox, Mary Virginia. *The Story of Women Who Shaped the West*. Scholastic Library Publishing, 1991. (0516447572)

*Griekspoor, Phyllis and Beccy Tanner. *Kansas: The Prairie Spirit History People Stories*. Grace Dangberg Foundation, Inc., 2000. (0913205265)

Hopkinson, Deborah. *Prairie Skies: Cabin in the Snow*. Aladdin Paperbacks, 2002. (0689843518) Simon and Schuster Adult Publishing Group, 2002. (0689843526)

———. *Pioneer Summer*. Simon and Schuster Adult Publishing Group, 2002. (068984320X) Econo-Clad Books, 2002. (0613450930) Aladdin Paperbacks, 2002. (0689843496).

*Kalman, Bobbie. *Who Settled the West?* Crabtree Publishing Co., 1999. (0778700755)

*———. *Women of the West*. Crabtree Publishing Co., 1999. (0778700801) (0778701123)

Kamma, Anne. *If You Were a Pioneer on the Prairie*. Scholastic, Inc., 2003. (0439414288)

*Katz, William Loren. *Black Women of the Old West*. Simon and Schuster Children's, 1995. (068931944)

*———. *Black People Who Made the Old West*. Africa World Press, Inc., 1993. (086543364X) (1992, 0865433631)

Littlefield, Holly. *Children of the Trail West*. Lerner Publishing Group, 2003. (1575053047)

*Miller, Brandon Marie. *Buffalo Gals: Women of the Old West*. Lerner Publishing Group, 1997. (0822597721) (1996, 0822517302)

Reynolds, Marilyn. *The New Land: A First Year on the Prairie*. Orca Book Publishers, 1999. (1551430711) Econo-Clad Books, 1999. (0613181875)

———. *The Prairie Fire*. Orca Book Publishers, 2001. (1551431750) (1999, 1551431378)

Rounds, Glen. *Sod Houses on the Great Plains*. Holiday House, Inc. 1996. (0823412636) (1995, 0823411621)

Turner, Ann Warren. *Dakota Dugout*. Simon and Schuster Children's, 1989. (0689712960) Econo-Clad Books, 1989. (0833527932)

BISON (BUFFALO)

*Berman, Ruth. *American Bison*. Lerner Publishing Group, 1992. (0876146973) Spanish - Lerner Publishing Group, 1994. (087614976X)

Crewe, Sabrina. *The Buffalo*. Steck-Vaughn, 1999. (0817262385) Raintree Publishers, 1997. (0817243771)

Doner, Kim. *Buffalo Dreams*. Graphic Arts Center Publishing Co., 1999. (1558684751) (155868476X)

*Hoyt-Goldsmith, Diane. *Buffalo Days*. Holiday House, Inc., 1997. (0823413276)

Johnston, Marianne. *Buffaloes*. The Rosen Publishing Group, Inc., 1997. (0823951472)

Koestler-Grack, Rachel A. *Sioux: Nomadic Buffalo Hunters*. Capstone Press, 2003. (0736815406)

Lee, Evelyn. *Bluestem Horizon: The Story of a Tallgrass Prairie*. Soundprints, 1999. (1568995997) (1998, 1568995970, 1568995962, 1568995954)

Lepthien, Emilie U. *Buffalo*. Scholastic Library Publishing, 1989. (0516011618)

Potts, Steve. *American Bison*. Capstone Press, 1997. (1560654686)

Robbins, Ken. *Thunder on the Plains: The Story of the American Buffalo*. Simon and Schuster Children's, 2001. (0689830254)

Roop, Peter Geiger and Michael Lacapa. *The Buffalo Jump*. Northland Publishing AZ, 1999. (0873587316) Previously published as *Little Blaze and the Buffalo Jump*.

Waldman, Neil. *They Came from the Bronx: How the Buffalo Were Saved from Extinction*. Boyd Mills Press, 2001. (1563978911)

WEB SITES AND OTHER RESOURCES

THE PRAIRIE ECOSYSTEM

Bison History, Facts and Photos — Wind Cave National Park, SD, www.nps.gov/wico/bison.htm

Changing Landscapes — Feb./March 2003, Kansas Geography — April 1999, Kansas Kaleidoscope. Kansas State Historical Society, 6425 S. W. Sixth Ave., Topeka, KS 66615, 785-272-8681, www.kshs.org/publicat/kaleidoscope/past.htm

Dig In! Hands On Soil Investigations — National Science Teachers Association, 2001. (0873551893) To order: store.nsta.org/

Educational Products — National Association of Conservation Districts, nacdnet.org/education/products.html

Environmental Explorers' Club — U.S. Environmental Protection Agency, www.epa.gov/kids

Frequently Asked Questions — National Bison Association, www.bisoncentral.com/nba/faq.asp

Fun Facts about Grasses, Trees, Wildflowers and Shrubs — Kansas Scenic Byways Program, Kansas Department of Transportation, 7th Floor, Docking State Office Building, Topeka, KS 66612, 785-296-3585

Kansas Rangelands — Kansas State University, www.lib.ksu.edu/ksrange/kshome.html

The Learning Web — U.S. Geological Survey, water.usgs.gov/education.html

Lessons, Resources — Nebraska Earth Sciences Education Network, www.nesen.unl.edu

Photos of Best Management Practices (water, soil) — Kansas Conservation Commission, www.accesskansas.org/kscc/photos.html

Resources

Range of Wonders (Environmental Adventures) — Soil and Water Conservation Society, www.swcs.org/f_pubs_booklist.htm

S. K. Worm — Natural Resource Conservation Service, USDA, www.nrcs.usda.gov/feature/education/squirm/skworm.html

Soil Fact Sheet Set — Soil and Water Conservation Society, www.swcs.org/f_pubs_booklist.htm

Soils — Natural Resources Conservation Service, USDA, soils.usda.gov

State Soils Photo Gallery — Natural Resources Conservation Service, USDA, soils.usda.gov/gallery/state_soils/

Water Science for Schools — U.S. Geological Survey, ga.water.usgs.gov/edu/

RANCHING

Brief History of Windmills ... — www.windmillersgazette.com/history.html

Diamond R Ranch (interactive children's Web site) — National Cowboy and Western Heritage Museum, www.nationalcowboymuseum.org

Ranch Diaries — National Cattlemen's Beef Association, www.beef.org, Beef Production>Diaries>Diaries> (Choose Family)

PRAIRIE HISTORY

Oh, Give Me a Home Where the Buffalo Roam: The Story of Life on the Kansas Prairie — April/May 2001, Settlement in Kansas — September 1998, Kansas Kaleidoscope, Kansas State Historical Society, 6425 S. W. Sixth Ave., Topeka, KS 66615, 785-272-8681, www.kshs.org/publicat/kaleidoscope/past.htm

Home on the Range

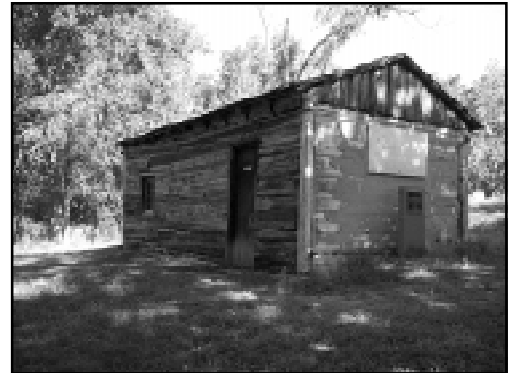
by Dr. Brewster M. Higley

Oh give me a home,
Where the buffalo roam
Where the deer and the antelope play,
Where seldom is heard
A discouraging word
And the skies are not cloudy all day!

Home, home on the range
Where the deer and the antelope play,
Where seldom is heard
A discouraging word
And the skies are not cloudy all day!

How often at night
When the heavens are bright
With the light of the glimmering stars,
I have stood there, amazed
And asked as I gazed
If their glory exceeds that of ours.

Home, home on the range
Where the deer and the antelope play,
Where seldom is heard
A discouraging word
And the skies are not cloudy all day!



This is the original Home on the Range cabin, located in Smith County, Kansas. This cabin is where Dr. Higley lived when he wrote the song.

Unit 1: Class Introduction

Home on the Range

Directions: Match the word in the first column with the picture in the second column.

deer



clouds



stars



buffalo



home



Prairie Profile

LEVEL: Lower Elementary

SUBJECTS: Art, Science

SKILLS: Cutting, sorting by characteristics, pasting

BACKGROUND INFORMATION

Grasses dominate nearly one-half of the Earth's land surface. These grasslands are the best use for lands that are not suitable for planting, growing and harvesting crops. Grasslands may also be lands that have not been developed for social, economic or legal reasons.

Nearly 50% of the land in the United States is grassland or rangeland. Kansas is part of the North American prairie, stretching from the Rocky Mountains to the Mississippi River and from southern Canada into Texas. Soils and rainfall amounts, as well as landscape features and geological history, determine the types of grasses and plants that grow in different regions.

Grazing animals, such as cattle, sheep and bison (buffalo), harvest the grasses. Ruminants, animals with a four-compartment stomach, are able to digest plants that humans cannot digest. These animals convert grasses into meat and milk, which are high-quality proteins for human consumption.

With 20 million acres of grass, Kansas is ideal for grazing animals. By controlling the number of grazing animals and the length of the

time the animals graze an area, the healthy growth of desirable plants is actually stimulated. Proper management of grasslands and pastures also protects the soil and improves water quality while providing wildlife habitat and recreational opportunities. Pastures are fenced to control the movement of livestock.

Water is pumped from wells in the ground by windmills, electricity or solar power into water tanks to make water available for grazing animals and wildlife. Other water sources include ponds and springs.

PROTEIN

Unlike plants, which can convert sunlight, water, nutrients and carbon dioxide into food, humans must eat animal and plant products to absorb the nutrients they need. Protein is the most critical nutrient. Complete proteins contain all the necessary amino acids, the building blocks for muscles, nerves and organ tissues. In order to grow properly and remain healthy, humans need to eat complete proteins. Animal proteins found in meat and milk are complete proteins while plant proteins lack one or more of the essential amino acids.

BRIEF DESCRIPTION

The students will cut out and paste animals into their ecosystems.

OUTCOMES

The students will

- Separate land, air and underground animals.

ESTIMATED TEACHING TIME

20 minutes

HOME ON THE RANGE

The official state song of Kansas is “Home on the Range.” It was adopted as the state song in 1947. The song was written around 1871 by Dr. Brewster M. Higley, a pioneer from Smith County, Kansas. (see Unit 1, class introduction, pages 15-16)

Dr. Higley’s song expressed an appreciation for the Kansas prairie and the wildlife that lived on the prairie at that time.

Today, through careful management, the Kansas prairie supports both livestock and wildlife. In fact, 75 percent of the wildlife in the United States lives on farms and ranches.

BISON (BUFFALO)

The American Bison (scientific name *Bison bison*) was adopted as the Kansas state mammal in 1955. Bison actually belong to the same family of animals as sheep and goats and are not related to Asian and African buffaloes. However, early explorers called them buffalo when they first saw the animals in North America. Today, “buffalo” and “bison” are both used to describe the animals, although bison — or more specifically, American Bison — is the correct way to identify these animals.

Estimates of the bison herd in North America range from 30 to 70 million animals in the early 1800s. However, the majority of the bison were killed between 1830 and 1855, reducing the herd to 1,500 animals in the late 1800s. Today, there are around 350,000 bison in the United States in private and public herds.

TEACHER PREPARATION**MATERIALS NEEDED**

- One copy of each worksheets 1-1a and 1-1b, pages 19 and 20 for each student

ACTIVITY

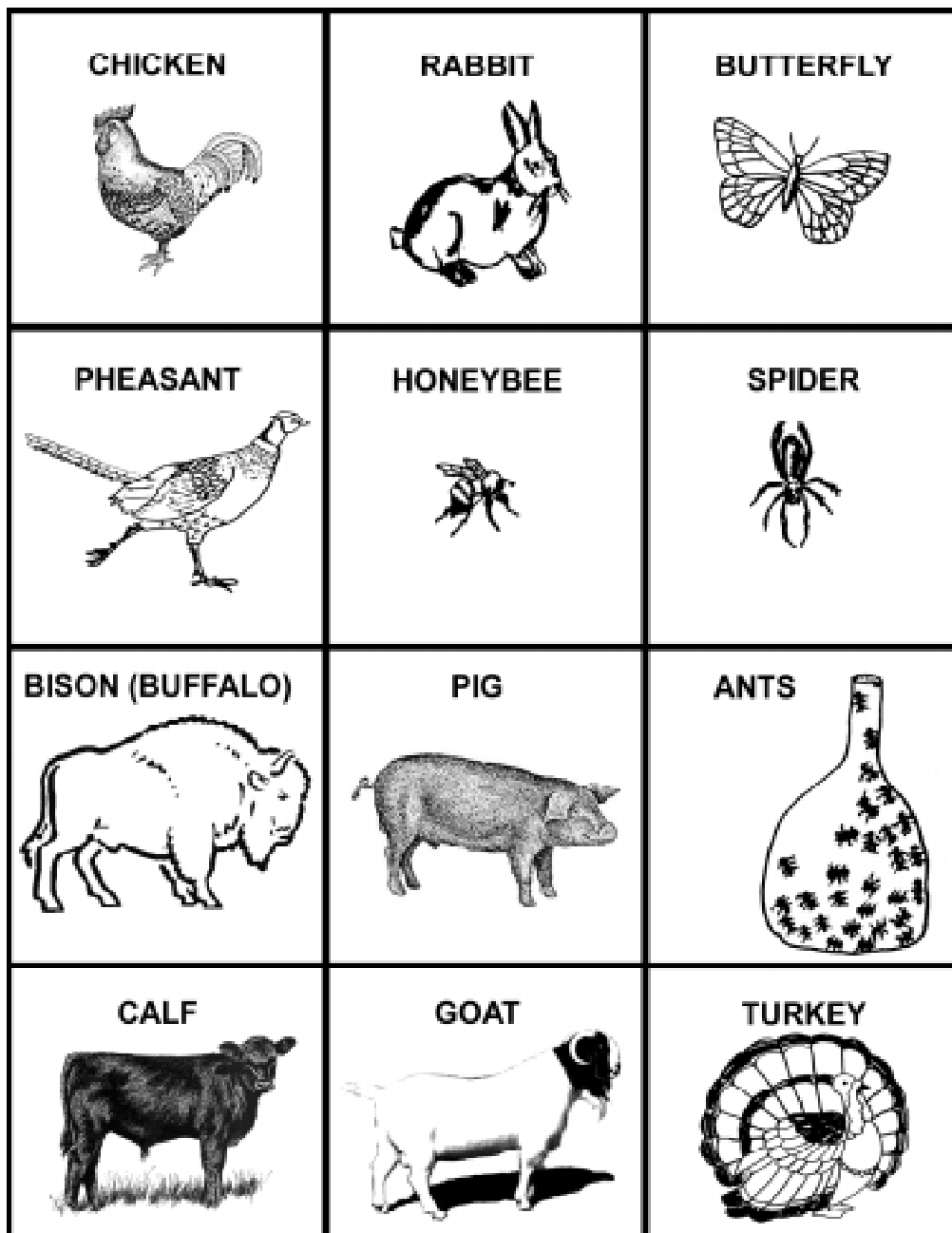
1. Instruct students to choose five prairie animals and cut them out.
2. Have the students place the prairie animals where they belong in the prairie ecosystem.

DISCUSSION QUESTIONS

1. Why are grazing animals, such as cattle, sheep and bison (buffalo) important to the prairie ecosystem? (They harvest the grasses. They are able to digest plants that humans cannot digest. They convert grasses into meat and milk, which are high-quality proteins for human consumption.)
2. What are some water sources for animals? (Water tanks, ponds and springs)
3. What is the state song of Kansas? (“Home on the Range”)

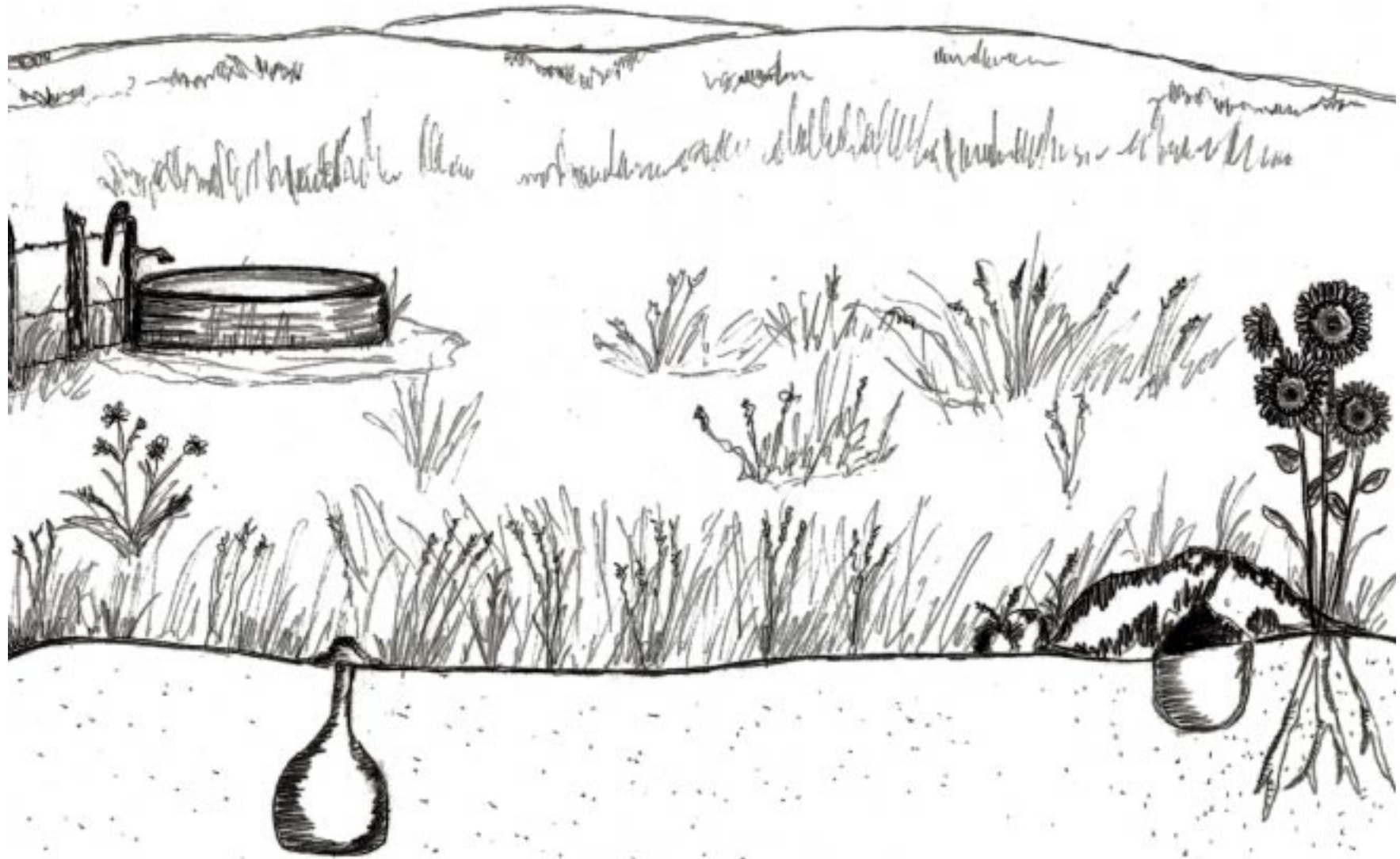
Prairie Animals

Directions: Choose five animals. Cut them out and place them where they belong on the Prairie Ecosystem.



Name _____

Prairie Ecosystem



Prairie Soils

LEVEL: Lower Elementary

SUBJECTS: Science, Social Studies

SKILLS: Developing hypothesis, performing experiment, discussing results

BACKGROUND INFORMATION

The amount of land in Kansas that is grassland is slightly less than the amount of land used for growing crops. Its soils make it possible for Kansas to be a leader in the production of major agricultural commodities, both crops and livestock. Kansas has more acres of prairie soils than any other state.

Soils are classified according to their texture. Soil texture is determined by the amount of sand, silt or clay in the soil. These three components vary in size, with sand being the largest and clay particles as the smallest. All soil needs some clay to hold moisture in the soil. Sand helps keep the soil from being too compact or solid.

The state soil of Kansas is Harney Silt Loam. "Harney" means "people." It was adopted from an ancient Wichita Indian term, "harahey," meaning "Pawnee Indian." Kansas is one of only seven states to have named an official state soil, a measure of its importance in the state.

Harney Silt Loam has all the desirable qualities of an ideal prairie soil. The Kansas state soil is a deep, well-drained soil. The topsoil, the top layer, is a dark grayish brown color. The lower layers, called subsoils, become lighter in color and more gray than brown, as they go down.

The subsoils contain clay particles that help hold moisture in the soil.

Harney Silt Loam was formed from windblown dust from eroding boulders and rocks left by the Ice Age and from sediments deposited in ancient rivers. It covers nearly four million acres in 26 west central Kansas counties.

SOIL COMPACTION

When soil is tightly compressed together, it has a negative impact on growing plants. Roots may not be able to penetrate the compacted soil and water from rain or irrigation cannot reach the roots or drain away from the surface of the soil. Compaction is undesirable anywhere that plants or trees are grown. It can also contribute to flooding since the water can't be absorbed into the soil.

There are places where compaction is desirable or even necessary. Examples of such areas would include roads or streets, a running track or walking trail, a bicycle path, or the infield of a softball or baseball field. Even if areas are covered by cement or asphalt, the dirt, sand, rocks and other materials in the base of the area have been compacted.

Soil compaction can impact plant growth for many, many years. Today, there are places in Kansas where the Oregon Trail, Santa Fe

BRIEF DESCRIPTION

The class will make a hypothesis about compaction, perform an experiment using cereal and discuss the results.

OUTCOMES

The students will

- Observe compaction and water absorption.

ESTIMATED TEACHING TIME

15 minutes

Trail, and other trails can be traced through pastures and areas that have never been cultivated. The grasses that grow in the wagon ruts are slightly different than the grasses growing nearby. In some areas where the wagons went over a ridge, up a steep hill or cut through a stream, the wagon ruts themselves are still visible.

EARTHWORMS

Night and day, earthworms are tunneling through acres of soil, working like small rototillers and swallowing soil as they go. Through the digestion process, nutrients are released into the earthworms' waste, called worm castings. The soil contains tiny bits of plants and animals.

As they tunnel through the soil, earthworms also make openings where roots can grow. The openings improve the soil's ability to absorb and hold water. The worm castings add nutrients such as nitrogen, potassium and phosphorus to the soil.

Earthworms are very important to farmers and ranchers. Earthworms improve the soil. An earthworm can eat its own weight in 24 hours. An acre (an area approximately the size of a football field without the end zones) of earthworms can move 20 TONS of soil in a year.

No-till farming, practiced by many Kansas farmers and ranchers, relies on earthworms tunneling through the soil to create openings for water and improve the soil — rather than breaking up the surface of the soil with tillage equipment pulled by a tractor.

Earthworms have no heads, no eyes, no teeth and no antennae. Ringlike segments form their bodies. The front of the body is indicated by a swollen band near one end, usually lighter in color than the other segments. Earthworms can be found at the surface of the soil after it rains. They must stay moist but too much water can cause problems. Earthworms are sensitive to light and vibrations.

TEACHER PREPARATION

MATERIALS NEEDED

- Two clear plastic cups
- Crispy rice cereal
- Water (*optional: color with food coloring for dramatic effect*)

ACTIVITY

1. Ask students to hypothesize about which will absorb water faster — a cup of crushed cereal or a cup of regular cereal.
2. Fill both cups with cereal.
3. Smash the cereal in one of the cups, breaking the cereal into smaller pieces until there is a flat layer at the bottom of the cup.
4. Fill the cup again with cereal and smash the cereal until the cup is full of small pieces of cereal.
5. Pour the water into both cups.

DISCUSSION QUESTIONS

1. What is compacted soil? (Closely packed soil which makes a dense or solid material.)
2. Why does compaction make it difficult for plants to grow? (The roots and water cannot penetrate the compacted soil.)
3. Would a farmer want soil compaction? (Compaction is undesirable in fields where crops must grow.)
4. How does soil become compacted? (By running heavy equipment over it many times or driving or walking in the same exact places over long periods of time.)
5. Are there examples of soil compaction around the school? (Bare areas of the playground where grass doesn't grow, such as under playground equipment, or paths or shortcuts across grassed areas.)

Water Movement

LEVEL: Lower Elementary

SUBJECTS: Science

SKILLS: Developing hypothesis, performing experiment, discussing results

BACKGROUND INFORMATION

All living things need water, food and energy to live and grow. Plants, including grasses, wildflowers and trees, are the only living things that make their own food, through a process called photosynthesis. Plants need four things to make food — carbon dioxide, water, nutrients and sunlight. Leaves are the food factories for plants, turning the carbon dioxide, water, nutrients and sunlight into sugar. Plants use the sugar for energy to live and grow.

Without water, the leaves of a plant will dry up and stop producing the sugar needed to keep the plant growing. Roots gather water and nutrients from the soil and move the water and nutrients through stems to the leaves. Stems may grow above ground or below ground, horizontally or vertically. There are round stems, square stems, three-sided triangular stems, stems that are somewhat flat, grooved stems, woody stems, barrel-shaped stems, ball-shaped stems, stems covered with spines and smooth stems. All serve the same function — supplying water to the leaves and carrying the sugar manufactured in the leaves to storage in seeds, roots and stems. Stems also display leaves, flowers and fruit.

All leaves contain chlorophyll, a green pigment that absorbs sunlight and is necessary for photosynthesis. When the process of making sugar slows down or stops completely, the chlorophyll is no longer needed and slowly disappears from the leaves.

Leaves also contain orange, yellow and brown pigments. As the chlorophyll (and green color) fades, the other colors appear. As a plant shuts down the food-making process, it moves the available sugar into storage. When the sugar gets trapped in the leaves, it dissolves and turns into red, orange or purple colors.

Nearly 250 different species of grasses grow in Kansas. Just like trees and other plants, grasses display a variety of colors and the colors change throughout the year. Most changes are due to the same food-making process found in other green plants. Some grasses have unique characteristics that cause color changes. Big bluestem, for example, has a waxy layer on the outside of the stem that helps prevent water loss. The blue-colored wax wears off as the growing season progresses, and the stems appear more brown or red.

BRIEF DESCRIPTION

The class will perform an experiment to test the water absorption of celery.

OUTCOMES

The students will

- Observe water movement in plants.

ESTIMATED TEACHING TIME

Set up: 10 minutes

Wait 2 days

Discussion: 20 minutes

Grasses and other plants, trees and crops in Kansas display the changes in seasons — from green to brown and back to green again. A closer look, though, reveals many color variations that create a living landscape.

TEACHER PREPARATION

MATERIALS NEEDED

- Eye dropper
- Red food coloring
- 1/2 teaspoon of sugar
- Glass of water
- Freshly cut celery stalk
- Knife

ACTIVITY

1. Add several drops of red food coloring and 1/2 teaspoon of sugar to a glass of water. Stir.
2. Place a cut stalk of celery in the solution and let it stand in sunlight for two days.
3. Remove the celery and cut it into several sections.

ADDITIONAL ACTIVITY

Using a green houseplant, observe what happens when the plant is not watered. The leaves will droop, turn lighter in color, and drop off the plant. When the plant is watered again, the leaves (and stems) will perk back up and new growth will appear.

DISCUSSION QUESTIONS

1. Did the celery change color?
2. How did the red color move through the celery stalk?
3. In a plant, where would the water come from? (Water from the soil is collected by the roots.)

Warming Up!

LEVEL: Lower Elementary

SUBJECTS: Math, Science

SKILLS: Developing hypothesis, performing experiment, recording data, discussing results

BACKGROUND INFORMATION

Keeping plants healthy is an important job. Plants often need warm periods of time before they can do their jobs. A healthy plant absorbs more sun and has more photosynthesis allowing it to be more productive. Growing Degree Units for plants are called heat units. When plants get sick, their leaves turn pale and dry, and they are unable to take in the sun and cannot feed on nutrients.

The process of photosynthesis is when a plant uses sunlight energy to convert water and carbon dioxide into oxygen and other organic compounds. Sugars are the first products of photosynthesis and are converted into starch, protein, oil and thousands of other chemical compounds.

Photosynthesis produces the oxygen in the earth's atmosphere. The earth's atmosphere is composed of oxygen (21%), nitrogen (78%) and other elements such as Argon, water and carbon dioxide (1%).

Some plants are more efficient in converting carbon dioxide and water into oxygen and organic matter. Corn and grain sorghum (milo) are faster in this conversion process than other grains. Many animals eat corn and grain sorghum to produce protein foods for people. These two plants, along with the grasslands in Kansas, produce more biomass (living matter) than the average forest.

TEACHER PREPARATION

MATERIALS NEEDED

- 2 quart-sized plastic jars
- Sheet of black paper
- 3 sheets of white paper
- Clear tape
- Thermometer
- Cool water (55-65°F)
- One copy of worksheet 1-4a, page 27.

BRIEF DESCRIPTION

The class will perform an experiment to test the heating effects of sunlight.

OUTCOMES

The students will

- Measure and graph temperatures.

ESTIMATED TEACHING TIME

Set up: 10 minutes

Data recording:

5 minutes every hour for 3 hours

EDUCATOR'S NOTE

Use a thermometer which is filled with alcohol, not mercury.

ACTIVITY

1. Ask students to hypothesize about which color will absorb more heat — black or white.
2. Wrap one jar with white paper and the other one with black.
3. Fill each jar with cool water.
4. Place both jars in the sun on sheets of white paper.
5. Record the beginning temperature on worksheet 1-4a, page 27.
6. Record the temperature every hour for 3 hours.

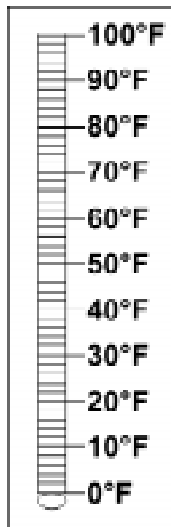
DISCUSSION QUESTIONS

1. Plants need water, food and energy to grow. Where do plants get energy? (from sunlight)
2. Which color is cooler in the sun — white or black? (white)
3. Think about what the weather is like during each season in Kansas. What may be happening to plants during the spring, summer, fall and winter?
 - Spring (mild weather, often crops are planted, when the fastest growth occurs)
 - Summer (hotter weather, growing, ripening of crops)
 - Fall (less sun, cooler temperatures, drying and harvesting of crops, storing energy and nutrients for spring growth)
 - Winter (coldest weather, dormancy or sleep for perennial plants)
4. Why did the water in the jar with black paper get warmer? (As the sun's rays struck the black surface around the jar of water, it absorbed the heat and warmed the water. The rays hitting the white paper were reflected away from the water.)

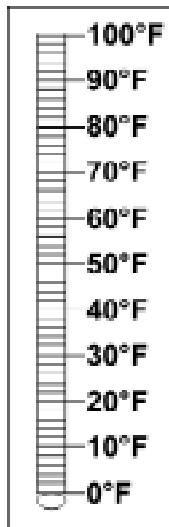
Temperature Records

Directions: Record the temperatures from both jars below.

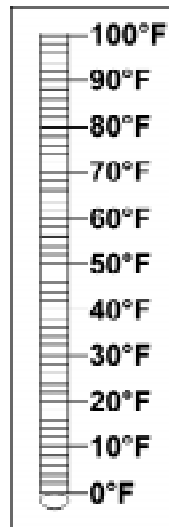
Black Jar Temperature



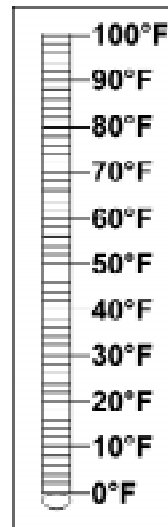
Beginning



1 hour

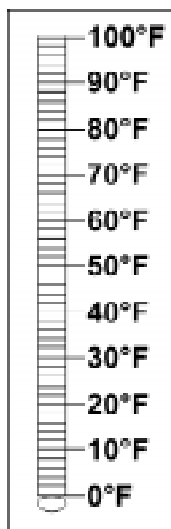


2 hours

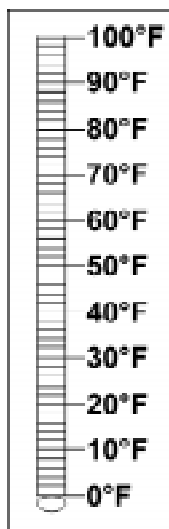


3 hours

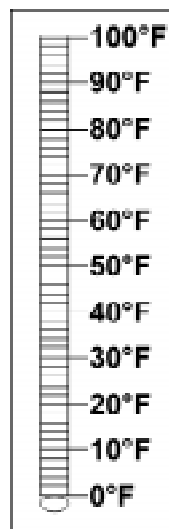
White Jar Temperature



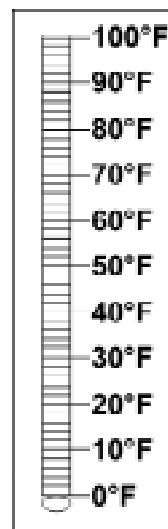
Beginning



1 hour



2 hours



3 hours

I found out...

the jar with the black paper _____

Unit 1: What I Know About the Kansas Prairie

Directions: Fill in the blanks, using the words in the Word Bank.

1. The state song of Kansas is “Home on the _____.”
2. Another name for the buffalo found in Kansas is the American _____.
3. It is difficult for plants to grow in compacted _____ because the roots and water cannot get through the soil.
4. Water from the soil is collected by the _____ of a plant.
5. Plants use energy from _____ to grow.

<p><u>Word Bank</u></p> <p>Bison</p> <p>Range</p> <p>roots</p> <p>soil</p> <p>sunlight</p>
