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Chicago Science Explorers Program

The Chicago Science Explorers Program, sponsored by the Department of Energy, owes its existence to the creativity of Mr. Bill Kurtis (WBBM-TV), the leadership of Dr. Alan Schriesheim, Director of Argonne National Laboratory, and the concern of Admiral James Watkins, former Secretary of the Department of Energy. Mr. Kurtis has created a series of TV programs called "The New Explorers" which profiles individual scientists and their science. He has given use of the tapes of these programs to teachers participating in the Chicago Science Explorers Program. The goal of the program is to introduce students, particularly minorities, to science as a career possibility for their own lives. Most of the schools and classes will come from the Chicago Public Schools, but suburban schools and private schools may also participate.

The Program is organized and implemented through a partnership of cultural and scientific organizations in the Chicago area. These organizations, called the Explorer partners are:

- The Adler Planetarium
- Argonne National Laboratory
- Brookfield Zoo, Chicago Zoological Society
- Chicago Academy of Sciences
- Chicago Police Department, 15th Precinct
- Commonwealth Edison
- Fermi National Accelerator Laboratory
- Field Museum of Natural History
- International Museum of Surgical Science
- Lincoln Park Zoological Gardens
- John G. Shedd Aquarium

To accomplish its goal the Program combines a Kurtis tape, the resources of each Explorer Partner, and specially prepared classroom materials so that each student experiences interesting science activities, contact with scientists, field trips to the Partner facility, and discussions of career opportunities and career preparation in science.

Teaching materials for each tape have been prepared by a tape support group consisting of master teachers, scientists and Partner staff. These materials include:

Background materials and references.
Suggested activities and lessons for use before the tape.
The videotape for showing in the classroom.
Notes for discussion when the tape is shown.
Suggested classroom activities following the tape.
Suggested activities in preparation of the field trip.
Field trip activities and instructions.

Teacher's Guide

From Beneath the Ashes

The Prairie: Above, On and Beneath the Ground

from THE NEW EXPLORERS
A co-production of WTTW/Chicago and Kurtis Productions, Ltd.
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Developed by Fermi National Accelerator Laboratory
for
THE CHICAGO SCIENCE EXPLORERS PROGRAM

Program Director
Samuel P. Bowen, Argonne National Laboratory

Partner Project Director
Marjorie G. Bardeen, Fermi National Accelerator Laboratory

The Fermi National Accelerator Laboratory program and guide designed and written by:
The Tape Support Group:

Lilia S. Bejec	Dieterich Elementary School, Aurora District 131
William F. Fraccaro	Johnson School, Wheaton/Warrenville District 200
Martha C. Gorman	Sycamore Trails School, Elgin District U-46
Bernard J. Jokiel	Washington Middle School, Aurora District 129
Donna S. McDonald	Batavia Junior High School, Batavia District 101
Sheree L. Novotny	Fourth Street School, Geneva District 304

Fermilab staff members:

Christine Abler	Rudolph F. Dorner
David A. Abler	Peter H. Kasper
Mitchell C. Adamus	Finley W. Markley
Robin D. Dombeck	Elizabeth K. Quigg

Laura Vazquez
and other contributing scientists:

Robert Betz	Northeastern Illinois University
James Carpenter	Consultant, Illinois Department of Conservation
Julie D. Jastrow	Argonne National Laboratory
Jerome M. Johnson	Garfield Farm, St. Charles
Robert J. Wolff	Trinity Christian College
Thomas E. Warkins	Natural Landscapes, Winfield
Marcia Lautanen-Raleigh	Schingoethe Center for the Native American Culture

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From Beneath the Ashes : Introduction

From Beneath the Ashes is a program that describes the impact of the Yellowstone fires of 1988 and compares the role of fire in a forest to that on a prairie. Fermi National Accelerator Laboratory uses this video as an opportunity to explore the importance of fire in the Fermilab prairie reconstruction project. Prairies are given special attention because it is possible for school groups to visit Fermilab to study a prairie directly. Because this unit is designed for intermediate students, it has been developed as a whole language unit incorporating activities for science, mathematics, social studies and language arts. It begins by helping students discover what a prairie is and culminates with the importance of fire ecology and the social questions related to protecting existing prairie ecosystems and restoring new ones.

These materials provide a wide range of activities for the professional educator to use in a study of the prairie. Included are ten day-long lessons that present an integrated approach to the subject and provide opportunities for the teacher to incorporate all subject areas. Included are process writing and cooperative grouping experiences utilizing scientific principles as catalysts. The time necessary for this approach could exceed the ten-day format if extension activities are used.

The integrated approach to this unit allows the teacher to actually create a life-size simulated prairie within the classroom. The final project includes life-size, three-dimensional prairie plants, life-size prairie animals (mammals, reptile, amphibians and insects), prairie birds, and a tape providing sounds of the prairie. Also included are the videotape, *From Beneath the Ashes,* historical background, and activities which will allow the students to become totally immersed in their study of the prairie. Each lesson contains the nine sections described below.

Objectives:	Student goals.
Background:	Necessary information to effectively present the lesson. Bibliography contains supplemental resources.
Materials:	Equipment and supplies list.
Vocabulary:	Basic foundation of terms needed to understand the concepts presented.
Process:	Scientific thinking and learning processes utilized by students.
Procedure:	Steps to introduce and implement the activity.
Extension Activities:	Activities to further enrich the unit for those who wish to go beyond the lessons provided.
Interdisciplinary Connection:	Utilization of integrated learning. While this unit may be taught successfully without a field trip, it is intended that students visit a prairie, either the Fermilab prairie or another site closer to the school.
Assessment :	Basis for student accountability.

Curriculum Outline

The curriculum is broken down into ten day-long lessons with the following activities:

Day 1: Introduction
- Videotape
- Student Journal
- Read-Aloud Novel

Day 2: Prairie Plants
- Prairie Grasses
- Prairie Forbs
- Prairie Mural
- Roots
- Ongoing Activities

Day 3: Soil Is More Than Dirt
- Soil Word Web
- Nutrient Cycle
- Soil Profile
- Dirt Cake Recipe
- Ongoing Activities

Days 4 & 5: Prairie Animals - Amphibians and Reptiles, Birds, Insects, Mammals
- Group Research - Reports
- Prairie Mural Continued
- Insect Classification
- Ongoing Activities

Days 6 & 7: People of the Prairie
- Native Americans
  - Brainstorming Activity
  - Native American "Journal Entries"
  - Timeline: What and When
- Settlers
  - Settlers of the Prairie
  - Prediction Exercise
- Changing Prairie
  - The Illinois Prairie - The Plow
  - Illinois Map Activity
  - Culminating Activities
  - Check Up
  - Ongoing Activities

Day 8: Fire
- *From Beneath the Ashes* Video
- Prairie Fires
- Ongoing Activities

Day 9: Restoration/Conservation and Career Awareness
- Restoration/Conservation
- General Review
- Prairie Restoration Practices
- Prairie Conservation Practices

Career Awareness
Draw a Scientist
Career Summaries
How to Be a Good Scientist
Ongoing Activities

Day 10: Culmination
Prairie Word Search
Prairie Pursuit
Ongoing Activities

From Beneath the Ashes - Annotations

When presenting the unit to younger students, it may be appropriate to show portions of the videotape as they relate to the lessons. The following notes provide guidance for selecting appropriate segments. The two prairie segments may be shown as an introduction on Day 1; the segment on one month after the fire may be shown on Day 3 with the Nutrient Cycle. The two segments on burn policy are appropriate on Day 8 as is the entire program.

05	Preface - Including Prairie Fire
237	Titles and Introduction
406	Yellowstone Preservation - Burn Policy
525	1988 Fire
621	Assessment of Fire's Impact Helicopter Survey, Scientific Research, Car Tour (VIDEO SHOWS BLACK HILLS; BILL SAYS "NOTHING WILL GROW BACK")
950	Prairie Restoration
1244	(VIDEO SHOWS FIRE TRUCK)
1337	One Month After the Fire Nutrients for Plants and Wildlife, Lodgepole Pine Adaptation
1557	Nine Months Later
1610	What Have We Learned

Activity Chart

Day One	Introduction and Explanation of Ongoing Projects *From Beneath the Ashes* Video, Introductory Portion Read-Aloud Novel, *Addie Across the Prairie* Student Journal Fermilab Prairie Flora and Fauna Poster
Day Two	Prairie Plants Prairie Mural Grasses Forbs Roots
Day Three	Soil Is More Than Dirt
Day Four and Day Five	Prairie Animals Amphibians Reptiles Birds Insects and Other Invertebrates Mammal
Day Six and Day Seven	People of the Prairie Native Americans Settlers Changing Prairie
Day Eight	Fire *From Beneath the Ashes* Video
Day Nine	Restoration/Conservation and Career Awareness
Day Ten	Culmination

State Goals Addressed in Unit

Biological and Physical Sciences

STATE GOAL FOR LEARNING 1

Students will have a working knowledge of the concepts and basic vocabulary of biological, physical and environmental sciences and their application to life and work in a contemporary technological society.

STATE GOAL FOR LEARNING 2

Students will have a working knowledge of the social and environmental implications and limitations of technological development.

Language Arts

STATE GOAL FOR LEARNING 1

Students will be able to read, comprehend, interpret, evaluate and use written material.

STATE GOAL FOR LEARNING 2

Students will be able to listen critically and analytically.

STATE GOAL FOR LEARNING 3

Students will be able to write standard English in a grammatical, well-organized and coherent manner for a variety of purposes.

STATE GOAL FOR LEARNING 4

Students will be able to use spoken language effectively in formal and informal situation to communicate ideas and information and to ask and answer questions.

STATE GOAL FOR LEARNING 5

Students will be able to understand the various forms of significant literature representative of different cultures, eras and ideas.

Mathematics

STATE GOAL FOR LEARNING 3

Students will be able to make and use measurements, including those of area and volume.

Social Sciences

STATE GOAL FOR LEARNING 2

Students will be able to understand and analyze events, trends, personalities and movements shaping the history of the world, the United States, and Illinois.

STATE GOAL FOR LEARNING 3

Students will be able to demonstrate a knowledge of the basic concepts of the social sciences and how these help to interpret human behavior.

STATE GOAL FOR LEARNING 5

Students will be able to apply the skills and knowledge gained in the social sciences to decision making in life situations.

Ongoing Activities: Prairie Mural

Three ongoing activities are suggested to provide a sense of continuity or a "common thread" among the topics.

Scale models of flora and fauna can be made by the students in order to create a simulated prairie in the classroom, hallway or learning center. Several extension ideas are provided with this activity to cover different subject areas and "grouping" options in the class.

One of the major goals of this unit is to visually and auditorially recreate an actual prairie environment, utilizing all subject areas. The mural is designed as an ongoing project. As lessons for grasses, forbs, amphibians, reptiles, birds, insects and mammals are presented, examples are added to the mural.

A rationale for the Prairie Mural includes several ideas:

- It provides a concrete method to visualize the sizes, colors and shapes of prairie plants and animals.
- It can be a means to integrate subject areas.
- It will help students classify organisms by common characteristics.

The transparencies in this packet can be used in the standard manner with a projector and screen to familiarize students with some of the plants and animals. However, an integrated approach can make use of the transparencies in another manner. Measure the given size of the plant or animal on a large piece of paper taped to the wall. Place the overhead projector on the floor and move until the projected image is the correct size. Have the students trace the image on the paper, decorate it and cut it out. Then, it can become part of your prairie mural.

The transparencies for Day 2 include spring and summer plants. Choose the season for the mural. Remember that the spring grass is short. It has not sent up its tall summer seed stalk although last year's yellow, dry grass plants may still be standing with the short wildflowers under them. (Transparencies for amphibians, reptiles, birds, and mammals are included in Days 4 & 5.)

Ideally, the students can construct a full-size, three-dimensional mural of prairie plants and animals in the classroom. The size of the mural can be just a few feet wide to show a few plants, perhaps some butterflies, and a bird, or the mural can be as large as space allows. It can be done as a shared activity with other teachers and be in a common area, such as a hallway or learning center.

For a three-dimensional effect, trace a few additional leaves on separate paper, cut out and glue to the traced plant so that they partially project into the room. Flower petals can also be cut out of colored paper but not glued down flat. Have the students glue the petals only at their base, then curve the petals. Butterflies can be folded to project into the room or "fly" over the mural suspended by string or thread.

Do not have the plants evenly spaced as they are on the transparency. That was done only for clarity. Overlap plants. Have several of each kind. For variety, turn the transparency over on the projector to switch left and right sides.

When your classroom prairie is complete, have the students experience it from different perspectives. With the tape of prairie sounds playing, have students sit on the floor as if they were insects, under their desks as if they were snakes, on their desks as if they were butterflies, on a ladder as if they were hawks, and so on. Have them write about their experiences.

Materials needed for the mural construction include:

- Glue
- Scissors
- Measuring stick
- * Coloring sheets of reptiles and amphibian, birds and insects
- Mural paper
- Markers
- Overhead projector
- Tape
- * Audiotape of prairie sounds
- * Transparencies of grasses, forbs, birds and mammals

Starred (*) materials are included in this packet.

Extension activities related to the mural include:

1. Making the mural so that it represents several seasons.

2. Assigning individual students or small groups to be the "experts" on "their" animal. Have them write or give an oral report on it. Included in the background section is some information on many of the plants and animals.

3. Posting prairie poetry written at the prairie around the plants in the mural.

4. Labeling plant and animal adaptations.

5. Making food chains (energy from the sun going to a plant--plant eaten by an insect--insect eaten by a bird, for example) by connecting links of the chain with colorful yarn. In a like manner, a food web can be constructed.

6. Inviting another classroom or grade level to visit your class to see the finished mural and hear oral reports. Videotape speech presentations.

Ongoing Activities: Journal Ideas

A daily student written record or Journal is an important activity for this unit. Students may use a bound notebook or create their own book using lined sheets of paper in a construction paper folder. If desired, teachers may copy the lined paper provided in this unit. Rationale for journal use includes the following ideas:

- It is a way for students to synthesize ideas, concepts and facts in a written manner.
- It provides a concrete method for students to realize what they have just learned.
- It can serve as a communication tool between small group members, student and teacher, and student and parent.
- It can be a means of integrating subject areas across the curriculum.
- It can be used as an evaluation tool.
- It simulates interest in first person journals and diary accounts that we use to learn about history.

Some suggestions on how to use journals include:

1. FREE WRITING JOURNALS - Students write on topics of their own choice.
2. RESPONSE JOURNALS - Students write down their reactions, thoughts and feelings about stories they have read. Then, students may exchange journals and respond to each others entries.
3. DIALOGUE JOURNALS - Students write to the teacher. Student 's awareness of content can be raised by questions from the teacher.
4. SCIENTIFIC LOGS - Students keep a daily record of hypotheses, observations, illustrations and conclusions.
5. LESSON EVALUATION - Students respond to activity page questions in a sequential manner. The teacher can use these as a summary or in lieu of a test.

******Teachers may use a variety of these techniques to keep students' interest levels high.

All journals need not be collected for reading at once. The teacher may read several a day or half the class each week, for example.

The following list suggests day-to-day journal ideas or topic questions.

DAY 1 - INTRODUCTION

- Describe in your own words what a prairie is.
- If you visited a prairie, what would you expect to see?
- In the story, *Addie Across the Prairie,* predict what might happen next.

DAY 2 - PRAIRIE PLANTS

- Describe the differences between the grasses and forbs by "interviewing" one of each. Ask questions such as, "How long have you lived in the prairie? How tall do you hope to get? Do any other plants or animals depend on you? How do you survive in the hot summer sun? What is your greatest fear? What do you want to do when you grow up?"

DAY 3 - SOIL IS MORE THAN DIRT

- Explain the difference between prairie soil and soil from other areas.
- Discuss some of the things that have happened to prairie soil. How has it changed?
- Write down hypotheses, observations and conclusions of the experiments/lessons.
- How can you help preserve, restore and conserve prairie soil?

DAYS 4 & 5 - PRAIRIE ANIMALS

- Amphibians and Reptiles - Compare and contrast these two groups.
- Imagine life as one of the animals and write about a typical day.
- Birds - If you could be a bird, which would you be? Which would you find easier, being a predator or prey? Explain why.
- Write about the life of various birds.
- Insects and Other Invertebrates - Write a newspaper advertisement promoting the positive aspects of an insect generally regarded as creepy or scary.
- Mammals - Write an Acrostic Poem using the name of a mammal.

Example: Daring
Eating leaves
Evening meals in the prairie
Running quickly away

DAYS 6 & 7 - PEOPLE OF THE PRAIRIE

- If the Mound Builders had no written language, describe how you think they may have communicated.
- Tell what your life might be like if you were a Prairie Native American. How might you live day to day? How would this be different than your present life?
- Imagine it is 1870 and your family is moving westward. You are allowed to take five things as long as they fit in a bushel basket. What would you take and why?
- If you were going west in a Conestoga wagon, how would you feel if you traveled day after day with only prairie in sight? What would be your impressions? What could you do to entertain yourself? What games could you play or invent?
- Settlers were often seen as pioneers. The dictionary says pioneers are people who do something first or prepare the way for others. Choose one of the following and find out why that person could be called a pioneer.

Jane Addams	Jean du Sable
Neil Armstrong	Amelia Earhart
Elizabeth Blackwell	Charles Lindbergh

DAY 8 - FIRE

- Describe how prairie plants survive fire.
- Pick one - Fire is Good/Bad for the prairie. Now persuade someone who isn't sure.
- Write about your experiences or impressions of viewing a prairie fire or the Yellowstone fire.

DAY 9 - RESTORATION/CONSERVATION AND CAREER AWARENESS

- Make a list of things that can affect prairies and how.
- List things you could do to help conserve/preserve prairie areas.
- If you could select any related career, what would it be and why? What would you have to do to prepare for this career? How would you help the environment?
- Write a narrative about one of the careers from the career summary sheet.

DAY 10 - CULMINATION

- Trade your journal with a partner and think about the similarities and differences in your entries. Write a note to your partner telling him/her which ideas he/she used you thought were clever, and why.
- React to or tell what you have learned about the prairie. How have your ideas changed?

Student Journal

Ongoing Activities: Read-Aloud Novel

This unit includes a copy of *Addie Across the Prairie* by Laurie Lawlor. Set in the 1800's, it describes the joys and challenges of a young girl and her family in trying to settle in a new land.

A rationale for a 15 to 20 minute daily read-aloud includes several ideas:

- It adds a child's personal perspective to the entire unit.
- It helps bring the unit to life.

Laurie Lawlor Background: Laurie Lawlor wrote *Addie Across the Prairie* after reading a manuscript written by her great-aunt titled *Pioneering*. She spent two years interviewing family members and researching the homesteading period before a character emerged. Addie is loosely based on Laurie's great-aunt and on other individuals from that time. Laurie Lawlor went on to write a second story about Addie, *Addie's Dakota Winter,* and she has written *How to Survive Third Grade, Daniel Boone* and *Second-Grade Dog*. She lives with her two children and her husband in Evanston, Illinois. Laurie Lawlor went to high school in LaGrange, Illinois and to college at Northwestern University where she majored in journalism.

Children's Books

Ask your librarian to pull books such as those listed below to use as references during the unit. The designations P, I and J refer to books which are primary, intermediate or junior level materials.

Fiction

Anderson, J. Christmas on the Prairie. 1985. (P & I)

Anderson, Joan. Joshua's Westward Journey. 1987. (P, I & J)

Coerr, E. The Josefina Story Quilt. 1986. (P)

Conrad, P. Prairie Songs. 1985. (I & J)

DeFelice, C. Weasel. 1990. (I & J)

George, Jean Craighead. One Day in the Prairie. 1986. (P)

Goble, P. Death of the Iron Horse. 1987. (P & I)

Harvey, B. My Prairie Year: Based on the Diary of Elenore Plaisted. 1986. (P & I)

Lawlor, Laurie. Addie Across the Prairie. 1986. (P & I)

MacLachlan, P. Sarah, Plain and Tall. 1985. (I)

Moeri, L. Save Queen of Sheba. 1981. (I & J)

Sanders, S. R. Aurora Means Dawn. 1989. (P & I)

Turner, A. Grasshopper Summer. 1989. (I & J)

Wilder, L. I. The Little House Books. 1973. (P & I)

Non-Fiction

Fradin, Dennis. Pioneers. 1984. (P)

Freedman, Russell. Buffalo Hunt. 1988. (I)

Freedman, R. Children of the Wild West. 1983. (I & J)

Freedman, R. Cowboys of the Wild West. 1985. (I & J)

Grimm, William. Indian Harvests. 1973. (I)

Harvey, B. My Prairie Christmas. 1990. (P & I)

Laycock, George & Ellen. How the Settlers Lived. 1980. (I & J)

Lerner, Carol. Seasons of the Tall Grass Prairie. 1980. (I & J)

Levenson, Dorothy. Homesteaders and Indians. 1971. (I)

Loeper, J. J. Going to School in 1876. 1984. (P & I)

Madson, John. Where the Sky Began - Land of the Tallgrass Prairie. 1982. (J)

Matthews, Leonard J. The Wild West in American History. 1989. (I)

May, Julian. The Prairie Has an Endless Sky. 1972. (I)

Rounds, Glen. The Prairie Schooners. 1968. (I)

Rounds, Glen. The Treeless Plains. 1967. (I)

Sabin, Francene. Pioneers. 1985. (P & I)

Stein, R. Conrad. Illinois. 1987. (I & J)

Stein, R. Conrad. The Story of the Homestead Act. 1978. (I)

Stone, Lynn M. Ecozones - Prairies. 1989. (I & J)

Waldman, Carl. Encyclopedia of Native American Tribes. 1988. (I & J)

Walker, B. M. The Little House Cookbook: Frontier Foods from Laura Ingalls Wilder's Classic Stories. 1979. (P, I & J)

Poetry

Fleischman, Paul. Joyful Noises. 1988. (P, I & J)

Lewis, C. Long Ago in Oregon. 1987. (P, I & J)

Activity Books

Blood, Charles. American Indians Games and Crafts. 1981. (P)

Purdy, Susan and Sandak, Cass. North American Indians. 1982. (I)

Teachers' Reference

Runkel, Sylvan and Roosa, Dean. Wildflowers of the Tall Grass Prairie. 1989.

Stratton, Joanna L. Pioneer Women - Voices from the Kansas Frontier. 1981.

DAY 1: INTRODUCTION

OBJECTIVE

The students will:
Be introduced to the prairie and the unit of study.

BACKGROUND

Illinois is nicknamed the "Prairie State." Four hundred years ago, what we now know as Illinois lay on the eastern border of a giant grassland. This grassland covered over 400,000 square miles of North America. From east to west, it stretched from Indiana to the Rocky Mountains, and from north to south, it ran 2,000 miles from Canada all the way to the Gulf of Mexico.

In the Illinois country, the grassland covered 21 million acres of land. Most of the Illinois grasses were of the tall variety, like big bluestem and switchgrass. These tall grasses grew on the flat, level land and in the river bottoms along the Illinois and Mississippi Rivers. During summer and fall, the big grasses grew to ten feet tall and a person could easily get lost trying to walk through them. Not all of the grasses were so big. Mid-sized grasses, such as little bluestem and side-oats grama, grew on the steep slopes of river bluffs and on flat sandy plains. Many beautiful wildflowers, such as purple prairie clover and prairie white-fringed orchid, grew alongside the grasses making the Illinois country a colorful place where the sky was big and the sun bright.

MATERIALS

* Book, *Addie Across the Prairie*
* Fermilab Prairie Flora and Fauna Poster (to display in the classroom)
* Sample Student Journal page, (may be duplicated)
* Transparency Master - *The U.S. Prairie*
* *From Beneath the Ashes* Video

Starred (*) materials are included in this packet.

VOCABULARY

prairie: A large expanse of land covered with specific grasses, wild flowers and few trees and the home of a variety of animals.

PROCESS

Brainstorming, predicting.

PROCEDURE

1. Write the word "prairie" on butcher paper* or the chalkboard.
   (*The use of butcher paper allows ideas to be saved and remain in the room throughout the unit.)
2. Ask the students to brainstorm ideas that come to mind when they think of the word "prairie" and record these ideas on the butcher paper or chalkboard.
   Sample questions:
   - What might it look like, hilly or flat?
   - Would there be trees and water?
   - What might you hear or smell?
   - What living things might you find in a prairie?
   - Where might you find a prairie?
3. Show *From Beneath the Ashes* and discuss. (OPTION: You may show the first part of the video to the end of the prairie section and save the rest of the video until DAY 8 - FIRE or you may show the entire video on DAY 8.)
4. Introduce the read-aloud novel *(Addie Across the Prairie* or other book). Explain that this is historical fiction written during a time when the prairie covered much of the Midwest and the Plains States.
5. Introduce journal writing. (You may wish to call this a daily writing assignment and not use the journal format. However, the term "journal" appears throughout the unit.)

EXTENSION ACTIVITIES

Before the video, have students draw what they believe a prairie looks like.

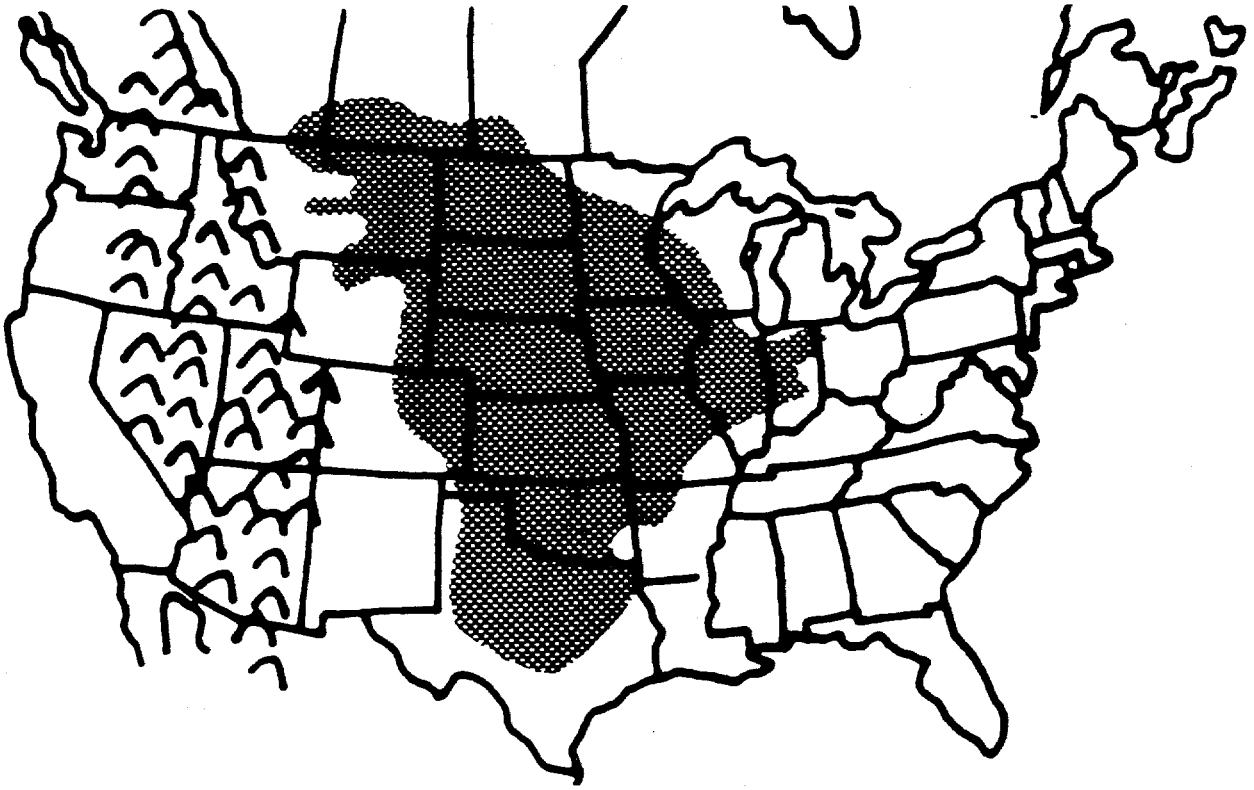
INTERDISCIPLINARY CONNECTION

Language arts, science, social studies.

ASSESSMENT

The following list suggests journal ideas or topic questions.

- Describe in your own words what a prairie is.
- If you visited a prairie, what would you expect to see?
- In the story, *Addie Across the Prairie,* predict what might happen next.



The United States prairie of the 17th century

Reprinted from Illinois Natural History Conservation/Education Kit III with permission from the Illinois Department of Conservation.

DAY 2: PRAIRIE PLANTS

OBJECTIVES

The students will:
1. Observe characteristics of prairie grasses and forbs to help identify them.
2. Comprehend the importance of prairie plant roots as an adaptation to drought and soil formation.

BACKGROUND

Prairie Grasses and Forbs: When many people think of the prairie, they think of tall grasses and treeless horizons. In and among the grasses, however, are forbs (prairie wildflowers) that add a continually changing garden of color to the prairie.

The shortest forbs bloom in spring before the grass becomes tall and shades them. Plants such as a pasque flower, prairie smoke and shooting star add a splash of color, then quietly fade as the summer grass becomes taller. As many as seventeen new species of forbs begin to flower each week. Each group of flowers is generally replaced by taller sun-loving plants. By fall, some flowers stand as tall as ten feet.

The leaves of many prairie plants are slender, finely divided and held vertically, which exposes less surface area directly to the sun. Grasses have this characteristic. Some plants have rough surfaces of fuzzy hairs on the leaves or stems for self-shading. Almost all prairie plants have very deep root systems. These are adaptations for the prairie environment: less than 30-36 inches of rain per year, extreme heat in summer and bitter cold in winter, high winds, periodic drought, and sweeping fires.

Roots: Some of the richest farmland in the world was once prairie. The roots of the prairie plants not only helped the plants survive both drought and fire but also were largely responsible for making this soil.

MATERIALS

* Book, *Addie Across the Prairie*
  Journal
  Prairie mural construction materials (See *Ongoing Activities: Prairie Mural.*, p.6)
  Class set of styrofoam coffee cups
  Small bag of potting soil
  Water
  "Sidewalk dirt" collected by students
* Student pages - *Prairie Grasses*
  Roots
* Teacher pages - *Prairie Forbs Background* (May be used for students too.)
  Prairie Grasses Answer Sheet
  Roots Answer Sheet
* Transparency Masters - *Prairie Grasses*
  Spring Forbs
  Summer Forbs (2 sheets)
  Prairie Grass Root System
  Prairie Burrows

Starred (*) materials are included in this packet.

VOCABULARY

adaptation: Ways that a living thing is special to allow it to live more successfully in a certain area.

drought: A long time without rain.

ecosystem: The living and non-living things cooperatively existing together.

forbs: Prairie wildflowers.

humus: A brown or black substance resulting from the partial decay of leaves, roots, and other vegetable matter; organic part of the soil.

perennial: Plants that come up from roots and other underground parts year after year.

sod: A surface layer of earth containing grass and their matted roots.

PROCESS

Observing, identifying, classifying, comparing and contrasting, forming models.

PROCEDURE

1. Distribute the prairie grasses student page and help the students do the four work steps.

2. Use the grasses and forbs transparencies to begin the prairie mural. As forbs are put on the mural, use the *Prairie Forbs Background* sheet for information about the plants and their flower color. This sheet may be used as an informational handout to students.

3. Have students read the *Roots* student page. Use root system transparency to elicit how the roots form soil and help the prairie survive.

4. Instruct each student to collect a sample of 1/3 cup of dirt from sidewalk cracks, along driveways or other paved areas where seeds could collect. This can be done for homework or at school. However, the results are more interesting if different students collect samples from various locations.

5. Have each student make a seed pot by filling a styrofoam cup with potting soil 1/2 full, adding the "sidewalk" dirt and watering. Have the student label the cup with their name and where they collected their dirt sample.

6. Have students predict whether they expect any plants to grow and if so what kinds.

7. Monitor seed cups and compare results with predictions.

8. Continue ongoing activities.

EXTENSION ACTIVITIES

1. Compare and contrast prairie plants to plants found on the school lawn or an open field.

2. If space allows, make a second mural of the underground prairie showing the roots. Simulate roots with string, twine, or rope. This mural can also show the correct size of animal burrows and can have the animal in the burrow or near its entrance. A transparency has been provided to show burrows for some of the prairie mammals.

INTERDISCIPLINARY CONNECTION

Art, mathematics, social studies.

ASSESSMENT

(Answers are italicized and refer to student pages indicated below. Answers are also included on the corresponding Teacher Answer Pages.)

Prairie Grasses (p. 23)

1. Name two differences among grass species *(Height, structure, soil type.)*

2.

Grass	Soil	Height
Big bluestem	*Moist*	*8'*
Little bluestem	*Dry to moist*	*2 to 4'*
Needlegrass	*Dry*	*2 to 4'*
Side-oats grama	*Dry*	*1 to 3'*
Switchgrass	*Moist*	*3 to 6'*
Indian grass	*Moist*	*4 to 8'*
Nodding wild rye	*Dry to moist*	*3 1/2'*
Prairie dropseed	*Dry*	*2 to 3'*

3. Grasses identified from left to right, top row followed by bottom row:
   Needlegrass, Switchgrass, Indian grass, Side-oats grama
   Big bluestem, Nodding wild rye, Prairie dropseed, Little bluestem

4. List three things that grasses contribute to the prairie ecosystem. *(Roots anchor the soil preventing erosion; Roots combine with soil to form sod which absorbs moisture; Nutrient elements in dead roots provide energy for other plants.)*

Roots (p. 28)

1. What is humus? *(The decayed roots of plants)*

2. List at least two ways that humus is good for the soil. *(It contains nutrients from the rotted roots, making the soil fertile. It loosens the soil so roots can grow through it more easily. Humus helps to hold water in the soil.)*

3. List at least two ways the long, perennial roots help prairie plants. *(Roots go deep into the soil to get water. They store food so the plants can survive drought. The prairie plants spread by sending up new shoots from the roots. The long roots help the plant live through the winter.)*

4. List possible reasons to explain why pioneers decided to farm the prairies? *(Possible answers include: It was a lifestyle with which they were most familiar and previously successful. They were not aware of the amount of hard work it involved or the value of the prairie.)*

5. Explain the differences between the grass in your front yard and the grass in the prairie. *(Possible answers include: Grass in the front yard was planted by man and is not native to the area. It is all of one variety and has shallow roots. Grass in the prairie was originally planted by nature and is native to the area. There are many varieties present at one time and all have very deep roots.)*

6. Make a plan to measure how many roots are in a soil sample. *(Possible answers may include: washing dirt off roots and weighing, counting roots directly.)*

7. As a pioneer, explain why it was necessary to plant crops on the prairie. *(It was the only method of producing food that they had experience with, and they needed food to survive. The pioneers may not have had any other alternatives at the time.)*

The prairie grasses student page may be graded or used as the basis of discussion.

Students can be assessed on their individual part of creating the mural, effort, artistry, oral or written reports and overall completion of the class project.

The following list suggests journal ideas or topic questions.

- Describe the differences between the grasses and forbs by "interviewing" one of each. Ask questions such as, "How long have you lived in the prairie? How tall do you hope to get? Do any other plants or animals depend on you? How do you survive in the hot summer sun? What is your greatest fear? What do you want to do when you grow up?" See *Journal Ideas* for Day 2.

Prairie Forbs Background

The prairie forbs (wildflowers) on the transparencies are listed in order in which they may be seen in bloom from spring to autumn.

SPRING FORBS

Pasque Flower
Pasque flower is one of the earliest spring prairie plants. It grows in dry sandy prairies, often on hills. To conserve water, its leaves are deeply cut into narrow lobes and are covered with long, silky hairs. The flower resembles a common spring garden flower called a crocus. Pasque flowers are pale purple.

Prairie Smoke
This forb blooms in May. The long, feathery hairs in its seed head give it the look of a "puff of smoke." The flowers and seeds are a maroon color.

Shooting Star
Shooting stars bloom April to June. The nodding clusters of flowers have white to pink petals that curve sharply upward, revealing a yellow core.

Prairie Violet
Prairie violets have fan-shaped leaves that have deep in-and-out cuts. The flowers are blue with yellow centers. It blooms in May with a splash of color but then quietly relaxes into the summer prairie background.

SUMMER FORBS

Compass Plant
The leaves of this plant are very large and usually have the thin edge of the leaf facing north and south. This way, they do not get the full force of the hot noon sun. This prevents the leaves from heating up and losing water. Conserving water in the dry prairie habitats is very important. Compass plant also has a very thick root that may grow ten feet or more into the soil. This assures it of a steady supply of water. The golden yellow blossoms bloom from June to early September.

Prairie Dock
The large leaves of prairie dock are rough, like sandpaper. The leaves at the base surround a tall leafless stalk that is from three to eight feet tall. The flowers are yellow. Its deep roots supply water to the leaves. As the water evaporates, it keeps the leaves cool. Pioneers often put these large, cool leaves under their hats for some relief from the heat of the treeless prairie. Prairie dock blooms from June to late September.

Rosinweed
The leaves of rosinweed are opposite across the stem from each other. The leaves are rough, as they are on both compass plant and prairie dock. The roughness may help the plant from losing water. Rosinweed's sap smells like rosin. The flowers are yellow. It blooms from July to early October.

Cup Plant
The paired leaves of this plant make a cup around the stem that holds water like a cup. It has a square stem and canary-yellow flowers. It blooms from July to early October.

Rattlesnake Master
The long, stiff, narrow leaves of rattlesnake master have teeth and spikes along the edge. The plant resembles a desert plant called a yucca. The flowers don't look like a typical flower. They are compact, greenish-white, spiny globes. Rattlesnake master blooms from July to early September. It may have earned its name from the rattling sound that the dried seeds are said to make when the wind blows.

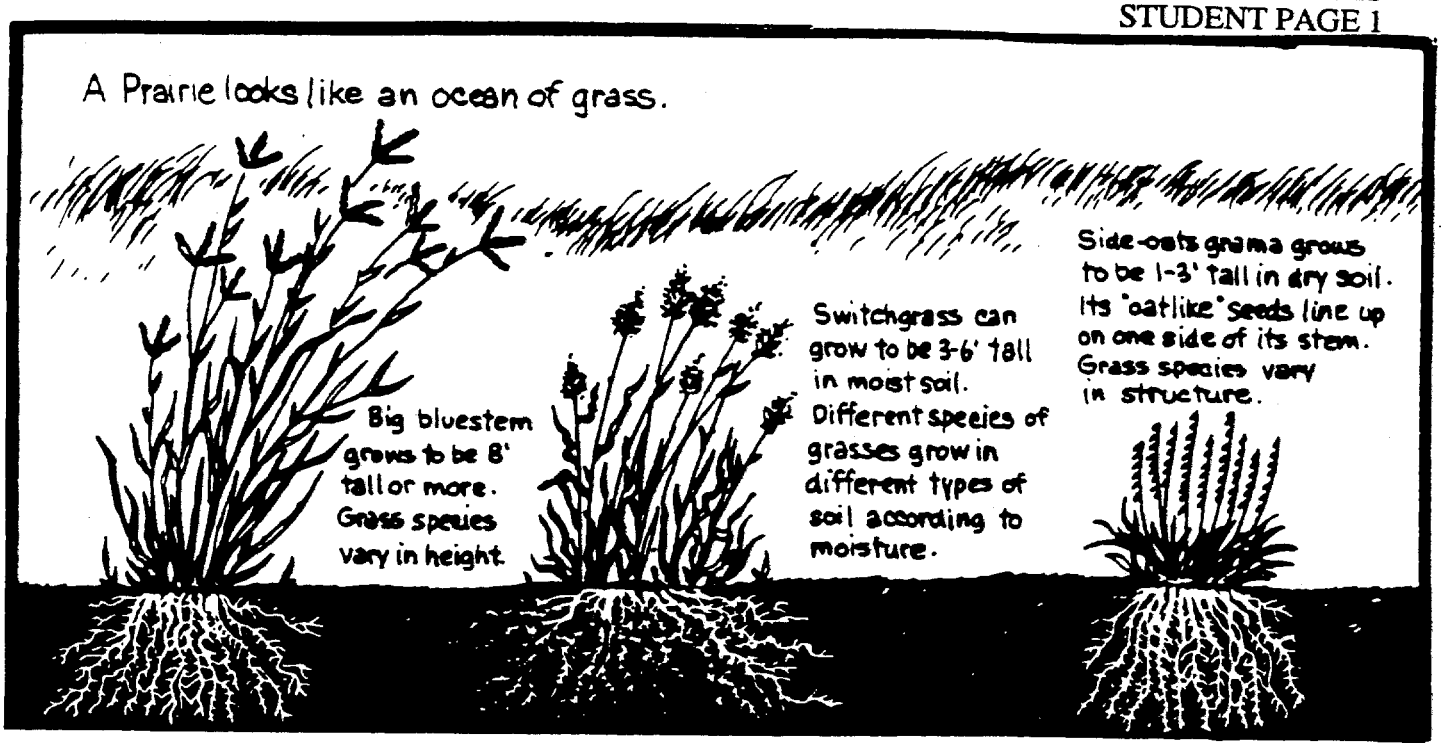
New England Aster
This plant has a yellow disk in the center with up to one hundred bright purple rays (the "petals"). The leaves are lance-shaped. It blooms from August to late October.

Yellow Coneflower
The petals of the yellow coneflower sag, or hang downward from a brown, cone-like ball. If you see this plant after the petals have fallen, the ball-like center of seeds looks silver-grey. Yellow coneflower blooms from July to late October.

Stiff Goldenrod
There are many kinds of goldenrod. You can tell if it is stiff goldenrod by gently patting the top of the plant. It will feel stiff. Goldenrods are often mistakenly blamed for causing hay fever. They do not; ragweed plant causes it. Ragweed flowers, however, are small, green, and not easily noticed. Goldenrod flowers, on the other hand, are yellow and easily noticed. They both bloom about the same time so the showy Goldentod flower is often mistakenly blamed for causing hayfever.

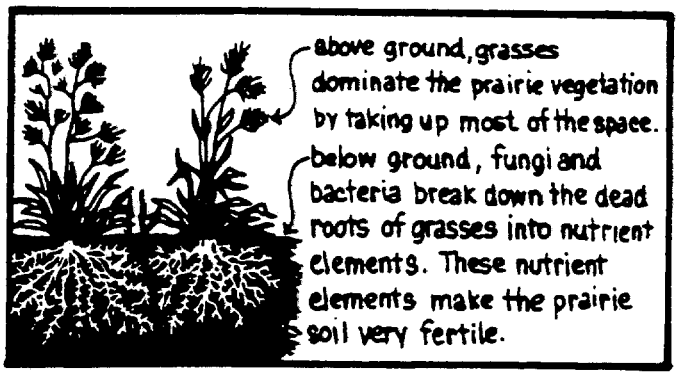
Cream Wild Indigo
This plant has pea-like flowers and pods. The flowers are cream to light yellow in color. It is an important plant for the prairie because it can take nitrogen gas out of the air and make it into a kind of nitrogen fertilizer for the soil. Plants that can do this are called legumes.

Prairie Grasses



The Role of Grasses in the Prairie Ecosystem:

As you learned when you studied the soil of the prairie, the importance of grasses to the ecosystem begins underground. The massive network of grass roots anchors the soil to the earth, thereby preventing erosion. The roots, combined with the soil, form a tough mass called sod which works like a sponge to absorb rainwater. The nutrient elements in the dead roots of grasses are recycled and kept in the soil until they are used to provide energy for living plants.



Working with Prairie Grasses:

Work Step #1. Using the drawing at the top of this page as a guide, name two differences amongst grass species.

Work Step #2. Read and study the descriptions below of eight grasses. On the blank lines following each grass description, write first the type of soil, according to moisture, that the grass grows in, and second, the height each grass grows to be.

Work Step #3. On page 24 are drawings of the eight grasses. Using the clues written beside each drawing, label each grass in the space provided.

Work Step #4. List three things grasses contribute to the prairie ecosystem.

1. **Big bluestem:** This grass grows to a height of 8' or more. It begins growing in late April and flowers in late summer. The seed head of its flower branches into three parts, looking something like a "turkey's foot". Big bluestem grows most commonly in moist soil. _____ _____

2. **Little bluestem:** This grass grows to be 2 to 4' tall. It grows from May until the first frost in fall. During spring and summer, the bottom shoots of little bluestem are bluish but by fall, they are a beautiful mixture of rust and gold. Its flowers are "feathery" and are covered with short, white hairs. Little bluestem grows in dry to moist soil in uplands. _____ _____

3. **Needlegrass:** This grass grows to be 2 to 4' tall in dry soil. It begins growth in April and flowers by June. This grass is sometimes called "needle and thread" because of its pointed seed that is as sharp as a needle. _____ _____

4. **Side-oats grama:** This 1 to 3' tall grass flowers during the summer. Its small (¼") "oatlike" seeds line up on one side of its stem. It is that arrangement which gives this dry soil grass its name. _____ _____

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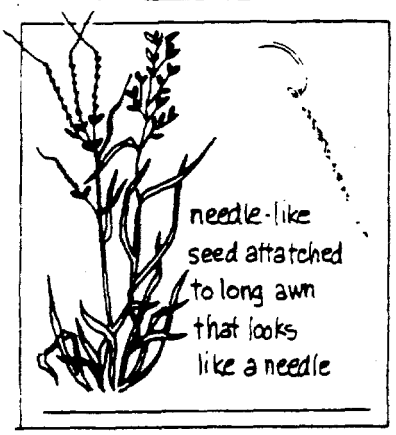
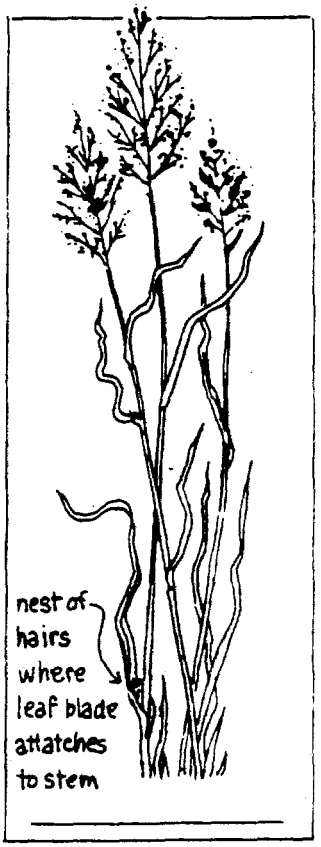
5. **Switchgrass:** This 3 to 6' tall grass is identified by a prominent nest of hair where the leaf blade attaches to the stem. This grass grows well in moist soil in bottomlands. _____ _____

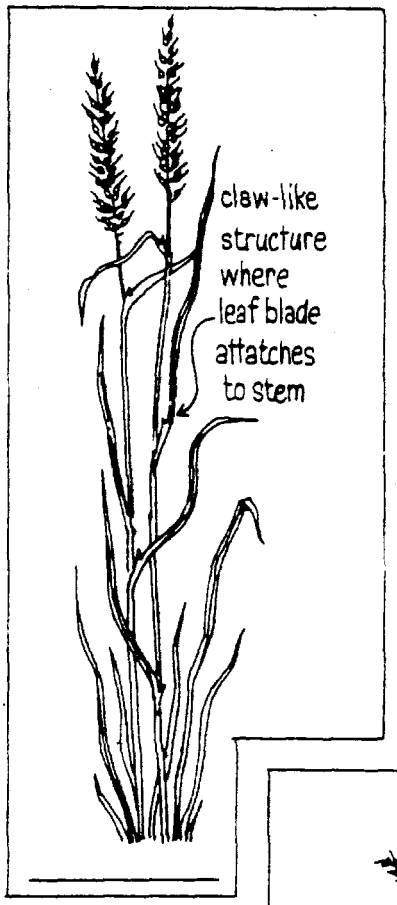
6. **Indian grass:** This 4 to 8' tall grass begins growing in dry to moist soil about the first of May and flowers during late July and August. Indian grass can be identified by the presence of a clawlike structure where the leaf blade attaches to the stem. _____ _____

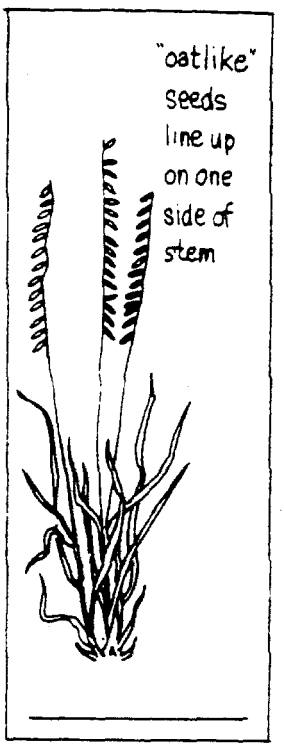
7. **Nodding wild rye:** This 3½' tall grass begins growth in March or April and matures by July. Its dense flowers look like they are nodding as they curve downward. Nodding wild rye grows in dry to moist soil. _____ _____

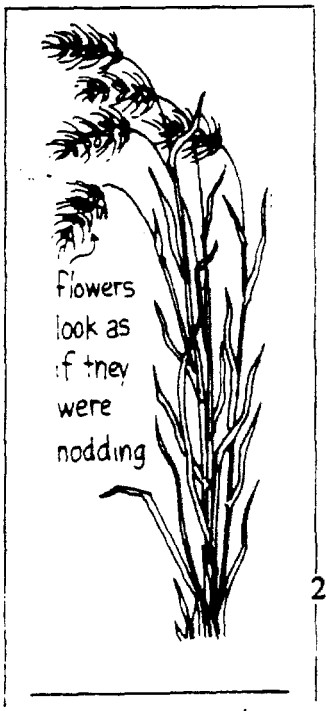
8. **Prairie dropseed:** This 2 to 3' tall plant stands very straight and has very long, narrow leaf blades. Prairie dropseed grows throughout the summer and flowers in the fall in dry soil. _____ _____

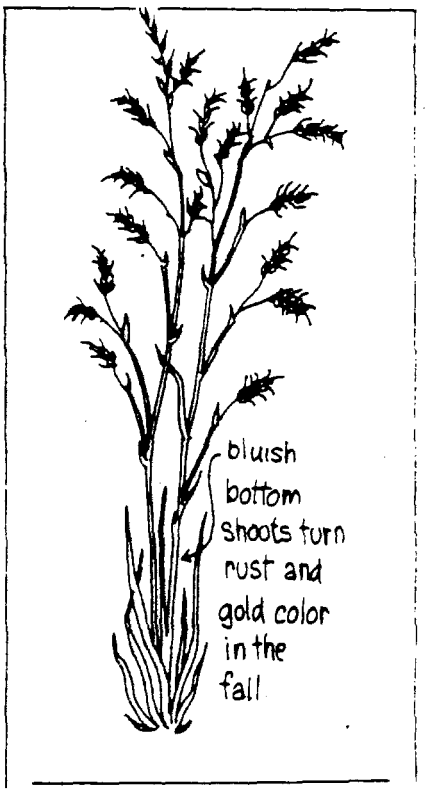












Name_____

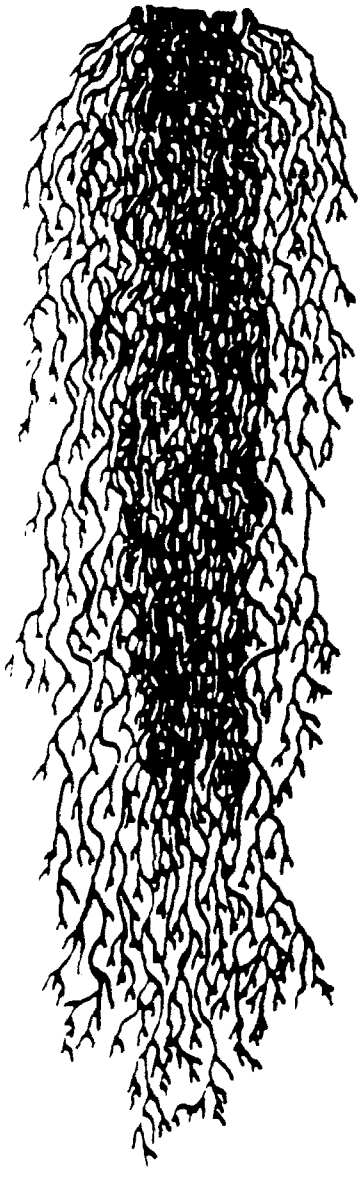
Date_____

Roots

The most important part of the prairie is hidden underground. The top few inches of prairie soil are filled with a tangle of roots. The roots, combined with the soil, form a tough mass called sod. To show how thick the roots in sod can be, it is estimated that if one could skim off a four-inch-thick surface layer of soil from one acre and wash the soil off the roots, the pile of roots would weigh four-and-half tons.

Usually the larger part of a prairie plant is undergound, and the smaller part above the ground. Below the ground, fungi and bacteria break down the dead roots. As the dead roots rot, they release the nutrients in them into the soil. The nutrients then can be recycled and used by other plants. The rotted material that gives the soil a rich black color is called humus. Humus makes the soil very fertile and loosens the soil, so the roots can grow through it easily. Humus also helps hold water in the soil. Since prairie plant roots go very deep, the humus made as they rot also goes down very deep. Some of today's best topsoil is on what was once prairie.

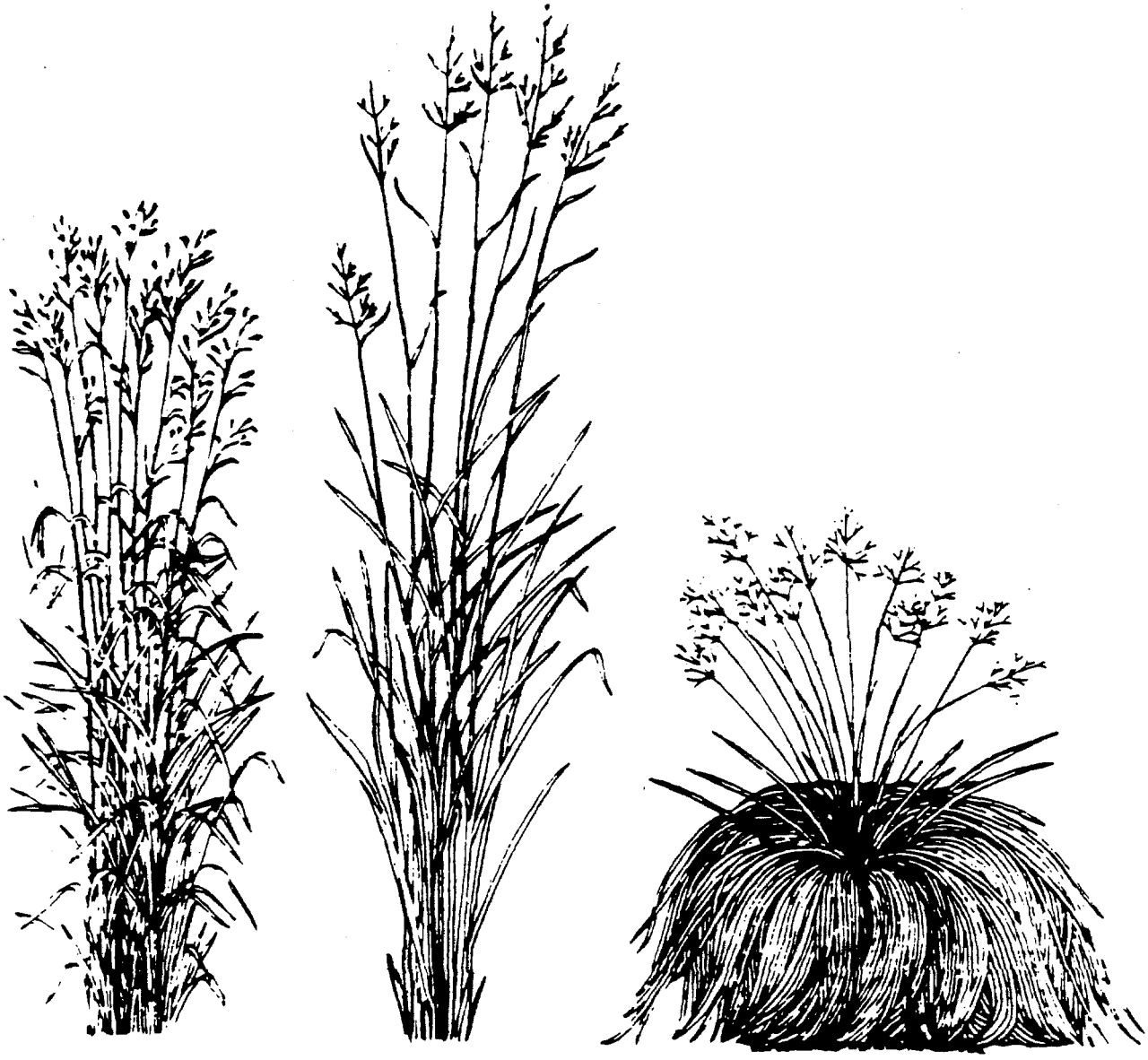
Prairies generally grow in areas where there is less than forty inches of rain per year. This is usually too dry for trees to grow, but prairie plants are adapted for little rain. The prairie roots allow prairie plants to get moisture from deep underground. Many plants take water from the upper five feet of soil, but others take very little moisture from this depth and have roots that extend deeper. Most of the forbs (prairie wildflowers) send their roots much deeper into the soil than the grass roots. This allows them to get water the grasses cannot reach. Some forbs have roots that go down ten feet or more, and some go over twenty feet. With different plants using water from different depths, many kinds of prairie plants can live together in a small space.



The roots and other underground parts store any extra food the plant makes. If there is a drought, the plant uses this stored food to keep it alive and growing. When there is enough rain, the plants spread by sending up new stems and leaves from the underground parts. In fact, prairie plants spread more often in this way than by seeds. There are so many roots in the soil that there is little room for a seed to send down a new root. Even if it does sprout, a seed has to compete with the roots of the other prairie plants for water.

Prairie plants are perennials. This means the plant comes up (from the roots) year after year. Only the aboveground parts of a prairie plant die in the winter. The roots contain stored food that helps send up new leaves the next spring. Some prairie plants live for twenty to fifty years or more - more than many kinds of forest trees.

Perennial plants cannot live if their roots are dug up or plowed. They must have soil that is undisturbed. With John Deere's invention of the steel moldboard plow, the prairie was rapidly killed and changed into farmland. It didn't give up without a fight, though. There are journals describing how pioneers used large bull-like animals called oxen to pull the plow. Sometimes the sod was so thick that they had to use five yokes (a yoke was a wooden collar used to harness two oxen side by side) of oxen to pull a single bottom plow, turning over only one row of prairie sod at a time.



Discussion Questions:

1. What is humus?

2. List at least two ways humus is good for the soil.

3. List at least two ways the long perennial roots help prairie plants.

4. List possible reasons to explain why pioneers decided to farm the prairies.

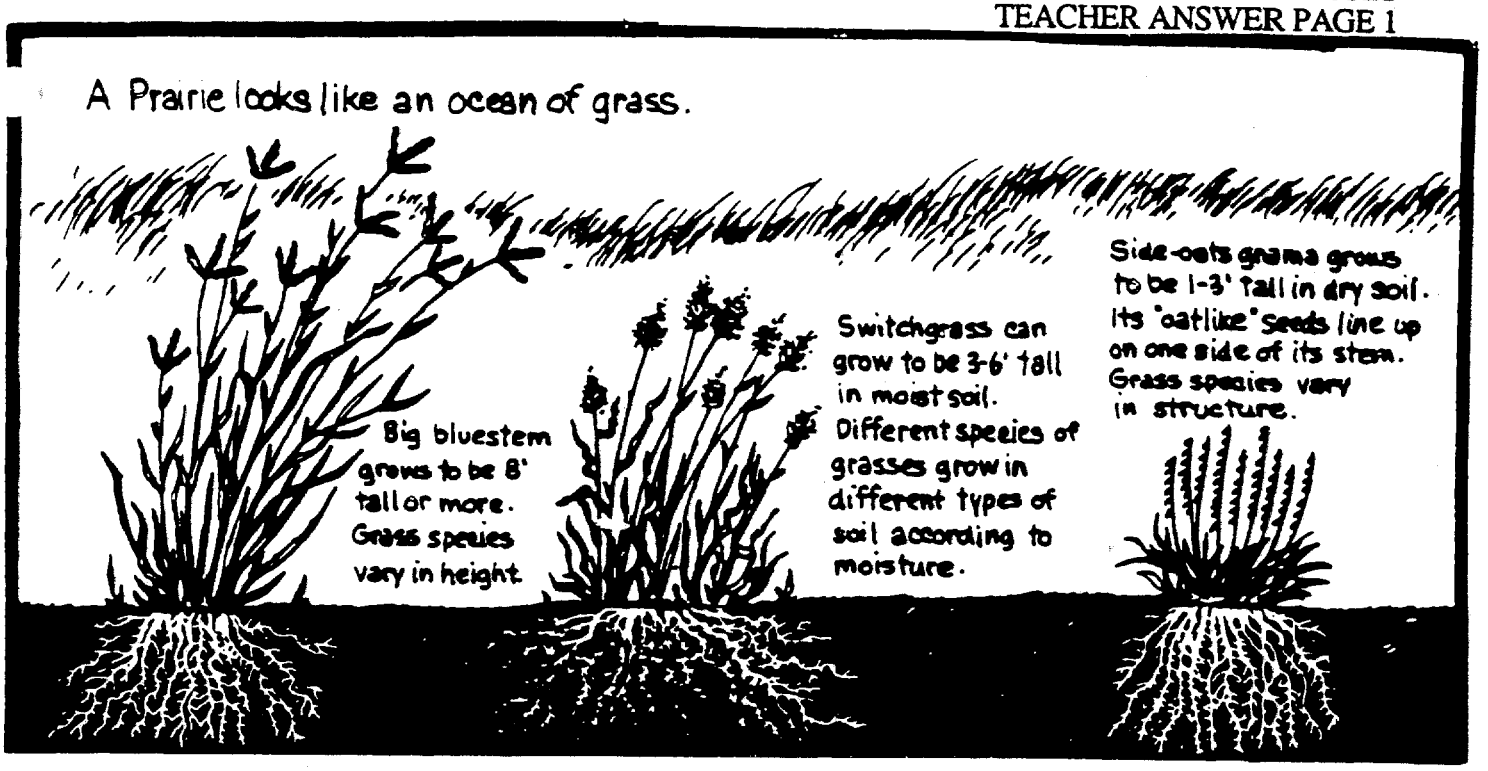
5. Explain the differences between the grass in your front yard and the grass in the prairie.

6. Make a plan to measure how many roots are in a soil sample.

7. As a pioneer, explain why it was necessary to plant crops on the prairie.

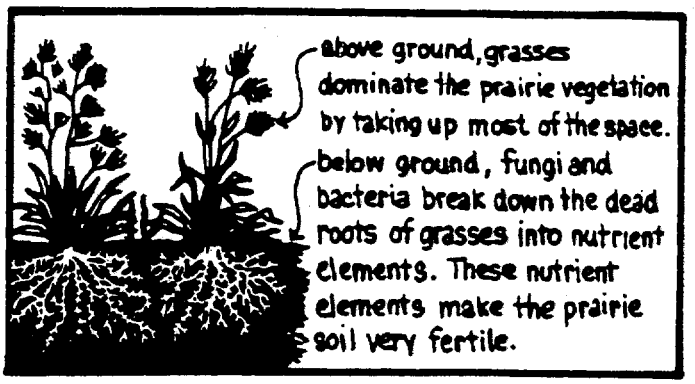
Adapted from Seasons of the Tallgrass Prairie, by Carol Lerner.

Prairie Grasses



The Role of Grasses in the Prairie Ecosystem:

As you learned when you studied the soil of the prairie, the importance of grasses to the ecosystem begins underground. The massive network of grass roots anchors the soil to the earth, thereby preventing erosion. The roots, combined with the soil, form a tough mass called sod which works like a sponge to absorb rainwater. The nutrient elements in the dead roots of grasses are recycled and kept in the soil until they are used to provide energy for living plants.



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Work Step #4. List three things grasses contribute to the prairie ecosystem.

1. **Big bluestem:** This grass grows to a height of 8' or more. It begins growing in late April and flowers in late summer. The seed head of its flower branches into three parts, looking something like a "turkey's foot". Big bluestem grows most commonly in moist soil. Moist 8'

2. **Little bluestem:** This grass grows to be 2 to 4' tall. It grows from May until the first frost in fall. During spring and summer, the bottom shoots of little bluestem are bluish but by fall, they are a beautiful mixture of rust and gold. Its flowers are "feathery" and are covered with short, white hairs. Little bluestem grows in dry to moist soil in uplands. dry to moist 2'-4'

3. **Needlegrass:** This grass grows to be 2 to 4' tall in dry soil. It begins growth in April and flowers by June. This grass is sometimes called "needle and thread" because of its pointed seed that is as sharp as a needle. dry 2'-4'

4. **Side-oats grama:** This 1 to 3' tall grass flowers during the summer. Its small (¼") "oatlike" seeds line up on one side of its stem. It is that arrangement which gives this dry soil grass its name. dry 1'-3'

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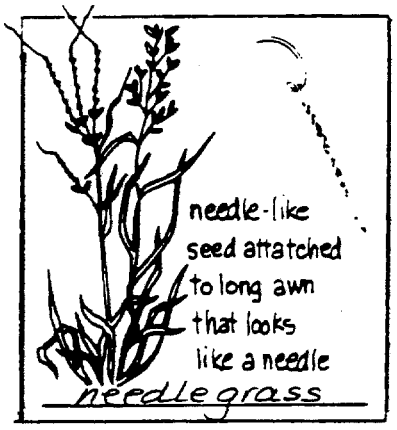
6. **Indian grass:** This 4 to 8' tall grass begins growing in dry to moist soil about the first of May and flowers during late July and August. Indian grass can be identified by the presence of a clawlike structure where the leaf blade attaches to the stem. moist 4'-8'

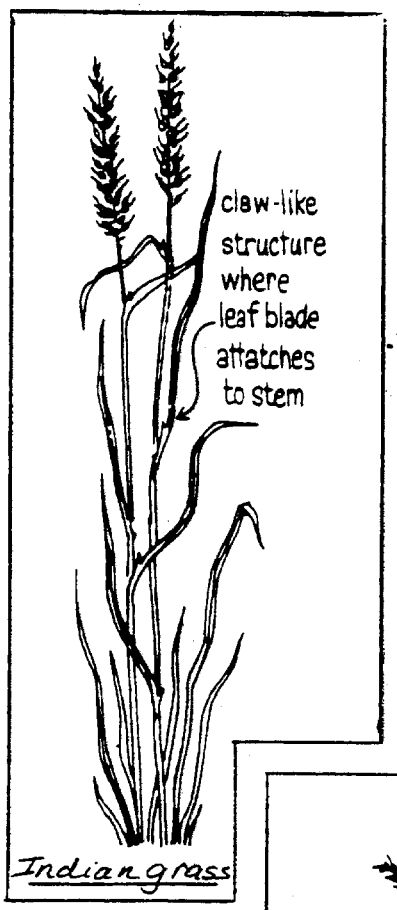
7. **Nodding wild rye:** This 3½' tall grass begins growth in March or April and matures by July. Its dense flowers look like they are nodding as they curve downward. Nodding wild rye grows in dry to moist soil. dry to moist 3½'

8. **Prairie dropseed:** This 2 to 3' tall plant stands very straight and has very long, narrow leaf blades. Prairie dropseed grows throughout the summer and flowers in the fall in dry soil. dry 2'-3'

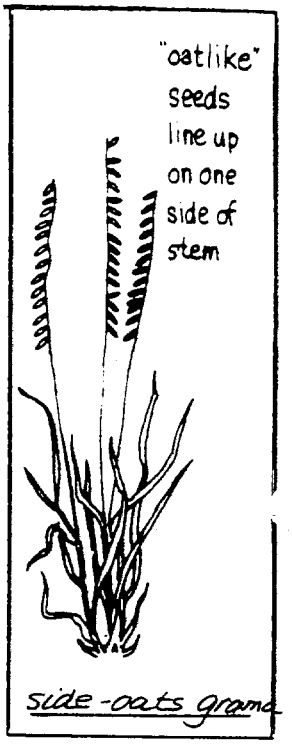


needlegrass

switchgrass

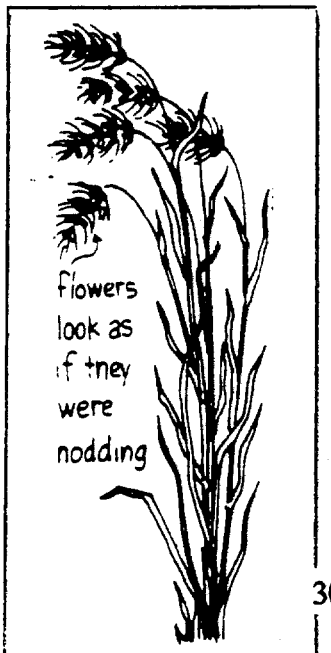


Indian grass

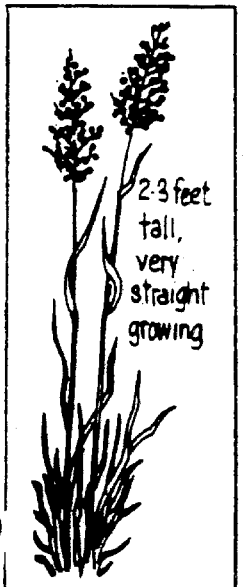


side-oats grama

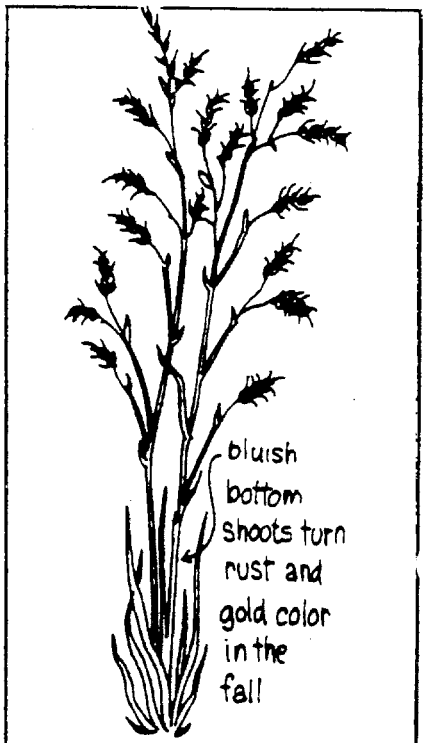
Big bluestem



nodding wild rye



Prairie dropseed



Little bluestem

Discussion Questions:

1. What is humus?

   (The decayed roots of plants.)

2. List at least two ways humus is good for the soil.

   (It contains nutrients from the rotted roots, making the soil fertile. It loosens the soil so roots can survive drought. The prairie plants spread by sending up new shoots from the roots. The long roots help the plant live through the winter.)

3. List at least two ways the long perennial roots help prairie plants.

   (Roots go deep into the soil to get water. They store food so the plants can survive drought. The prairie plants spread by sending up new shoots from the roots. The long roots help the plant live through the winter.)

4. List possible reasons to explain why pioneers decided to farm the prairies.

   (Possible answers include: It was a lifestyle with which they were most familiar and previously successful. They were not aware of the amount of hard work it involved or the value of the prairie.)

5. Explain the differences between the grass in your front yard and the grass in the prairie.

   (Possible answers include: Grass in the front yard was planted by man and is not native to the area. It is all of one variety and has shallow roots. Grass in the prairie was originally planted by nature and is native to the area. There are many varieties present at one time and all have very deep roots.)

6. Make a plan to measure how many roots are in a soil sample.

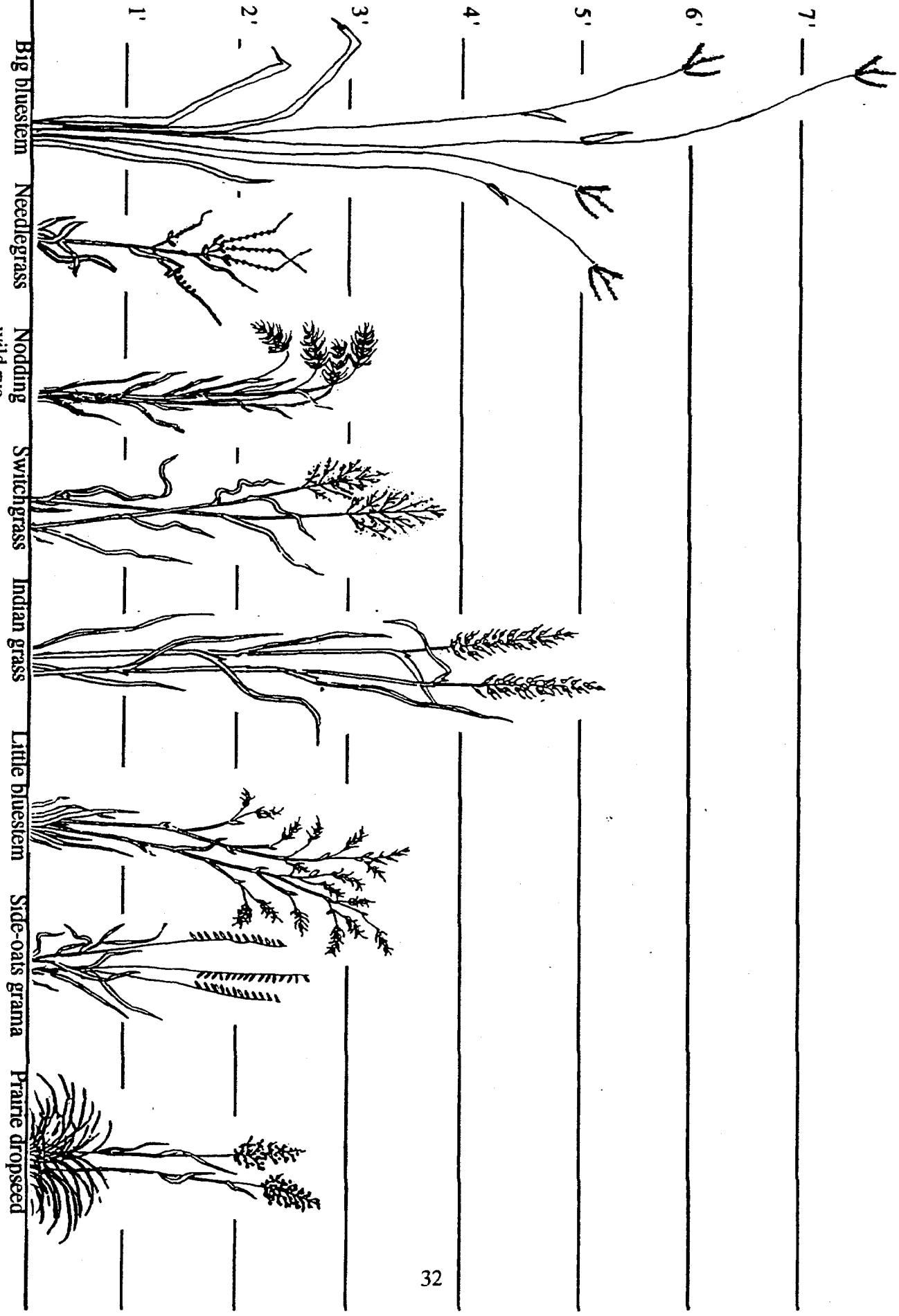
   (Possible answers may include: washing dirt off roots and weighing, counting roots directly.)

7. As a pioneer, explain why it was necessary to plant crops on the prairie.

   (It was the only method of producing food that they had experience with, and they needed food to survive. The pioneers may not have had any other alternatives at the time.)

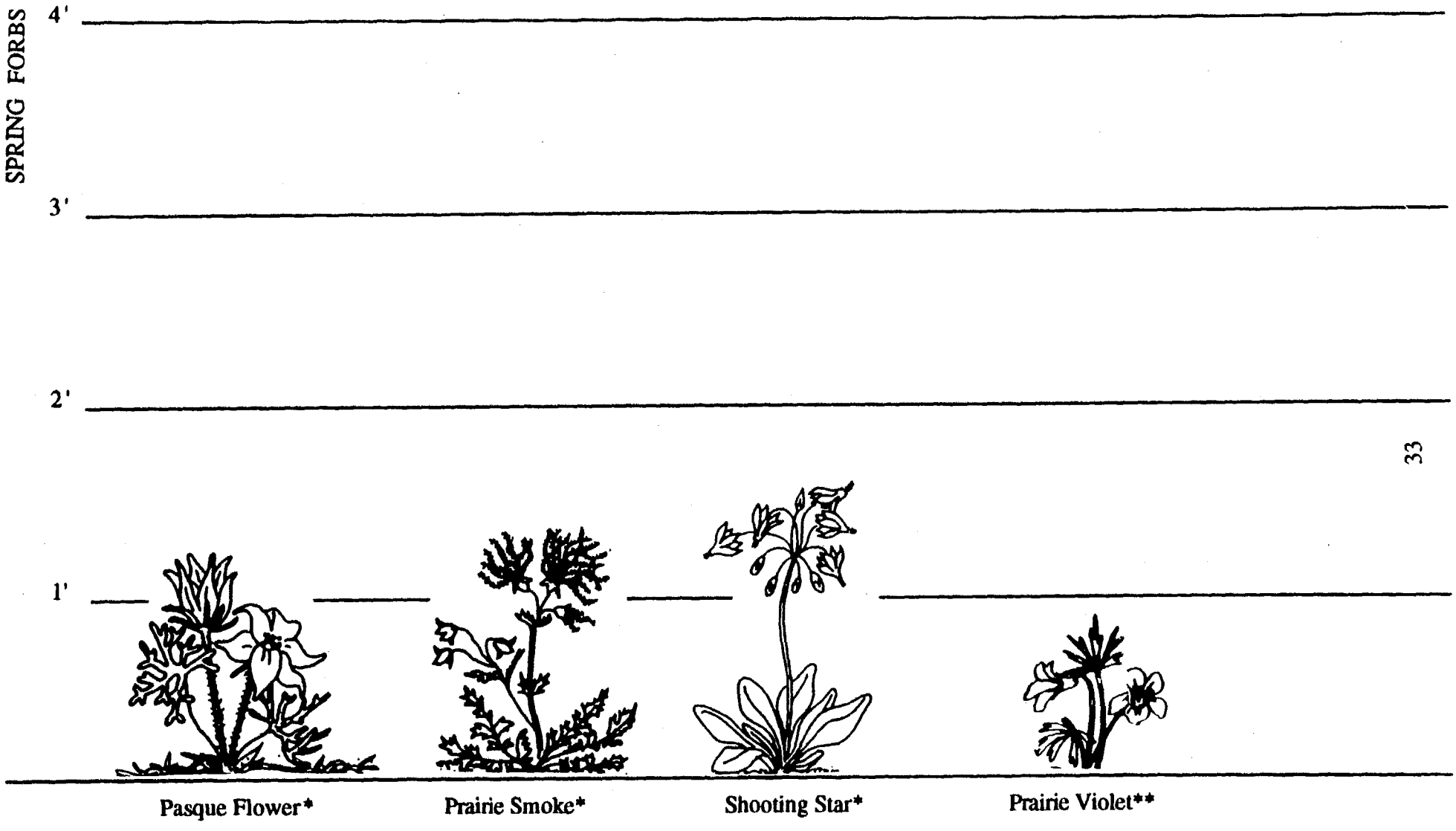
Adapted from Seasons of the Tallgrass Prairie, by Carol Lerner.

DAY 2 - PLANTS
TRANSPARENCY MASTER
PRAIRIE GRASSES



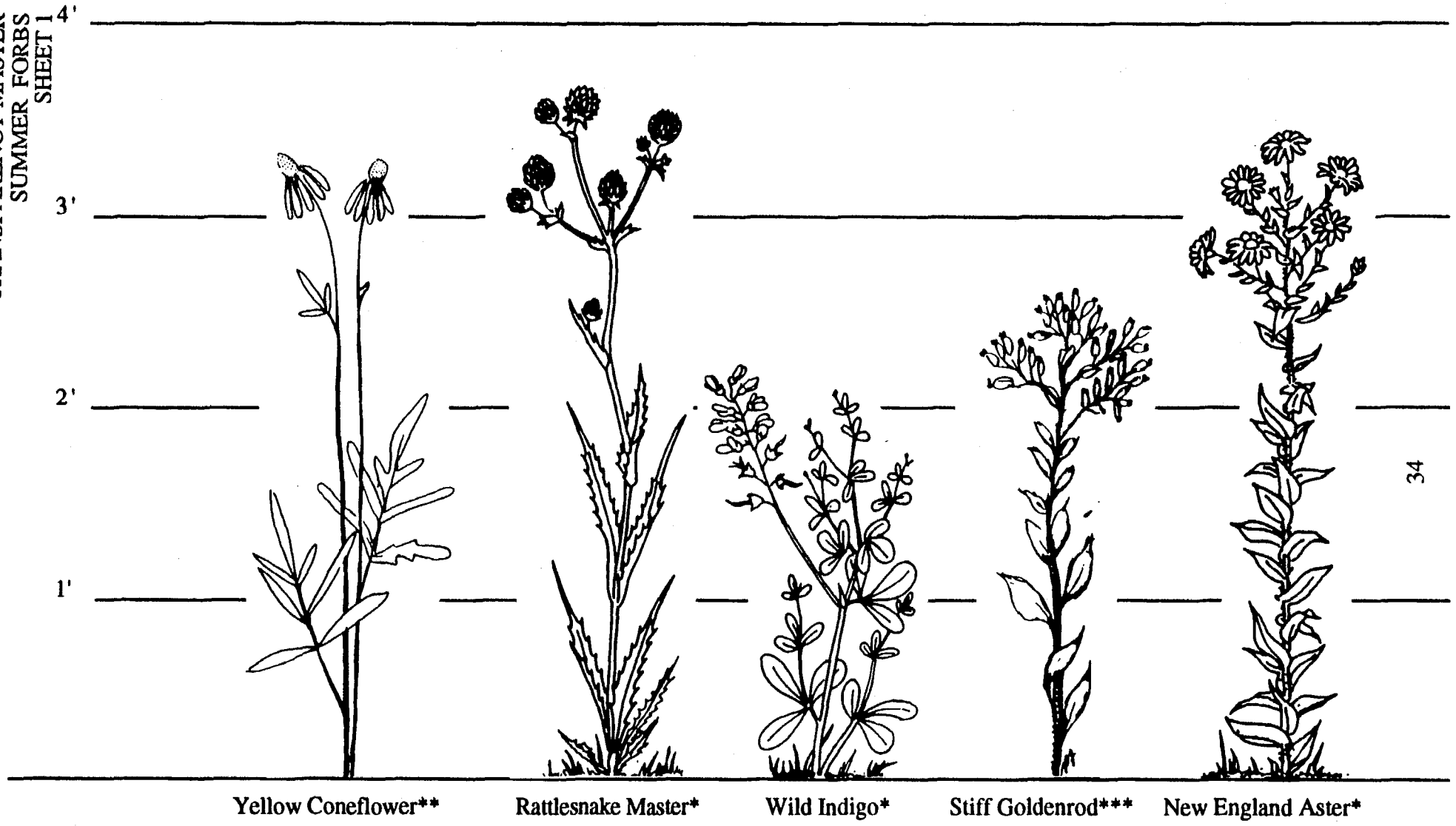
Courtesy of Illinois National Heritage Conservation Kit III, Illinois Dept. of Conservation, 1983

DAY 2 - PLANTS
TRANSPARENCY MASTER
SPRING FORBS



*Courtesy of Illinois National Heritage Conservation Kit III, Illinois Dept. of Conservation, 1983 **Courtesy of Morton Arboretum Education Dept.

DAY 2 - PLANTS
TRANSPARENCY MASTER
SUMMER FORBS
SHEET 1



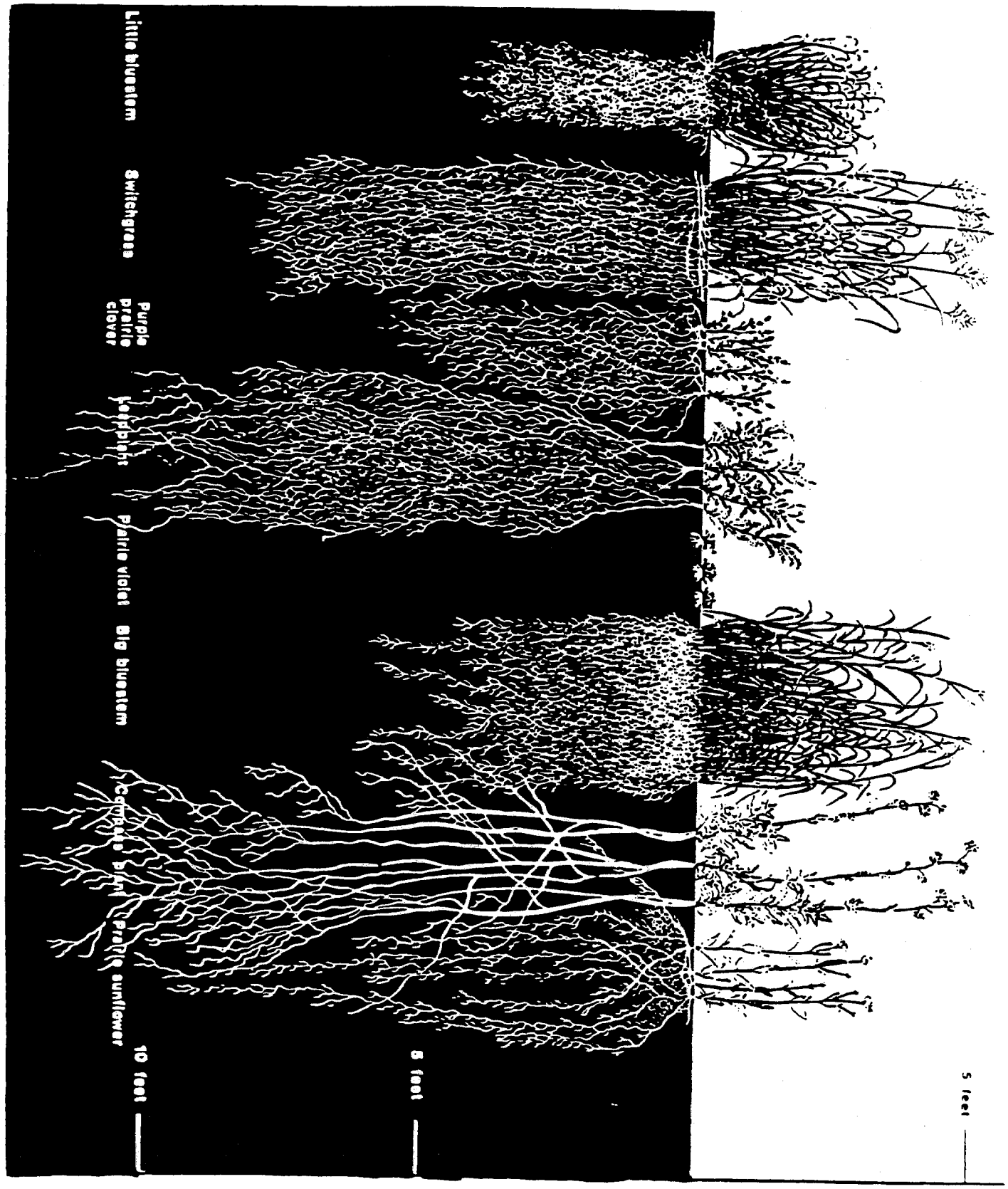
*Courtesy of Illinois Education Kit III, Illinois Dept. of Conservation, 1983
**Courtesy of Chicago Botanic Garden, Education Dept

***Courtesy of Particles and Prairies: The Fermilab Savannah
Fermi National Accelerator Laboratory

DAY 2 - PLANTS
TRANSPARENCY MASTER
SUMMER FORBS
SHEET 2

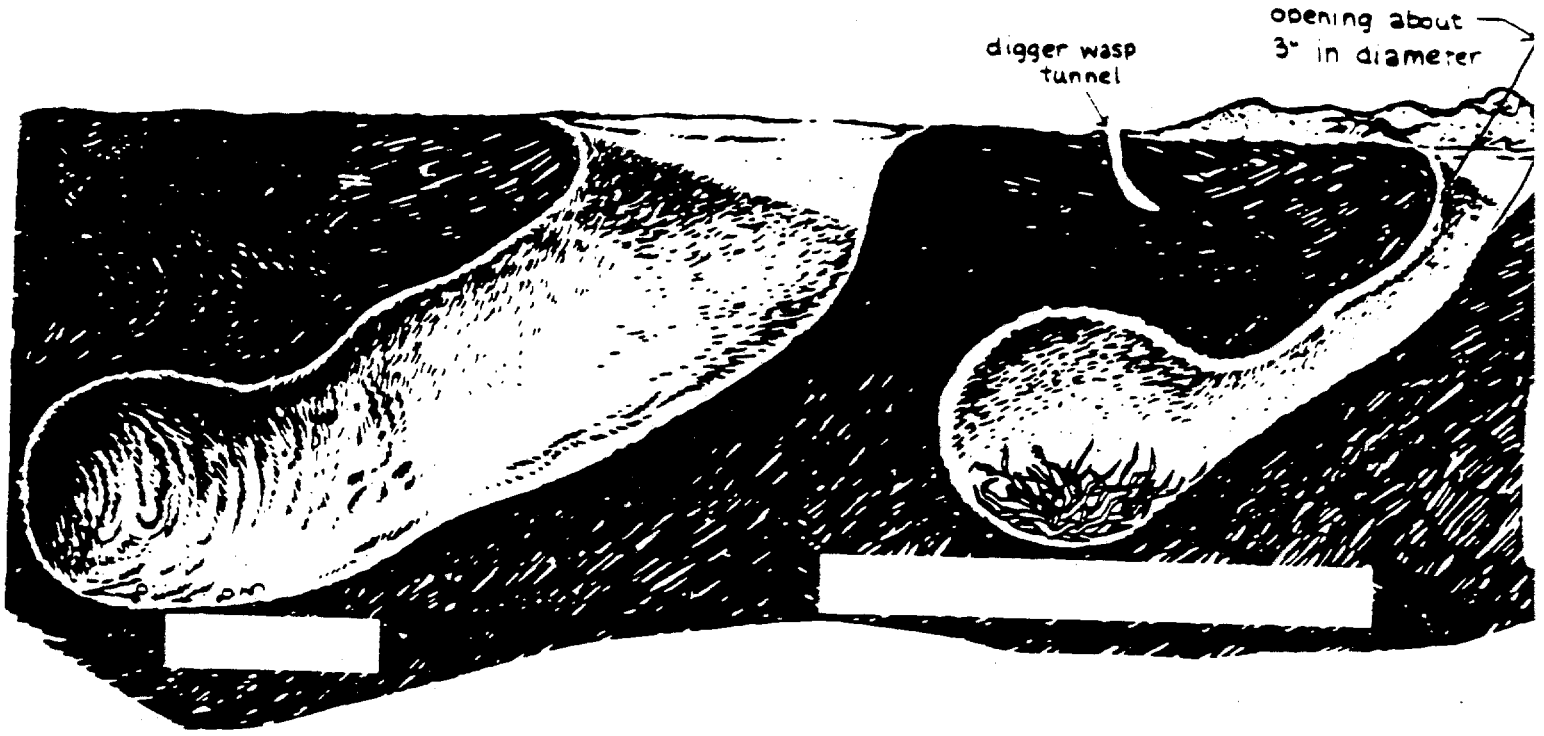
Courtesy of the Chicago Botanic Garden Education Department

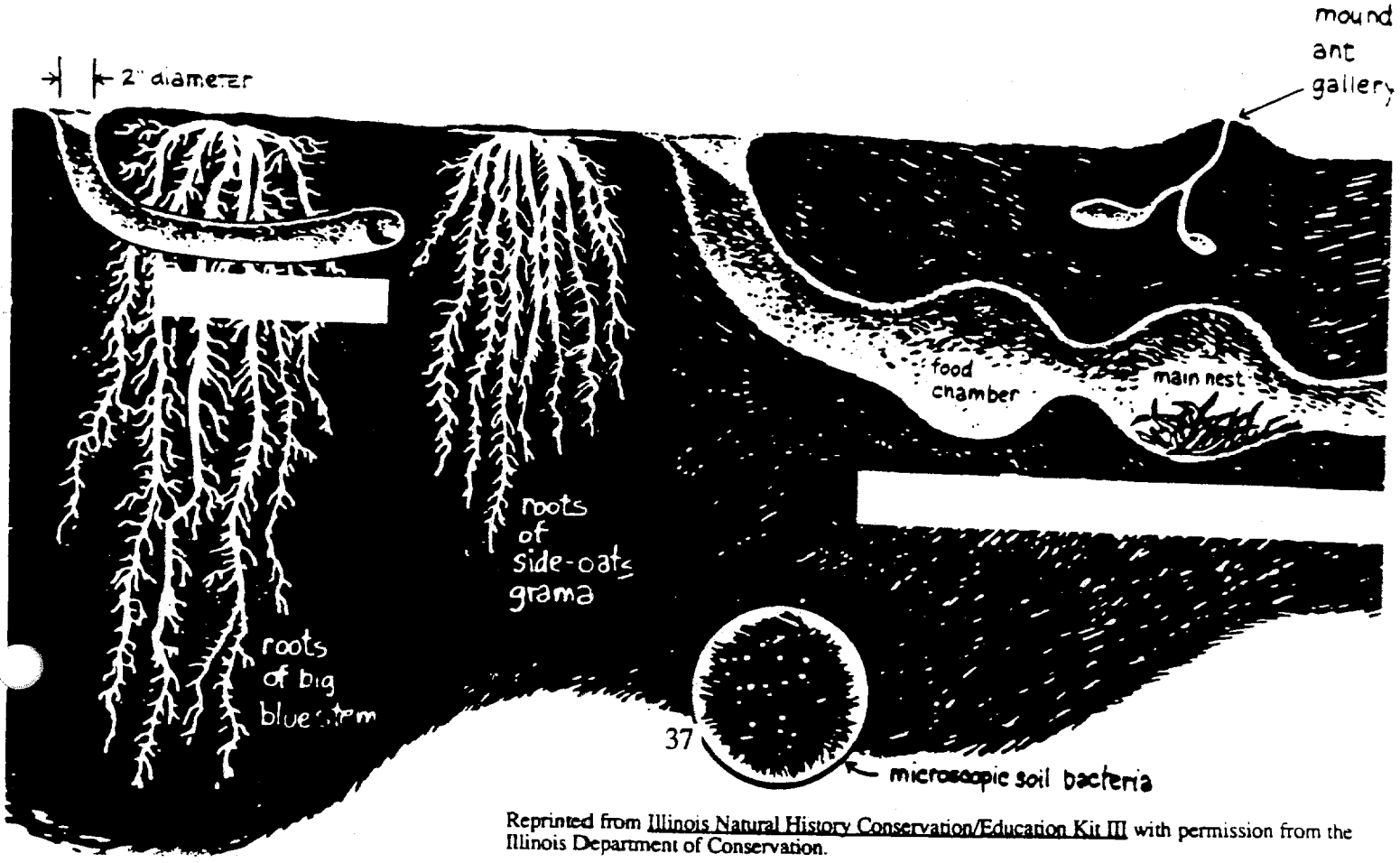
PRAIRIE GRASS ROOT SYSTEM



Reprinted from ***Seasons of the Tallgrass Prairie*** by Carol Lerner, y & Co. publishers

DAY 2 - PLANTS
TRANSPARENCY MASTER
PRAIRIE BURROWS





Reprinted from Illinois Natural History Conservation/Education Kit III with permission from the Illinois Department of Conservation.

DAY 3: SOIL IS MORE THAN DIRT

OBJECTIVES

The students will:
1. Increase their knowledge of the composition and formation of soil.
2. Compare the soil structure of prairie soil and another soil.

BACKGROUND

Soil: Soil is much too precious to just call it dirt. Soil is the basis of all life. We walk on it, grow crops on it, pave it over for roads and airports, and all too often take it for granted.

Prairie soil is a source of nutrients because its many decomposers (641,000 fungi and more than 20 million bacteria per acre) break down dead plant and animal materials into important nutrient elements such as carbon and nitrogen. These nutrient elements are stored in the soil until they are taken through the roots of plants. The end result - that dead materials are recycled into nutrient elements that help plants grow - is called the nutrient cycle. (See Student page 2: *Nutrient Cycle)*

Prairie soil is also a shelter. When harsh weather or fire sweep across the prairie, the roots and buds of plants are tucked away safely in the soil. When the aboveground parts wither and die in late summer and fall, the roots and buds live on through the winter, waiting to send new shoots up through the soil in spring. Animals, too, depend on the soil as a refuge. The deer mouse builds its small nest underground and hoards seeds for winter use in burrows near its nest. Although it does not hibernate, the badger uses its burrow in spring as a nest chamber to sleep for several days. The Franklin's ground squirrel, on the other hand, hibernates in its burrow throughout the winter months. Many birds, reptiles and amphibians also find refuge in the soil.

Soil Formation: Soil is formed in two ways: building up and breaking down. Soil formation is influenced by five factors: climate, organisms, topography, parent materials and time. By the interaction of climate and organisms over a long period of time, soil is created. This period of time depends on the nature of the materials. It takes 100 to 600 years, or more, to form an inch of topsoil. Parent materials include rock debris, sand-silt and clay-sized particles transported and deposited by water (called sediment), ice (glacial drift), and/or wind (loess) and out croppings of bedrock. The minerals of the soil come from the roots of plants, leaves, twigs, insects and other organisms that are decomposed.

Different soils develop under different climatic conditions. Also, variations in the type of vegetation and organisms that decay in the soil cause soil to differ. There are more than 20,000 kinds of soil in the United States. Some of these include forest soils, tropical soils, prairie soils and rainforest soils.

Soil Particles: Most soil contains a mixture of particles. Sand, the largest of the three soil particles, ranges from .05 to 2.0 millimeters in size. If the soil has an adequate amount of sand particles, it can hold enough water for vegetation. Silt is the medium-sized particle that feels like flour. Silt particles are .002 to .05 millimeters in diameter. The smallest particle is clay. Clay is too small to be seen with a magnifying glass. When wet, clay particles are slick and sticky.

Soil Profile: A soil profile is a slice of earth several feet deep. Most soil profiles have a surface layer of organic material and two or three layers of mineral materials. Soil is broken into three major layers: topsoil, subsoil and parent material.

Topsoil, the A horizon, is the upper six to ten inches of soil. It contains most of the soil's living organisms, and it is rich in nutrients. It is dark, ranging in color from gray-brown to black. Darker colors come from rotting organic matter called "humus" which keeps the soil loose. Humus is like a sponge because it absorbs water and holds it for plants to use. The plant roots, bacteria, fungi and small animals are abundant here.

The next layer is called subsoil, the B horizon. It holds water and some plant nutrients, but it is less fertile than the topsoil, containing less humus, roots and organisms. The subsoil is clay-like - it is usually harder when dry and stickier when wet than the surrounding soil layers. Subsoil is lighter-colored.

The C horizon is called parent material because it is the weathered rock and partly weathered soil from which the soil layers were formed. Parent materials can be rocks, materials left by glaciers, materials left by wind, and water or even organic matter such as plants. (See Soil Profile transparency.)

MATERIALS

* Book, *Addie Across the Prairie*
  Journal
  Prairie mural construction materials
  Prairie soil samples (optional)
  Digging trowel
  Vials or small containers
* Student pages - *Soil is More Than Dirt*
  Soil Word Web
  Nutrient Cycle Explanation
  Nutrient Cycle Worksheet
* Teacher pages - *Soil Word Web Answer Sheet*
  Nutrient Cycle Answer Sheet
  Dirt Cake Recipe
* Transparency Master - *Soil Profile*

Starred (*) materials are provided in this packet.

VOCABULARY

erosion: The loosening and movement of soil by wind, raindrops, moving water, ice or landslides.

habitat: A place where plants and animals grow, live, and reproduce.

loam: A soil containing sand, silt, and clay.

nutrient: A substance that supplies nourishment for an organism to live.

organisms: Living things.

parent material: Materials, such as rock or dead plants, that break down or decay to form soil.

sediment: Soil that is deposited by water or wind.

silt: A medium-sized soil particle. Silt helps the soil become rich and loose.

soil: A dynamic mixture of broken-down rocks, air, water, and plant and animal material.

topsoil: The uppermost layer of soil. This is the richest, most productive layer of soil.

PROCESS

Observing, comparing and contrasting, recognizing relationships, drawing conclusions.

PROCEDURE

1. Soil Is More Than Dirt
   A. Read "Soil Is More Than Dirt."

   B. Do the *Soil Word Web* student page.

   C. Divide a soil sample (30.5 cm X 30.5 cm X 10 cm deep) among cooperative groups of three or four students.

   D. Ask students to observe and identify objects found in the soil dividing the objects into two categories - living and nonliving.

   E. Discuss the nutrient cycle using student page.

   F. Using the *Nutrient Cycle* page, have students fill in the time order for the nutrient cycle.

2. Soil Particles
   A. Collect soil samples from a playground or vacant lot. Crush the lumps. Remove rocks and roots.

   B. Pour the soil samples into a jar until they are 1/4 full. Add water until the jars are full.

   C. Add two teaspoons of detergent or dishwashing soap. Close the lid tightly. Shake the jars three to four minutes.

   D. Poke holes in the lid and set the jars in a safe area, free from disturbance for at least two to three days or until the particles settle into observable layers.

   E. After the particles have settled, examine the soil sample's texture, color, and amount of sand, silt and clay. Ask students to predict how well plants will grow in this type of soil. OPTIONAL: If you are able to obtain soil samples from a prairie, distribute them to each cooperative grouping.

   F. Ask students to compare their soil samples with the prairie soil sample, using a "compare and contrast format.

3. Soil Profile

   Using the soil profile transparency discuss differences in the horizons (depth, color, plant growth, soil particles and rock size). Why is the particle size important to plant growth and the water-holding capacity of soil? What results if plant cover is absent?

4. Dirt Cake

   This is an excellent culminating activity and can be served to visiting parents.

5. Continue ongoing activities.

ASSESSMENT

The following list suggests ideas or topic questions.

Explain the difference between prairie soil and soil from other areas.
Discuss some of the things that have happened to prairie soil. How has it changed?
Write down hypotheses, observations and conclusions of the experiments/lessons.
How can you help preserve, restore and conserve prairie soil?

EXTENSION ACTIVITIES

1. Have students experiment with different processes that help create soil.

   Abrasion - Rub together limestone, sandstone, brick or concrete.
   Heating - Heat limestone and drop it in ice water. It should crack or break.
   Freezing - Freeze water in a plastic jar. What happens? Water trapped in rock freezes and rock breaks into smaller and smaller pieces.

2. Talk to your art instructor about correlating art projects with clay, sand jars, sand paintings, etc.

INTERDISCIPLINARY CONNECTION

Art, language arts, mathematics.

Name_____

Date_____

SOIL IS MORE THAN DIRT

What is really this stuff called soil? Soil is much too precious to just call it dirt. Whenever you step outside, the soil beneath your feet is full of life. It is the home for creatures such as microbes, moles, ants, and earthworms.

WHAT IS IN THE SOIL?

The prairie soil has as many as 641,000 fungi and more than 20 million bacteria per acre that break down dead plant and animal materials into important nutrient elements, such as carbon and nitrogen, to help plants grow.

The soil is a refuge for animals like the deer mouse that builds its small nest underground and hoards seeds for winter use in burrows near its nest. The Franklin's ground squirrel, on the other hand, hibernates in its burrow throughout the winter months. Many birds, reptiles, and amphibians find refuge and/or food in the soil.

HOW IS SOIL FORMED?

Soil is formed by five soil-forming factors: climate, organisms, topography, parent material and time. Soil is formed very, very slowly. Soil is formed in

two ways, building-up and breaking-down. Rock, debris, sand-silt, and clay-sized particles, are transported and deposited by water (called sediment), ice (glacial drift), and/or wind (loess). These deposits together with out croppings of bedrock, form the topography or landscapes of the earth's surface. These are the parent materials from which soil forms. Continued weathering or breaking down of these parent materials by interactions of climate and organisms over long periods of time creates soil. As plants and animals decay, they also become part of the soil. The minerals of the soil come from the roots of the plants, leaves, twigs, insects, and other animals and organisms that are decomposed.

WHAT IS THE COMPOSITION OF SOIL?

A soil profile is a slice of earth several inches or feet deep. Most soil profiles have a surface layer of organic material and two or three layers of mineral materials.

The TOPSOIL is the upper 6 to 10 inches of soil. It contains most of the soil's living organisms, and it is rich in nutrients. The dark colors come from rotting organic matter, plants, and animals. This highly decayed matter from dead plants and animals is called "humus." Humus keeps the soil loose. It is like a sponge that absorbs water and holds it for plants to use. The plants, roots, bacteria, fungi, and small animals are abundant here.

The SUBSOIL holds water and some plant nutrients, but it is less fertile than the topsoil. It is good for growing plants. It is clay-like, usually harder and stickier when wet than the surrounding soil layers. It contains lesser humus, roots and organisms.

The PARENT MATERIAL is the weathered rock, partly weathered soil from which the soil layers were formed. Parent material can be rocks, materials left by the glaciers, materials left by wind and water, or even organic matter such as plants.

The size of soil particles is important. The amount of open space between the particles has a lot to do with how easily water moves through soil and how much water it holds. Too much clay (smallest soil particle) in proportion to silt (medium-sized particles like flour, when you rub it) and sand (largest of the soil particles that allow water to pass through easily) causes soil to take in water very slowly. The soil that has a favorable proportion like 27% clay, 50% sand and the rest silt is a good example of a loam soil.

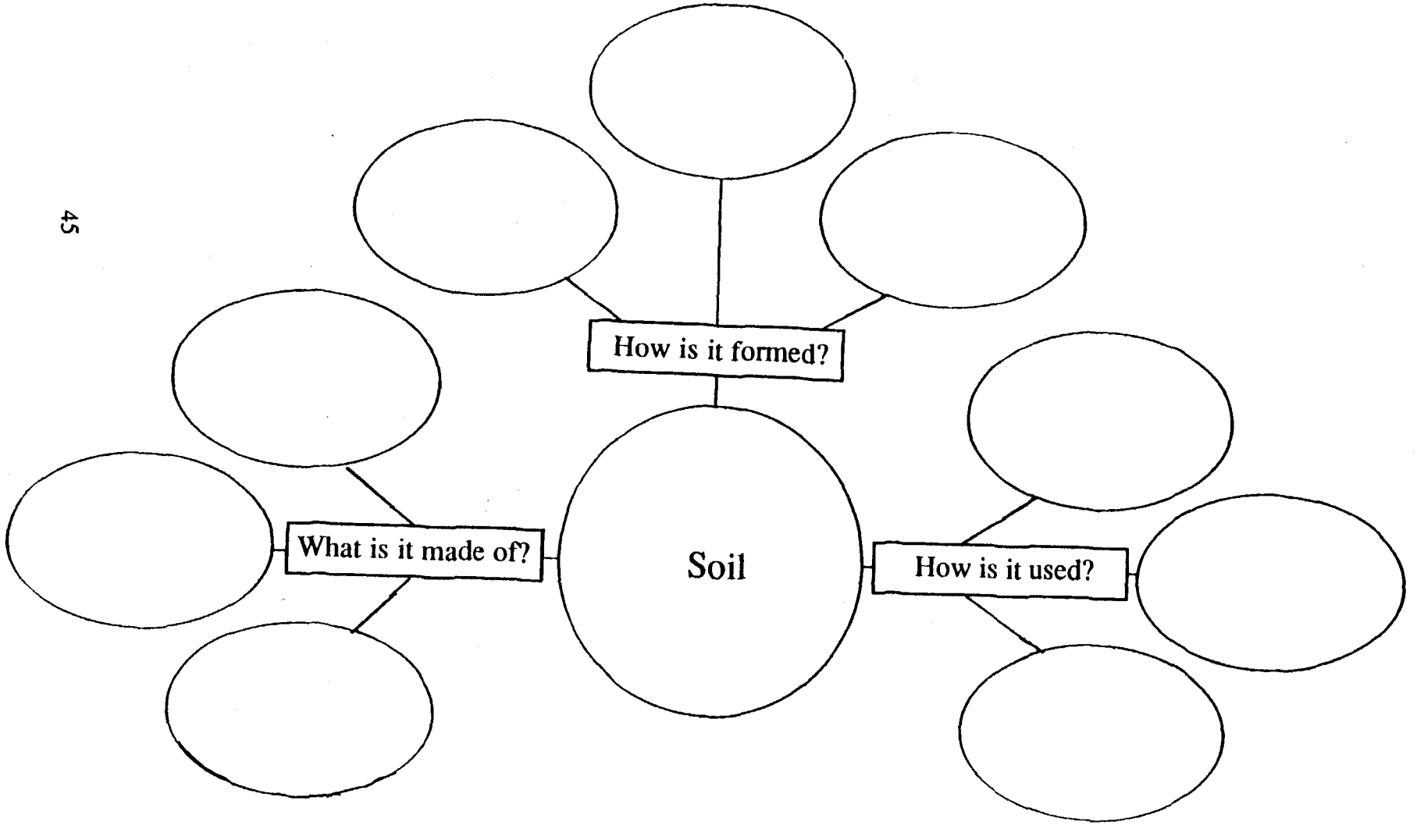
Most of Illinois prairie is now used as farmland where the prairie grasses and forbs have been replaced with corn, soybeans and wheat. Beneath the farmland, the prairie soil exists. This black soil is excellent for plants. Illinois' rich soil is a gift from its prairies that helps feed people all over the world.

Soil Word Web

Name_____

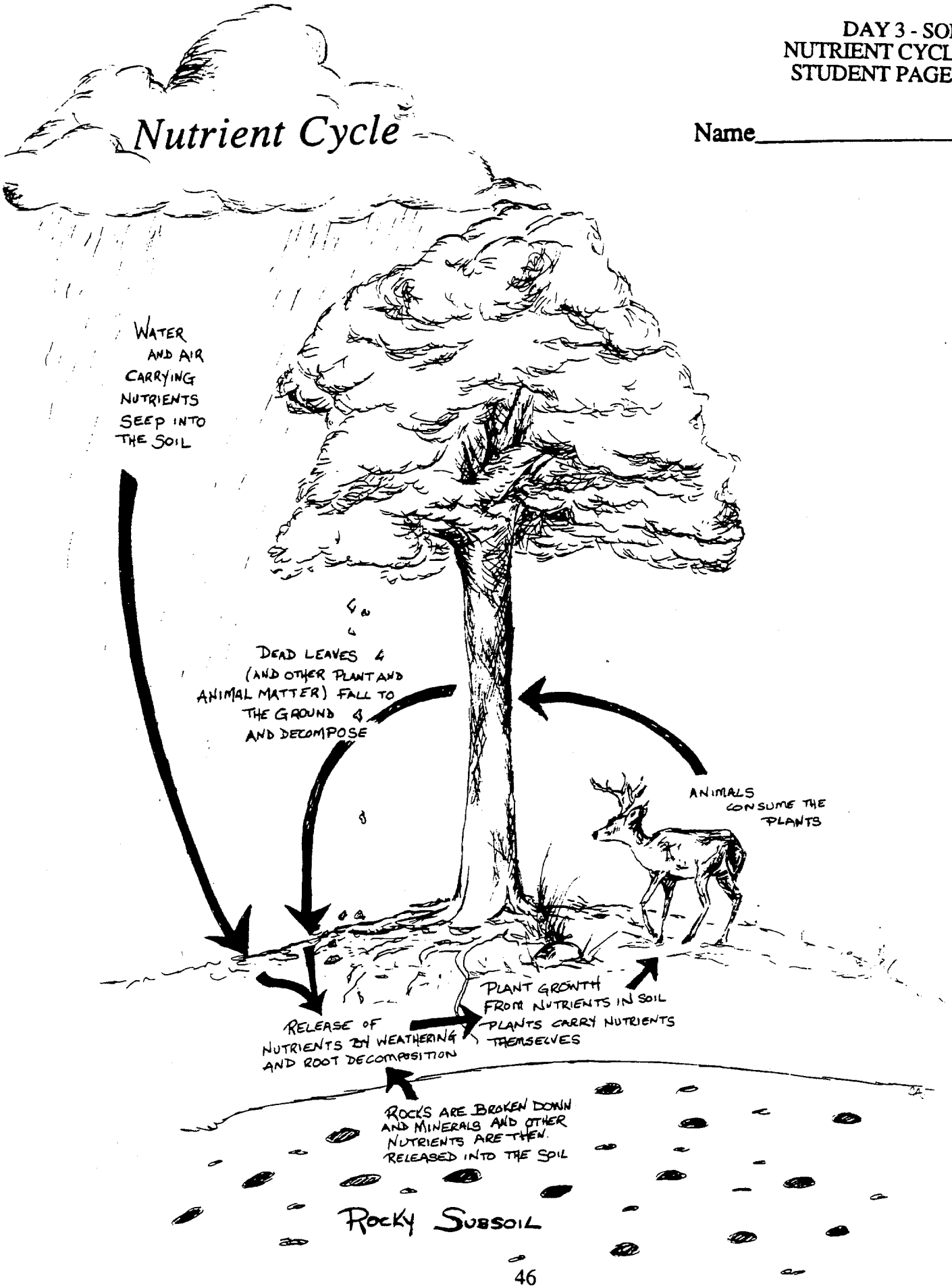
Date_____

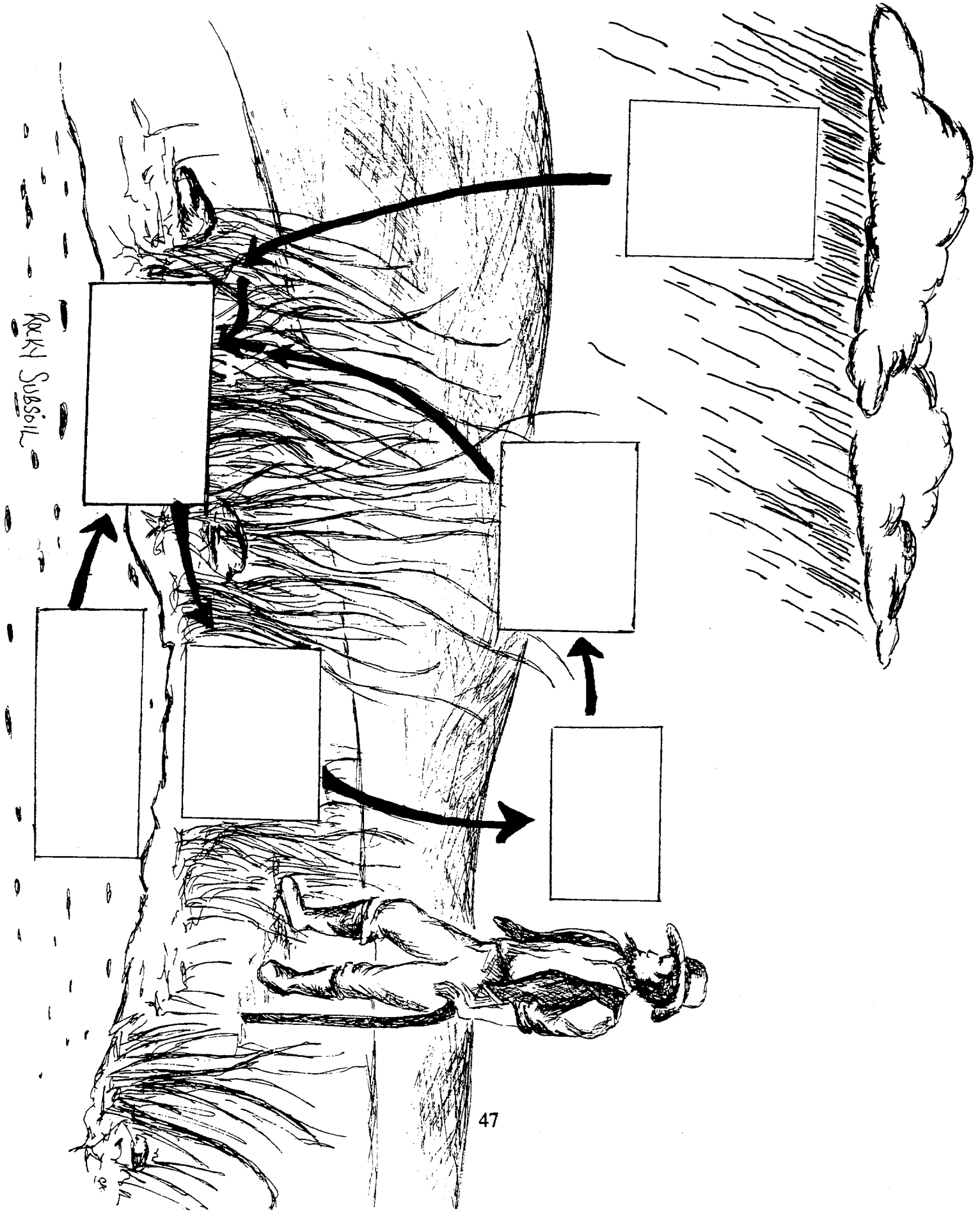
Write three answers to each question.



Nutrient Cycle

Name_____



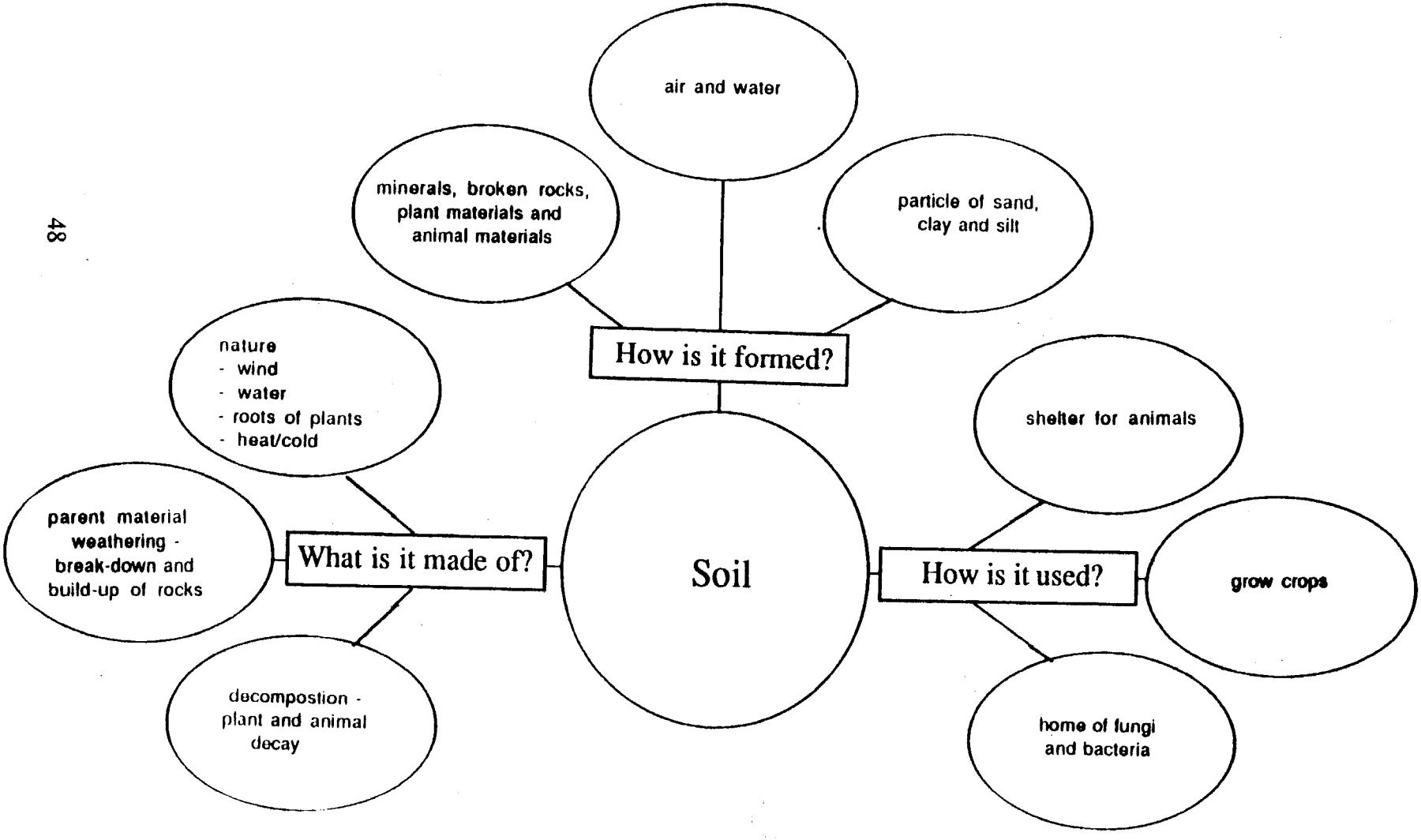

ROCK SUBSOIL

Soil Word Web

Name_____

Write three answers to each question.

Date_____



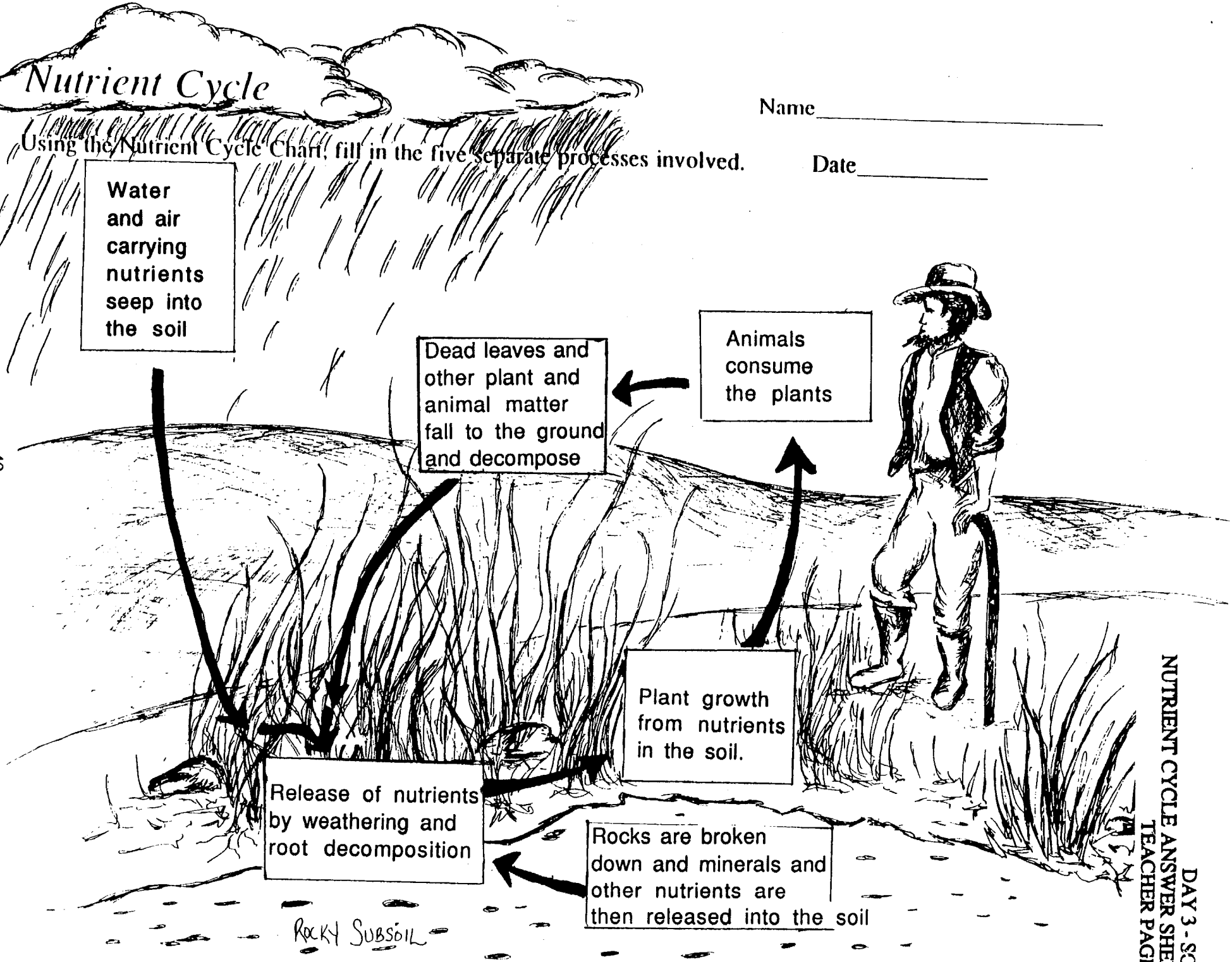
DAY 3 - SOIL
SOIL WORD WEB ANSWER SHEET
TEACHER PAGE 1

Nutrient Cycle

Name_____

Using the Nutrient Cycle Chart, fill in the five separate processes involved.

Date_____



DAY 3 - SOIL
NUTRIENT CYCLE ANSWER SHEET
TEACHER PAGE

Dirt Cake Recipe

Prepare the following cream cheese mixture.
Beat until creamy:

1 cup powdered sugar
1 - 8 oz. package of cream cheese
1/2 stick butter

Set Aside.

Prepare the following chocolate pudding mixture.
Mix until thick:

2 large packages of instant chocolate pudding
3 1/2 cups milk

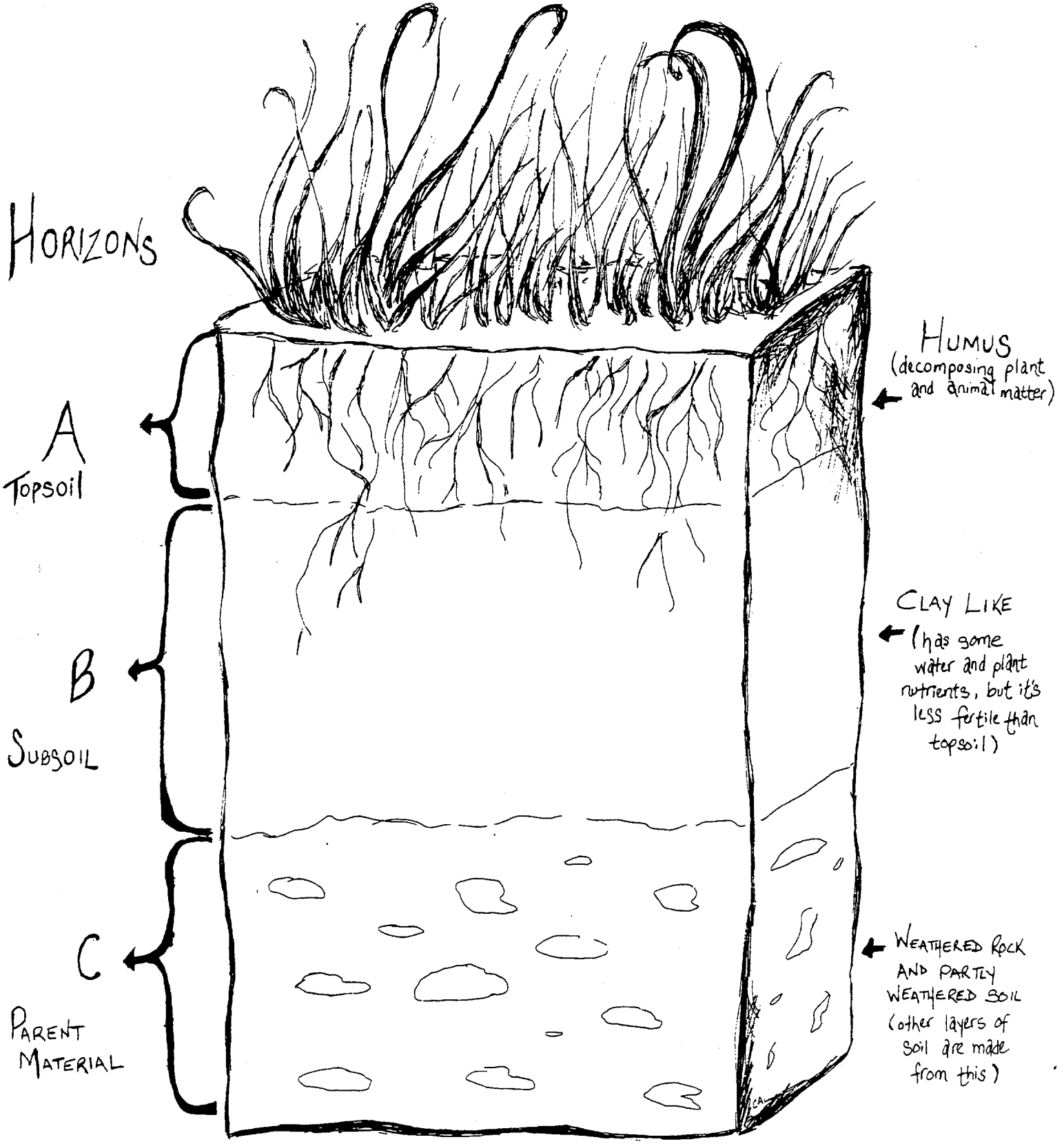
Refrigerate.

Using an electric blender (you may do this manually as well), break up a 20 oz. package of oreo cookies until they have the same appearance as dirt.

Mix the cream cheese mixture and the chocolate pudding with 8 oz. of cool whip.

In a large container (A CLAY FLOWER POT WILL WORK!), layer the ingredients.
Add:

1/3 of the cookie crumbs in the bottom of the pot.
1/2 of the pudding mixture.
Another 1/3 of the cookie crumbs.
The remainder of the pudding mixture.
The remainder of the cookie crumbs.
Decorate with plastic or real flowers. Gummy worms may be an additional pleasant touch.


HORIZONS
A
TOPSOIL
B
SUBSOIL
C
PARENT MATERIAL
HUMUS
(decomposing plant and animal matter)
CLAY LIKE
(has some water and plant nutrients, but it's less fertile than topsoil)
WEATHERED ROCK AND PARTLY WEATHERED SOIL
(other layers of soil are made from this)

DAYS 4 & 5: PRAIRIE ANIMALS

OBJECTIVES

The students will:

1. Become familiar with amphibians and reptiles, birds and mammals of the prairie and the roles they play in the ecosystem.
2. Identify the importance of insects and other invertebrates in the prairie ecosystem.
3. Contrast positive and negative influences of amphibians, reptiles and birds upon the environment.
4. Describe the predator/prey relationship within the prairie ecosystem.
5. Understand food webs.
6. Develop a base of knowledge to be able to make sound ecological decisions.

BACKGROUND

Amphibians and reptiles are both cold-blooded animals. Their body temperatures fluctuate based upon the temperature of the environment around them.

Amphibians: There are three basic groups of amphibians: salamanders, frogs/toads and the Caecilians - living fossils that are limbless, earless, almost blind and earthwormlike. They all differ from reptiles in that they never have true clawed feet or a scaly skin.

Amphibians and reptiles significantly contribute to the prairie ecosystem. As predators, they help control the insect population, and as prey, they become food for birds and mammals in addition to other reptiles. Amphibians do not have scales and spend part of their life in a fishlike "tadpole" stage.

Reptiles: Reptiles can be found in every state and are classified into four major groups: turtles, lizards, snakes and alligator/crocodiles. All reptiles have lungs and breathe air. Their skin is usually covered with scales or plates. Most reptiles lay eggs, however, in a few the eggs develop inside the female, and the young are born alive.

Birds: When students become really interested in birds, there's nothing like the thrill of seeing a beautiful bird, observing behavior, learning the importance of birds in the world of wildlife, and how they help control insect population.

Prairie grasses hide many ground-nesting birds, including meadowlarks, bobolinks, sparrows, larks and burrowing owls who nest under the prairie, usually in the deserted burrows of badgers or squirrels.

An important part of the prairie includes the birds of prey circling and diving for their next meal. The open field hunters include marsh hawks, red-tailed hawks, prairie falcons, eagles and turkey vultures (who scavenge the leftovers of the hunters).

It is important to remember that most birds do not remain in the prairie throughout the entire year. However, when present, they provide an intricate function in the prairie ecosystem. They help control insects, disperse seeds and provide a source of food for larger carnivorous birds.

Insects and Other Invertebrates: Life exists above, on and below the ground in the prairie. This aspect of study will concentrate on life on the ground in the form of insects and other invertebrates. Insects are remarkable animals. They occur almost anywhere, and they make up

more than half of all living things on this planet. They exhibit some unusual physiological and structural peculiarities.

Insects and other invertebrates play an important role in the prairie ecosystem. Some are destructive, some annoying, but they all play one of four extremely important functions: pollination, food processing, decomposition and soil tillage. You can find millions of insects on the prairie, so it would be impossible to give a comprehensive list.

The interdependence among species found within the prairie ecosystem is astonishingly important. If left totally unchecked, two flies could produce, in a single year, a ball (packed a thousand flies to the cubic inch) 96 miles in diameter.

Mammals: The mammals covered in this lesson include two distinct divisions. One group includes those mammals which once lived on the vast prairies, and the other includes those which lived on the prairie in the past and in the present. It is important for students to realize that when they visit a current prairie plot, they probably will not find bison, elk, bear, mountain lions, bobcats or wolves. Depending upon the size and location of prairie "museums," a vast variety of mammals can be found.

Mammals of the prairie can be classified as those which typically run or burrow. These animals learn to develop certain adaptations which allow them to survive. Ground squirrels burrow in the ground, which creates an ideal habitat for prairie life. Jackrabbits, deer and antelope depend upon speed for survival.

The dominant carnivorous animals of the prairie were bears and wolves. The removal of these animals makes it difficult to control some mammal populations on the prairie. Large restoration projects have experienced some difficulty maintaining the natural balance of species. The return of coyotes, fox, weasels and badgers has helped to facilitate the proper predator/prey relationship.

Each animal of the prairie has developed its own niche which has allowed it to survive. Burrowing animals have been able to coexist with prairie fires finding safety underneath the cool ground, while the surface temperature can reach 400 degrees within minutes. These adaptations for survival should be stressed as the animals of the prairie are studied. The interrelationships and interdependence found among species on the prairie, creating a workable food web, is an extremely important process.

The introduction of anthropomorphism is effective in teaching the necessity for death to occur in nature which allows life to exist. The death of plants, herbivores, carnivores and omnivores is key to the process of species survival.

MATERIALS

* Book, *Addie Across the Prairie*
  Journal
  Prairie mural construction materials
  Overhead projector
  Wire hangers
* Student pages - *Prairie Amphibians and Reptiles*
  Prairie Amphibian and Reptile Coloring Sheet
  Prairie Birds
  Prairie Birds Coloring Sheets
  The Marsh Hawk
  Prairie Insects
  Prairie Insect Coloring Sheets

* Student Pages - *Prairie Mammals*
  Food Web
* Teacher pages - *Prairie Amphibians and Reptiles Answer Sheet*
  Prairie Birds Answer Sheet
  Prairie Insects Answer Sheet
  Prairie Mammals Answer Sheet
* Transparency Masters - *Prairie Amphibians and Reptiles (1)*
  Prairie Birds (4)
  Prairie Mammals (4)
* Identification Cards - *Birds and Insects*

Starred (*) materials are included in this packet.

VOCABULARY

amphibians: Animals who live on both land and water and have smooth, moist skin without hair or scales. They go through a metamorphosis to become adults.

anthropomorphism: Projecting human feelings onto animals. A good example would be people feeling sorry for the bunny rabbit caught by the hawk.

carnivores: Meat eaters.

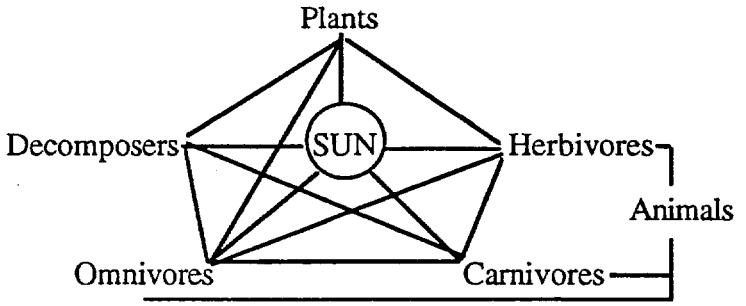
cold-blooded: Having blood that varies in temperature with the outside air, water or land.

decomposers: The animals, plants and microorganisms which break down dead plants and animals. This process enriches the soil.

decomposition: The breaking down of dead things into smaller parts or elements.

ecosystem: Living and nonliving things existing cooperatively.

food web/food cycle: A series of interrelated food chains. For example, plants are eaten by carnivores (meat eaters). Plants and animals can be eaten by omnivores (plant and meat eaters), all of which will eventually die and be eaten by decomposers thus continuing the cycle.



Use food web chart to help clarify.

herbivores: Plant eaters.

insect: A group of small, air-breathing arthropods (invertebrates with jointed legs) with a body clearly divided into three segments (head, thorax, abdomen). Insects have only three pairs of legs.

interdependence: Living and nonliving things relying on one another in an ecosystem.

invertebrates: Animals without backbones.

mammals: Warm-blooded animals, with hair, which usually bear their young live. The females have the capability to nurse their babies.

metamorphosis: The process of change. A change in appearance as an insect becomes an adult.

niche: The special role a species plays in an ecosystem.

nymph or larva: The young of an insect before metamorphosis.

omnivores: Plant and animal eaters.

pollination: The transfer of pollen for the fertilization of plants.

predator: The hunter.

prey: The hunted.

reptile: Cold-blooded animals that produce eggs which hatch into young. These young are miniature replicas of the adults (color may change).

scavengers: Animals that clean up food scraps.

PROCESS

Observing, discovery, inquiry, critical thinking, researching, application, report writing, public speaking, cooperative learning, concept application.

PROCEDURE

This lesson is a four-part, two-day lesson on the animals of the prairie.

1. Prairie Mural (continued):
   Divide the students into five separate cooperative groups: amphibians, reptiles, birds, insects and mammals. Over the next two days, background information will be presented which will allow the students to begin their individual research on their subgroup. They will also begin construction of the life-size animals utilizing the enclosed transparencies. Students may need assistance with the creation of life-size drawings.

2. Introduce the *Prairie Amphibians and Reptiles* student pages. For the students who were assigned to this facet of creating the classroom prairie, explain the task of creating life-size reptiles and amphibians which can be placed in the classroom restored prairie. Individual students (or cooperative groups) should research amphibians and reptiles of their choice as they become specialists in their area.

   Introduce *Prairie Birds* student pages. Individual students (or cooperative groups) should research birds of their choice to become specialists in their area. Have the students who were assigned to the bird facet of creating the classroom prairie make the life-size birds. (Students will need to consult an encyclopedia for color.) The birds can be hung from the ceiling and placed upon prairie grasses for authenticity.

Students will also begin to research and create the insects and other invertebrates found on the *Insect Identification Card* for placement in the classroom prairie.

Introduce the *Prairie Insects* student pages. They may be used in a variety of ways: by the small group exclusively, with the whole class with small group assistance, or solely as a whole-class activity. The activity sheet can be given to the class following the construction of the classroom prairie environment.

Introduce *Prairie Mammals* student pages. For the students who were assigned to the mammal facet of creating the classroom prairie, explain the task of creating life-size mammals which can be placed in the classroom restored prairie. The animals which live beneath the surface can be placed near the entrance to their burrow or their habitat could be shown using separate drawings. The enclosed transparencies will be helpful in creating the life-size drawings. Individual students (or cooperative groups) should research mammals of their choice as they become specialists in their area.

3. The *Bird Identification Card* has been provided as a field guide should a field trip to a prairie become an aspect of this project. Many of these birds may also be observed (depending upon your location and time of year) near your school or students' homes.

4. Group Research - Reports:
   Reports can become process writing exercises to be presented visually and/or verbally to other students. Students can also attempt to reproduce the sounds made by each animal as an enrichment activity.

5. Insect Classification:
   THE DAY BEFORE instruct each student to catch and bring an insect to class.

6. Divide the class in groups of four or five. Have each student in the group identify a characteristic that can be used to group "like" insects. Instruct students to list the characteristics on a sheet of paper and write the names of the insects (the name of the student if they do not know the name of the insect) that fall into that group.

7. When all students have completed their classification, record appropriate responses on the board or overhead. Did everyone categorize in the same manner? Why or why not? Was anyone wrong? List three ways we classify items in our daily lives. Why might classification be important in science?

8. Continue ongoing activities.

ALTERNATE LESSON PLAN

1. Another option for presenting the prairie insects, birds, amphibians, reptiles and mammals segments of this project is to utilize whole-class instruction for the student worksheets.

2. Present the background information for each segment to the entire class. Present the student worksheets to the entire class, discuss and complete all together. It is important to note that if this option is chosen, it may take longer than ten days to complete the entire unit.

EXTENSION ACTIVITIES

Many activities can be found in "Project Wild."
The starred (*) items can be found in the "Extension" section of this unit.

Reptiles and Amphibians

1. Project Wild *Changing Attitudes.*

2. Project Wild *First Impressions.*

3. Project Wild *Cartoons and Bumper Stickers.*

Birds

1. Take a field trip to a prairie to observe birds.

2. Have students observe birds around their school or home and graph results and observations.

3. Draw sketches of birds observed.

4. Project Wild *Seed Need.*

5. Project Wild *Deadly Links*

Insects and Other Invertebrates

1. Project Wild *Interview a Spider* .

*2. Gummy Worm Lab.

3. Collect insects using a field net.

4. Purchase mealworms to observe the metamorphosis process.

Mammals

1. Take a field trip to a prairie to observe mammals. A zoo will provide opportunities to safely observe prairie mammals as well.

2. Have students observe mammals around their school or home and graph results and observations.

3. Draw sketches of animals observed.

4. Make entries into journals about the life of various mammals. What would it be like to be a predator or prey?

5. Project Wild *Oh Deer* .

6. Project Wild *Foxes and Rabbits* .

7. Project Wild *What Bear Goes Where.*

8. Project Wild *Muskoxen Behaviors* can be adapted to Buffalo Behaviors. This activity is excellent for teaching the predator/prey concept.

*9. *Animal Sounds, The Right Words, and Animal Groups.*

*10.*Deer Stalking*

General Animals
*1.*Creative Writing* activity sheet.

*2. *Pantomime of Nature Objects* activity.

*3.*V.I.P.'s in Nature* activity.

INTERDISCIPLINARY CONNECTION
Art, language arts, mathematics, science.

ASSESSMENT
(Answer are italicized and refer to the Student Pages indicated below. Answers are also included on the corresponding teacher answer pages.)

Prairie Amphibians and Reptiles (p. 58 - 60)

1. Name one thing some amphibians add to the prairie scene. *(Music; variety)* Explain how amphibians exist in two forms? *(First they are a larva and then become an adult.)* Do reptiles exist in these two forms? *(No)*

2. List locations for shelter.

Name	Adult	Egg	Larva
Blue racer	*rock, shrub, water*	*rock*	
Ornate box turtle	*shell, burrow*	*soil*	
American toad	*grass*	*pond bottom*	*water*
Western fox snake	*grasses, tree bark*	*soil beneath rock*	
Small-mouthed salamander	*soil beneath rocks*	*aquatic plant*	*water*
Bull snake	*grass, burrows*	*rock*	
Gopher frog	*soil beneath pond, crayfish hole*	*aquatic plant*	*water*
Six-lined racerunner	*rock*	*soil*	

3. Label each illustration. Answers given from left to right, the top row followed by the bottom row.
Ornate box turtle, Blue racer, Western fox snake, Small-mouthed salamander
American toad, Six-lined racerunner, Gopher frog, Bull snake.

Prairie Birds (p. 65 - 67)

1. List type of feeder and location of nest.

Name	Feeder	Nest
Mourning dove	*herbivore*	*shrubs or trees*
Upland sandpiper	*omnivore*	*ground*
Canada goose	*herbivore*	*ground near water*
Dickcissel	*omnivore*	*on or near ground*
Killdeer	*carnivore*	*small hollow on ground*
Eastern meadowlark	*omnivore*	*ground*
Prairie chicken	*omnivore*	*ground*
Loggerhead shrike	*carnivore*	*shrub or small tree*
Turkey vulture	*carnivore*	*ground*

Short-eared owl	*carnivore*	*ground*
Marsh hawk	*carnivore*	*ground*

2. Identify the illustration. Answers given from left to right working down the page.
   Dickcissel, Killdeer
   Upland sandpiper, Canada goose, Mourning dove
   Eastern meadowlark, Turkey vulture
   Prairie chicken
   Short-eared owl, Loggerhead shrike, Marsh hawk

Prairie Insects (p. 82 - 84)

1. Name the most common insects of the prairie. *(Grasshoppers, wasps, flies, ants, bees, dragonflies, termites, beetles, aphids, butterflies, moths and flies)* Explain how nymphs mature into adults and how larva mature into adults. *(Nymphs mature into adults through a process called incomplete metamorphosis and go through a series of molts. Larva mature into adults through a process called complete metamorphosis where larvae first go through a series of molts and then a pupal stage where the transformation is completed.)*

2. Insect tasks.

Insect	Task
Flesh fly	*Adult 1; Larva 3*
Robber fly	*3*
Least skipper butterfly	*1, 3*
Painted lady butterfly	*1*
Spotted cucumber beetle	*Adult 2, larva 3*
Digger wasp	*Adult 1, larva 2*
Aphids	*2*
Praying mantis	*2*
Least skipper caterpillar	*2*
Tumblebug	*3*

3. Label each insect. Answers are given from left to right and from top to bottom.
   Digger wasp, Least skipper butterfly, Painted lady butterfly, Bumblebee, Praying mantis
   Robber fly, Aphid, Tumblebug
   Spotted cucumber beetle, Mound ant
   Flesh fly, American carrion beetle, Least skipper caterpillar, Red-legged grasshopper

Prairie Mammals (p. 92 - 95)

1. Explain why some mammals are most important as sources of food for other animals. *(They are a vital source of food energy.)* Explain why some are most important as predators. *(They keep insect and rodent populations under control.)* Name two mammals that are important both as food sources and predators. *(Brown bat and Franklin's ground squirrel.)*

2. Describe the niche of the badger. *(Lives in burrows; Nest chamber; At night; Stalks prey at night; Ground Squirrels or mice; Man.)* Describe the niche of the red fox. *(At night; Prairie floor; Slow, deliberate steps, crouches and wiggles, then rushes and kills with powerful bite; Rabbits and mice; Underground den; One per year; Quick speed and cunning; Man.)* Compare niches. *(Both active at night; Badger stays in burrow and red fox stays in clump of grass; Badger fast and fox slow and deliberate; No; No.)*

3. Describe various niches. *(Answers readily available from text.)*

4. Label each mammal. Answers given from left to right and from top to bottom.
   coyote, red fox
   plains pocket gopher, least shrew, badger
   striped skunk, little brown bat
   prairie vole, eastern cottontail, Franklin's ground squirrel

Prairie Amphibians and Reptiles, *Prairie Birds, Prairie Mammals* and *Prairie Insects* sheets can be utilized as assessment tools.

The construction of animals for your prairie classroom can be included in accountability.

The students may be asked to report to the class, orally or in writing, as entomologists, birders, etc.

Students may be graded on their individual specimens and written/verbal reports to other students.

Students may be asked to respond to the following questions:

Describe the positive and negative influence of insects on the environment.

What would it be like to be a predator or prey?

The basic knowledge vocabulary can be included in a test or quiz.

The following list suggests journal ideas or topic questions.

- Amphibians and Reptiles - Compare and contrast these two groups.
  Imagine life as one of the animals and write about a typical day.
- Birds - If you could be a bird, which would you be? Which would you find easier, being a predator or prey? Explain why.
- Write about the life of various birds.
- Insects and Other Invertebrates - Write a newspaper advertisement promoting the positive aspects of an insect generally regarded as creepy or scary.
- Mammals - Write an Acrostic Poem using the name of a mammal.
  Example: Daring
  Eating leaves
  Evening meals in the prairie
  Running quickly away

Creative writing/lesson evaluation.

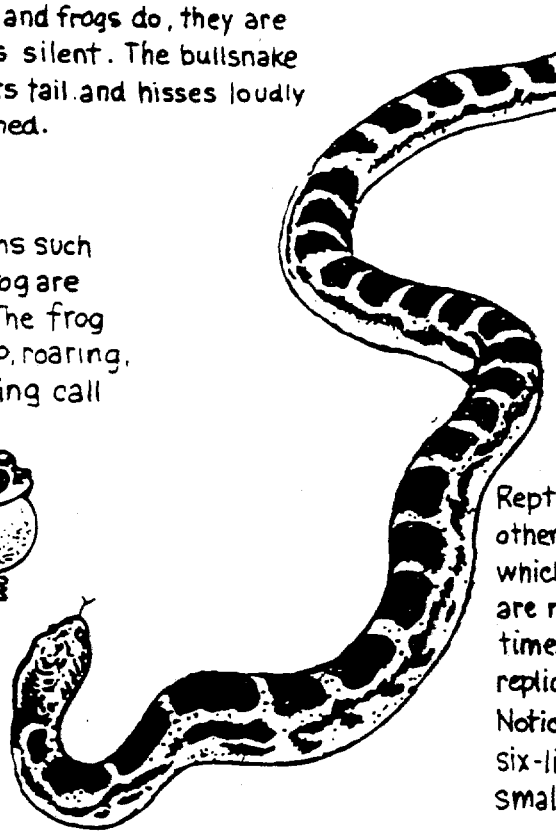
Prairie Amphibians and Reptiles:

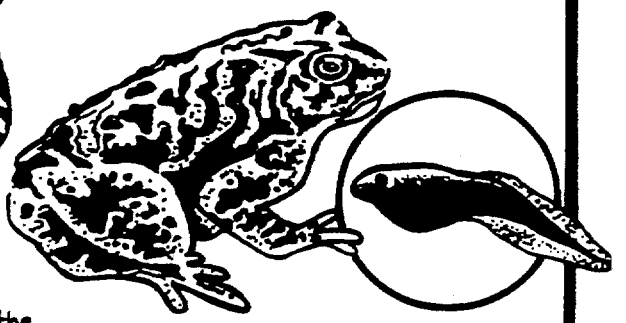
Amphibians and reptiles bring music and variety to the prairie.

Though reptiles do not vocalize as the toads and frogs do, they are not always silent. The bullsnake vibrates its tail and hisses loudly if threatened.

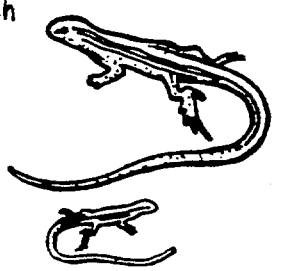
Like insects, amphibians, such as this American toad exist in two forms, first as a larva, (such as the tadpole) and then after a metamorphisis as an adult.

Some amphibians such as the gopher frog are quite musical. The frog produces a deep, roaring, snore-like mating call in springtime.





Reptiles on the other hand, produce eggs which hatch into young which are miniature though sometimes differently colored, replicas of the adults. Notice how this young six-lined racerunner is a smaller model of the adult.



The Role of Amphibians and Reptiles in the Prairie Ecosystem:

Amphibians and reptiles have a great deal to contribute to the ecosystem. As predators, amphibians and reptiles help control the population of insects and rodents. As prey, they serve as food for birds, and mammals as well as other amphibians and reptiles.

The American toad preys upon the red-legged grasshopper, Food energy in grasshopper is transferred to the Toad.

Working with Prairie Amphibians/Reptiles:

Work Step #1: Using the word picture at the top of this page as a guide, name one thing some amphibians add to the prairie scene. Explain how amphibians exist in two forms. Do reptiles?

Work Step #2: On page 62 are descriptions of eight prairie amphibians and reptiles. One thing all of these animals have in common is the need for adequate shelter. The adults need shelter for themselves and for their eggs. And when the eggs hatch, the young also need shelter. There are many different types of shelter available in the prairie ecosystem. Sometimes rocks and clumps of grasses provide shelter, other times water and soil provide the only shelter. After

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reading the description of each animal, write on the blank lines all of the locations wherein each animal finds shelter for itself, eggs and young. If there is more than one line, it means the animal finds shelter in more than one place. For example, the adult blue racer finds shelter in three different places but only one place is shelter for its eggs.

Work Step 3: On page 63 are illustrations of the eight amphibians and reptiles. Using the clues provided, label each illustration.

Blue racer: This slender blue snake has a white chin and throat and is from 36-60" long. This snake usually hangs out under a rock but will climb a shrub or take to the water if being pursued or searching for food. The racer preys upon insects, amphibians, reptiles and small birds and mammals. In June and July, the racer lays its 19 to 25 white eggs under a rock. Adult. _____ _____ _____ eggs _____

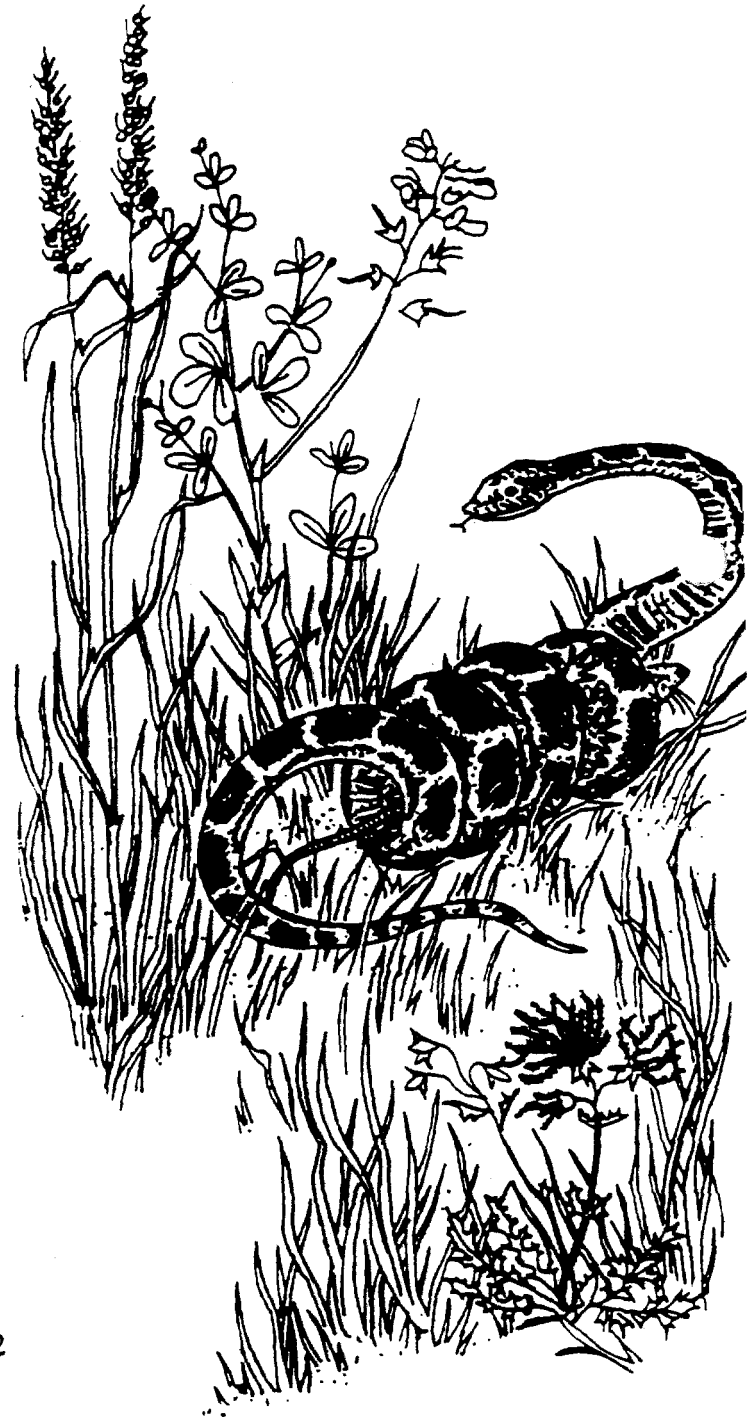
ornate box turtle: This dark brown, 4-5" long turtle is decorated with golden lines radiating outward from the middle of its shell. This turtle carries one of its shelters with it. If threatened, it pulls in its head and feet and closes its shell so tight the prying beak, claws or teeth of a predator cannot get through. During the spring of the year, the turtle crawls out of its burrow in the soil. By June and July, the female buries her clutch of eggs in the soil. The box turtle travels across the prairie floor in search of fungi, fruits, seeds and tiny animals. In the severe heat of midsummer, the turtle seeks refuge by burrowing into the soil. During fall, the turtle emerges again for several weeks, the young turtles hatch. But as the days turn colder, the turtle begins digging into the soil a short distance each day. By the time of the first freeze, the turtle has worked its way deep enough in the soil to avoid freezing. Adult: _____ _____ eggs _____

American toad: During the day, this 2-3½" brown to olive toad hides in the thick clumps of grass stems. At dusk, it ventures out to feed on insects and worms. The female lays several thousand eggs in long strings in the bottom of a prairie pond. In only a week's time, small, black tadpoles hatch. These tadpoles have gills and swim about like fish looking for tiny aquatic plants and animals for food. When they transform into adults, they lose their gills, breathe by lungs and live on land. Adult _____ eggs _____ tadpoles _____

western fox snake: This yellow-gray snake is marked by red-brown spots and grows to be 36-50" long. In search of small mammals and birds, the fox snake makes its way about the prairie floor. Occasionally, the fox snake rests hidden in a clump of grasses. Other times, the agile snake climbs a dead standing tree or stump at the edge of the prairie and finds shelter underneath the loose bark. The female snake lays her eggs in the soil beneath a rock and hatching occurs in late summer. Adult _____ _____ eggs _____

small-mouthed salamander: This 4½-7" salamander is named for its tiny mouth and head. Its skin is dark brown to black and marked by grayish-yellow patches. The adult salamander finds shelter in the soil beneath rocks. At night, it travels the prairie floor in search of earthworms, slugs and insects, sticking close always to the protective cover of the vegetation. During the spring the female finds a prairie pond or ditch and deposits a sticky mass containing 6 to 30 eggs onto the stem of an aquatic plant. The eggs hatch in a few days and the larvae stay in the water, often seeking shelter beneath rocks, until they are transformed into adults, usually by July. Adult: _____ eggs _____ larvae _____

bull snake: This large (50-72") yellowish snake is marked by darkly colored blotches. The powerful bull snake travels about the prairie in search of small birds and mammals. It ambushes its prey from a hiding place like a clump of grasses or mammal burrow. The bull snake squeezes its prey to death. The bull snake is a beneficial animal because it helps control the population of rodents. Eggs of the bull snake are often laid beneath a rock. Adult _____ _____ eggs



gopher frog: The spring mating season is the only time this creme colored frog marked with black spots ventures above ground. During the winter, the gopher frog hibernates in the soil beneath a pond. During summer and fall, the frog lives by day inside a crayfish hole dug into the bank of a pond. At night, the frog darts out to capture crayfish and aquatic insects. The female frog lays 5,000 eggs in shallow water and occasionally attaches the egg mass to the stems of plants. The larvae swim in the water, finding refuge from time to time under decaying vegetation until they have transformed into frogs by July. Adult _____ _____ eggs _____ larvae _____

six-lined racerunner: This olive-gray to brown lizard has six lightly colored stripes running from its head to the base of its tail. The 6-9½" racerunner is a real sun-lover and is often seen during the day basking on a rock. On cool days, the lizard seeks shelter beneath a rock. The racerunner is a quick predator and has little problem snagging spiders. The eggs on the racerunner are sheltered in the soil until they hatch in July. Adult _____ Eggs _____ .

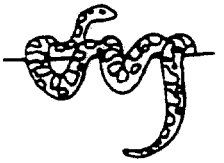
dark brown, gold lines on shell

_____

slender blue, white chin and throat

_____

yellow-gray, red brown spots



_____

dark brown to black, grayish yellow patches

_____

Prairie Amphibians and Reptiles

brown to olive, 2 to 3½" long

_____

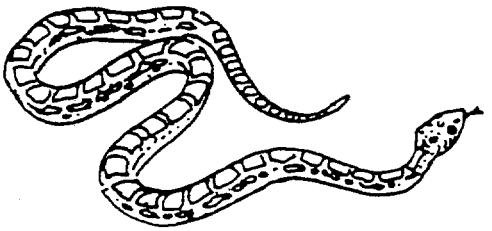
olive gray to brown, six stripes

_____

cream colored, black spots

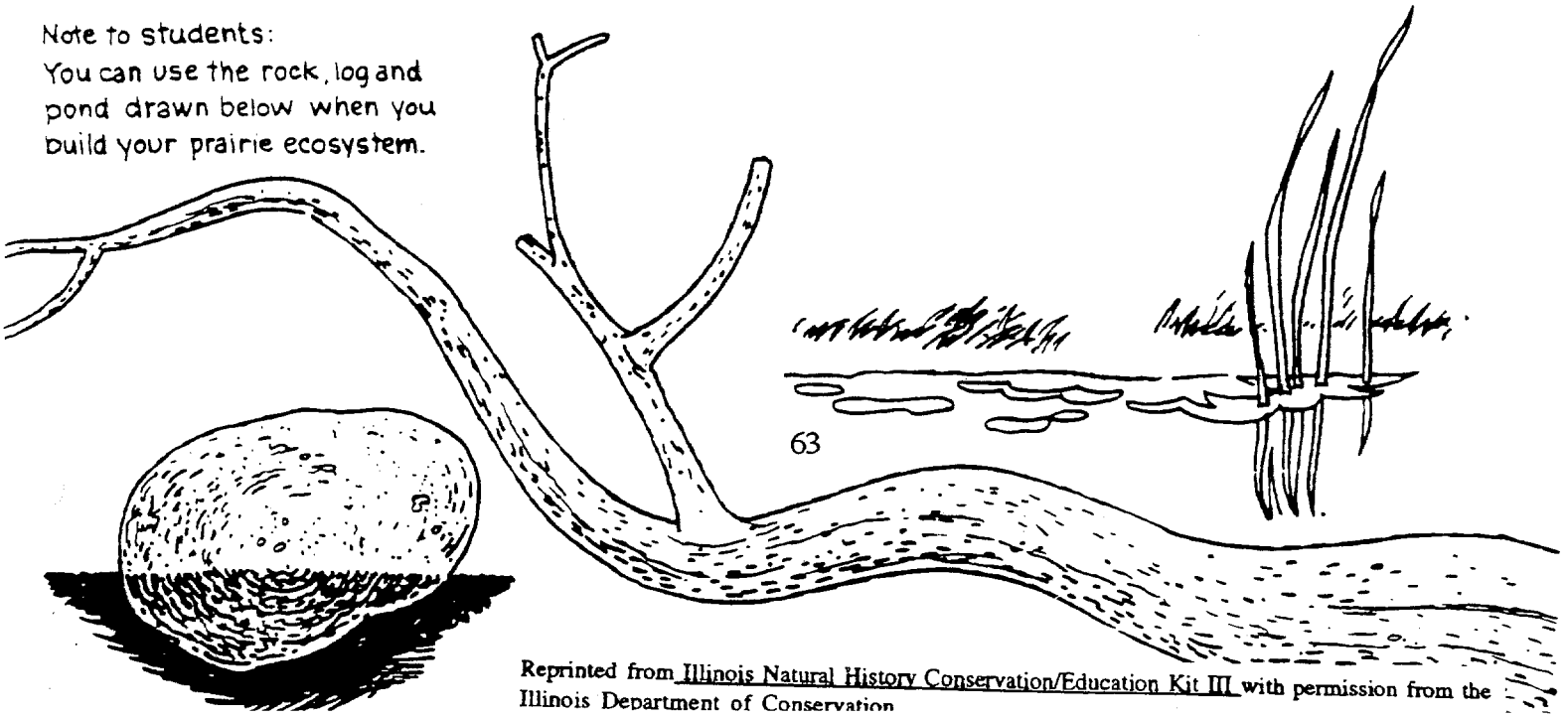
_____

50-72", yellowish, dark blotches



_____

Note to students:
You can use the rock, log and pond drawn below when you build your prairie ecosystem.



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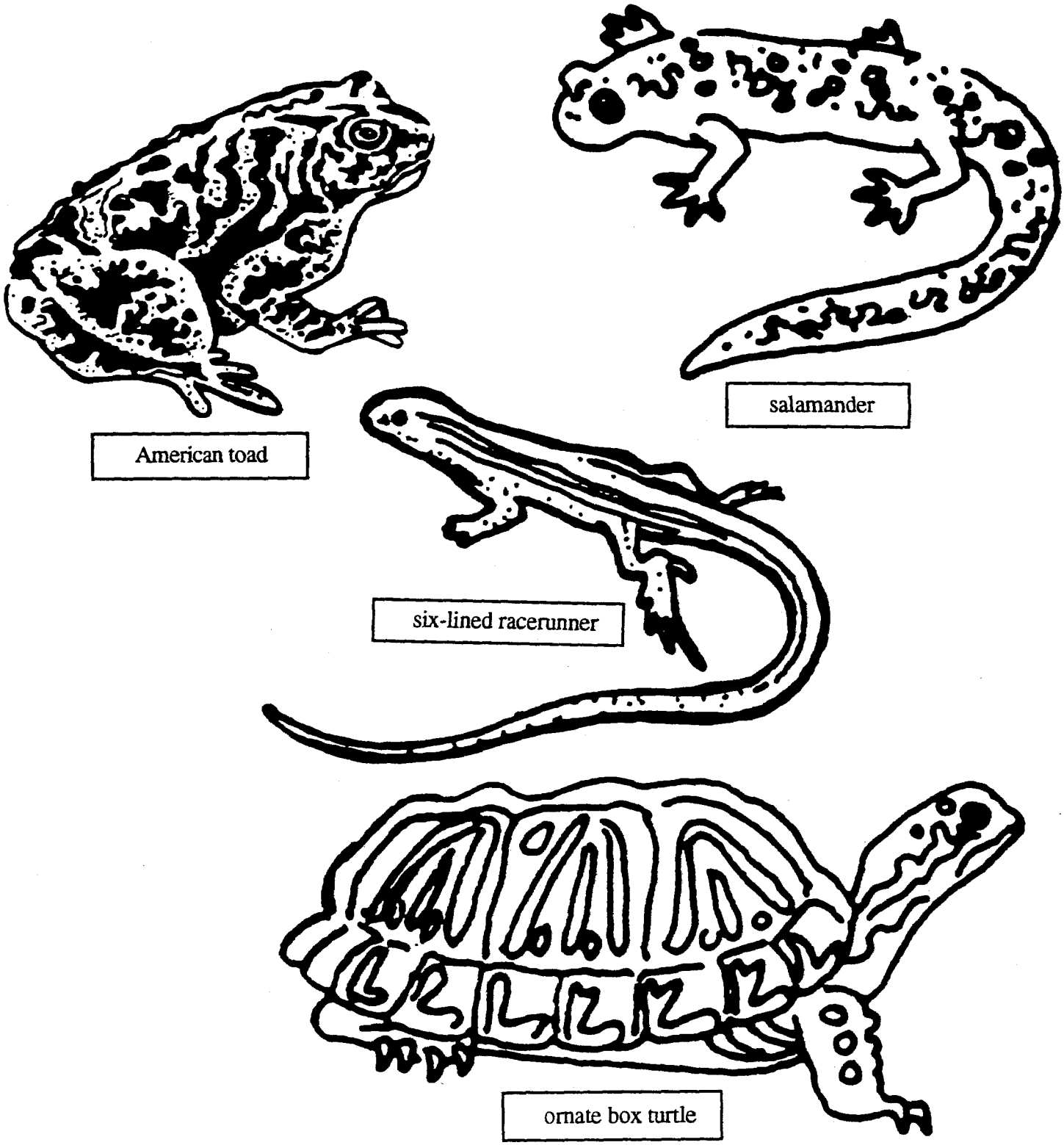
LIFE-SIZE COLORING SHEET



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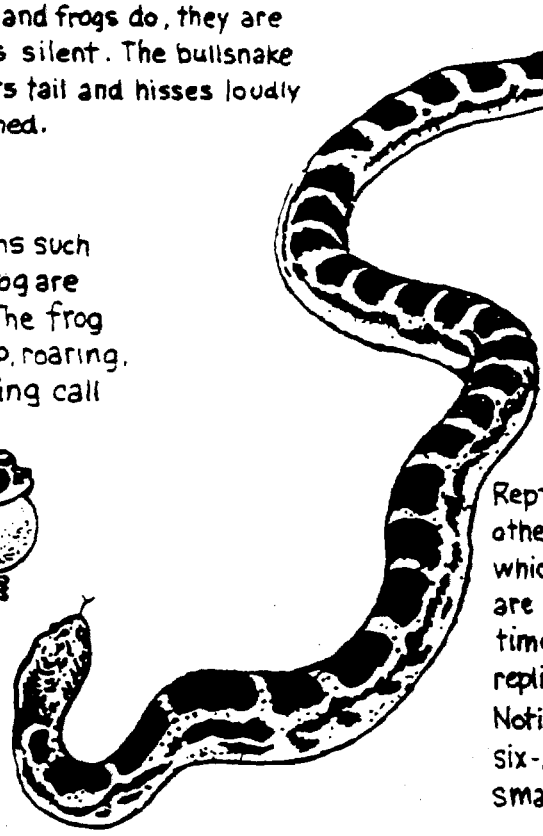
Prairie Amphibians and Reptiles:

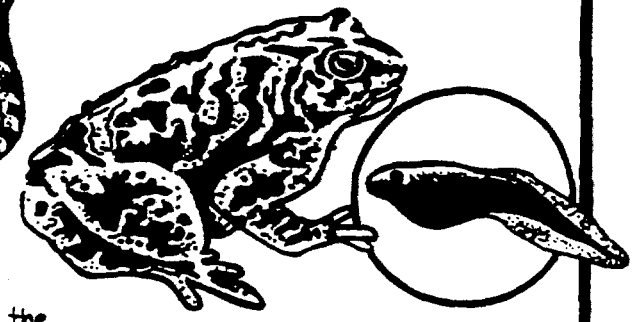
Amphibians and reptiles bring music and variety to the prairie.

Though reptiles do not vocalize as the toads and frogs do, they are not always silent. The bullsnake vibrates its tail and hisses loudly if threatened.

Like insects, amphibians, such as this American toad exist in two forms, first as a larva, (such as the tadpole) and then after a metamorphisis as an adult.

Some amphibians such as the gopher frog are quite musical. The frog produces a deep, roaring, snore-like mating call in springtime.





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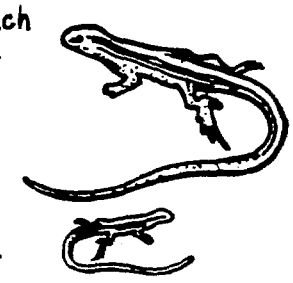

The Role of Amphibians and Reptiles in the Prairie Ecosystem:

Amphibians and reptiles have a great deal to contribute to the ecosystem. As predators, amphibians and reptiles help control the population of insects and rodents. As prey, they serve as food for birds, and mammals as well as other amphibians and reptiles.

FOOD CHAIN LINK NO. _____

The American toad preys upon the red-legged grasshopper. Food energy in grasshopper is transferred to the Toad.

Working with Prairie Amphibians/Reptiles:

Work Step #1: Using the word picture at the top of this page as a guide, name one thing some amphibians add to the prairie scene. Explain how amphibians exist in two forms. Do reptiles?

Work Step #2: On page 66 are descriptions of eight prairie amphibians and reptiles. One thing all of these animals have in common is the need for adequate shelter. The adults need shelter for themselves and for their eggs. And when the eggs hatch, the young also need shelter. There are many different types of shelter available in the prairie ecosystem. Sometimes rocks and clumps of grasses provide shelter, other times water and soil provide the only shelter. After

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reading the description of each animal, write on the blank lines all of the locations wherein each animal finds shelter for itself, eggs and young. If there is more than one line, it means the animal finds shelter in more than one place. For example, the adult blue racer finds shelter in three different places but only one place is shelter for its eggs.

Work Step 3: On page 67 are illustrations of the eight amphibians and reptiles. Using the clues provided, label each illustration.

Blue racer: This slender blue snake has a white chin and throat and is from 36-60" long. This snake usually hangs out under a rock but will climb a shrub or take to the water if being pursued or searching for food. The racer preys upon insects, amphibians, reptiles and small birds and mammals. In June and July, the racer lays its 19 to 25 white eggs under a rock. Adult. rock shrub water eggs rock

ornate box turtle: This dark brown, 4-5" long turtle is decorated with golden lines radiating outward from the middle of its shell. This turtle carries one of its shelters with it. If threatened, it pulls in its head and feet and closes its shell so tight the prying beak, claws or teeth of a predator cannot get through. During the spring of the year, the turtle crawls out of its burrow in the soil. By June and July, the female buries her clutch of eggs in the soil. The box turtle travels across the prairie floor in search of fungi, fruits, seeds and tiny animals. In the severe heat of midsummer, the turtle seeks refuge by burrowing into the soil. During fall, the turtle emerges again for several weeks, the young turtles hatch. But as the days turn colder, the turtle begins digging into the soil a short distance each day. By the time of the first freeze, the turtle has worked its way deep enough in the soil to avoid freezing. Adult: shell burrow eggs soil

American toad: During the day, this 2-3½" brown to olive toad hides in the thick clumps of grass stems. At dusk, it ventures out to feed on insects and worms. The female lays several thousand eggs in long strings in the bottom of a prairie pond. In only a week's time, small, black tadpoles hatch. These tadpoles have gills and swim about like fish looking for tiny aquatic plants and animals for food. When they transform into adults, they lose their gills, breathe by lungs and live on land. Adult grass eggs pond bottom tadpoles water

western fox snake: This yellow-gray snake is marked by red-brown spots and grows to be 36-50" long. In search of small mammals and birds, the fox snake makes its way about the prairie floor. Occasionally, the fox snake rests hidden in a clump of grasses. Other times, the agile snake climbs a dead standing tree or stump at the edge of the prairie and finds shelter underneath the loose bark. The female snake lays her eggs in the soil beneath a rock and hatching occurs in late summer. Adult grasses tree bark eggs soil beneath rock

small-mouthed salamander: This 4½-7" salamander is named for its tiny mouth and head. Its skin is dark brown to black and marked by grayish-yellow patches. The adult salamander finds shelter in the soil beneath rocks. At night, it travels the prairie floor in search of earthworms, slugs and insects, sticking close always to the protective cover of the vegetation. During the spring the female finds a prairie pond or ditch and deposits a sticky mass containing 6 to 30 eggs onto the stem of an aquatic plant. The eggs hatch in a few days and the larvae stay in the water, often seeking shelter beneath rocks, until they have transformed into adults, usually by July. Adult: soil beneath rock eggs aquatic plant larvae water

bull snake: This large (50-72") yellowish snake is marked by darkly colored blotches. The powerful bull snake travels about the prairie in search of small birds and mammals. It ambushes its prey from a hiding place like a clump of grasses or mammal burrow. The bull snake squeezes its prey to death. The bull snake is a beneficial animal because it helps control the population of rodents. Eggs of the bull snake are often laid beneath a rock. Adult grass burrows eggs rock

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gopher frog: The spring mating season is the only time this creme colored frog marked with black spots ventures above ground. During the winter, the gopher frog hibernates in the soil beneath a pond. During summer and fall, the frog lives by day inside a crayfish hole dug into the bank of a pond. At night, the frog darts out to capture crayfish and aquatic insects. The female frog lays 5,000 eggs in shallow water and occasionally attaches the egg mass to the stems of plants. The larvae swim in the water, finding refuge from time to time under decaying vegetation until they have transformed into frogs by July. Adult soil beneath pond crayfish hole eggs aquatic plant larvae water

six-lined racerunner: This olive-gray to brown lizard has six lightly colored stripes running from its head to the base of its tail. The 6-9½" racerunner is a real sun-lover and is often seen during the day basking on a rock. On cool days, the lizard seeks shelter beneath a rock. The racerunner is a quick predator and has little problem snagging spiders. The eggs on the racerunner are sheltered in the soil until they hatch in July. Adult rock Eggs soil .

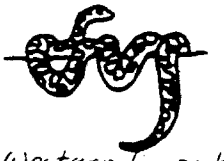
dark brown, gold lines on shell

ornate box turtle

slender blue, white chin and throat

blue racer

yellow-gray, red brown spots



Western fox snake

dark brown to black, grayish yellow patches

smallmouthed salamander

Prairie Amphibians and Reptiles

brown to olive, 2 to 3½" long

American toad

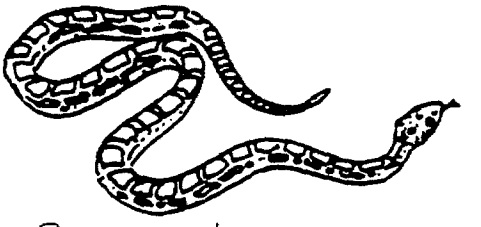
olive gray to brown, six stripes

Six-lined racerunner

cream colored, black spots

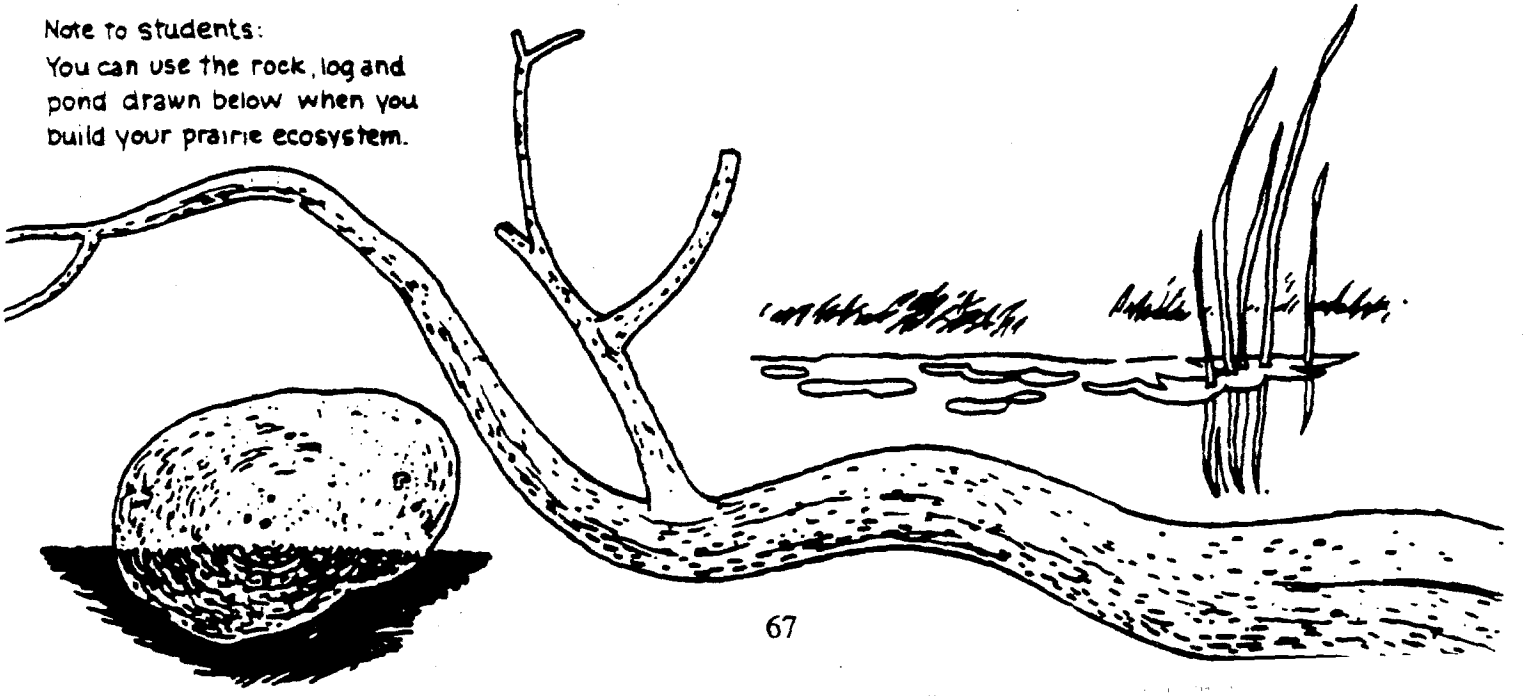
gopher frog

50-72", yellowish, dark blotches



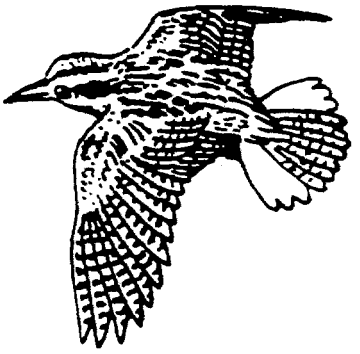
Bull snake

Note to students:
You can use the rock, log and pond drawn below when you build your prairie ecosystem.



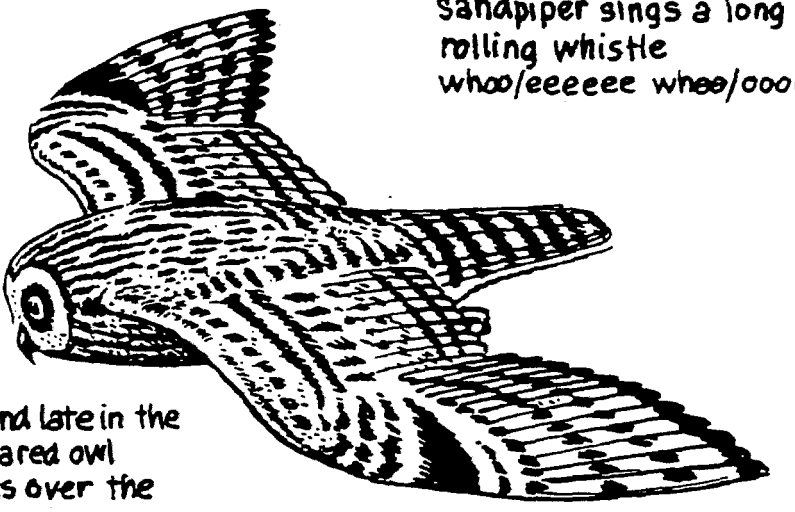
Prairie Birds

Birds add color, movement and beautiful sounds to the prairie.



The chunky brown meadowlark sports a brilliant yellow throat and vest crossed by a black V. When this bird flies, two broad patches of white can be seen on either side of the tail.

The song of the upland sandpiper is one of the most beautiful and mysterious sounds on the prairie. While circling slowly in the sky, the sandpiper sings a long rolling whistle whoo/eeeeee whee/ooooo



Early in the morning and late in the afternoon, the short-eared owl patrols on silent wings over the prairie. If it spots prey, it may hover and drop or it may snatch the prey from the ground and pass on without even checking its speed, so swift and skillful is its stroke.

The Role of Birds in the Prairie Ecosystem:

In addition to contributing to the beauty of the prairie, birds help the ecosystem function smoothly. Birds that pick apart the fruits of plants help scatter the seeds that will someday grow as new plants. Birds that eat only plant parts are known as *herbivores.*

Other birds on the prairie eat both plant parts and animals. These birds, known as *omnivores*, are important because not only do they help scatter seeds but they also help control the population of insects.

Birds of the prairie that are equipped with sharp talons and/or beaks are usually *carnivores*, which means they only eat other animals.

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Working with Prairie Birds:

Work Step #3. Following is a description of eleven prairie birds. After each description are two blank lines. On the first line, write down what type of feeder each bird is. The choices are *herbivore, omnivore,* and *carnivore.* On the second line, write down the location of each bird's nest.

Work Step #4. On page 30, the eleven birds are drawn. It is your job to label each bird in the space provided. Be sure to use the clues written beside each drawing.

mourning dove: 12". This handsome dove is mostly gray to brown with white spots on its tail. It feeds on the seeds of plants and builds its nest in shrubs or trees at the edge of the prairie. _____ _____

upland sandpiper: 11½". This brown bird has a whitish belly streaked with black. When not flying or tending to its nest on the ground, it commonly perches on fenceposts. It feeds on insects, worms and plant seeds. _____ _____

Canada goose: 16-25". This goose has a black head and neck, with a white patch or "chinstrap" running into the side of the head. The Canada goose feeds on parts of plants, especially roots, and builds its nest on the ground near water. _____ _____

dickcissel: 6-7". The male dickcissel ha black bib on a yellow chest; the female is much paler in color and has just a touch of yellow on the chest. The dickcissel feeds on insects, plant parts and nests near or on the ground. _____ _____

killdeer: 9-11". This brown-backed, white-bellied bird is told by two black breast bands and its loud shrill call kill-dee, kill-dee. The killdeer feeds on insects, worms and snails and makes its nest in a small hollow on the ground. _____ _____

eastern meadowlark: The meadowlark feeds on insects and plant parts and builds its nest on the ground. (see word picture on page 27 for description) _____ _____

prairie chicken: 17-18". This bird is brown with dark bars. The male is told by orange air sacs on the side of the neck. During courtship, the male inflates those air sacs and then releases the air, causing a hollow oo-loo-woo sound known as "booming". The prairie chicken feeds on insects and plant parts and nests on the ground. _____ _____

loggerhead shrike: 9". This gray, black and white bird is told by its black mask. The loggerhead shrike preys only upon animals including insects, reptiles and amphibians, birds and small mammals. Lacking sharp talons to hold down its food, the shrike hangs the body of its pray on a thorn or fence barb so it can tear away at the flesh with its bill. The loggerhead shrike builds its nest in a shrub or small tree. _____ _____

turkey vulture: 26-32". This black bird soars on wings that spread 6 feet. At close range, one can see the turkey-like red head on the adult vulture. The vulture is the clean-up bird of the prairie, feeding upon already dead animals. The vulture nests on the ground. _____ _____

short-eared owl: 13-17". This streaked brown owl is named for the two short tufts of feathers located on its forehead. It preys upon insects, amphibians/reptiles, birds and small mammals and nests on the ground. _____ _____

marsh hawk: 17½-24". The female marsh hawk is streaked brown; the male, gray; but the best clue for identifying either sex is white rump. This slim hawk hunts low over the ground for insects, reptiles/amphibians, birds and small mammals. It nests on the ground. _____ _____

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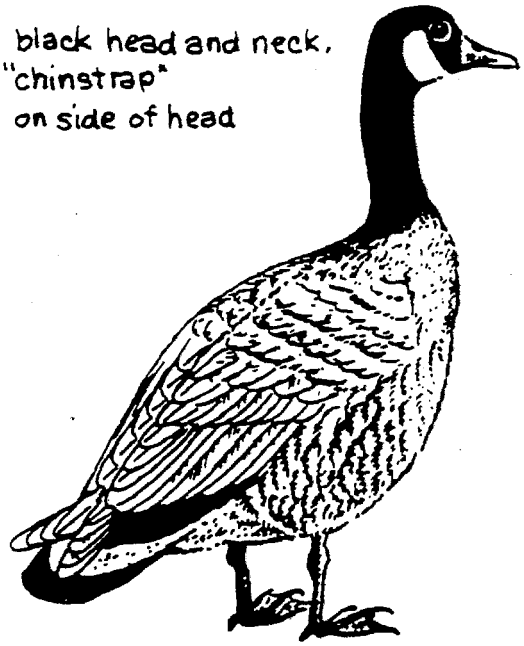
Prairie Birds

black bib on yellow chest

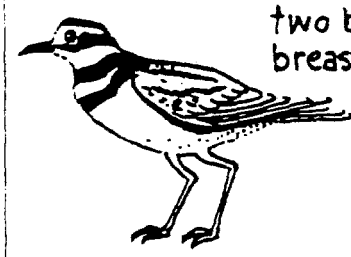
_____

black head and neck, "chinstrap" on side of head



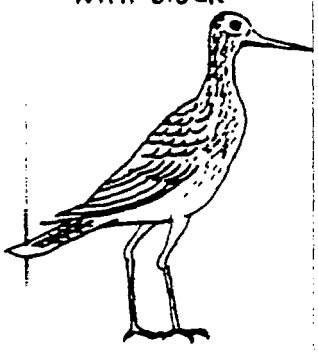
_____

two black breast bands



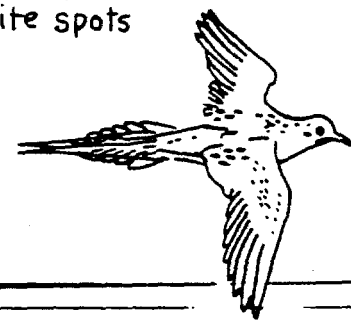
_____

brown, whitish belly streaked with black



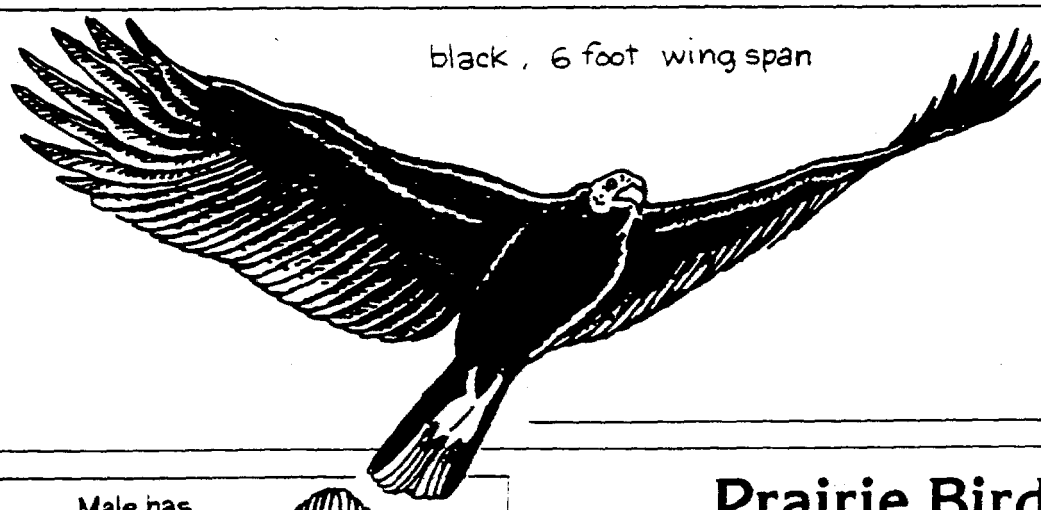
_____

brown, pointed tail with white spots



_____

black, 6 foot wing span

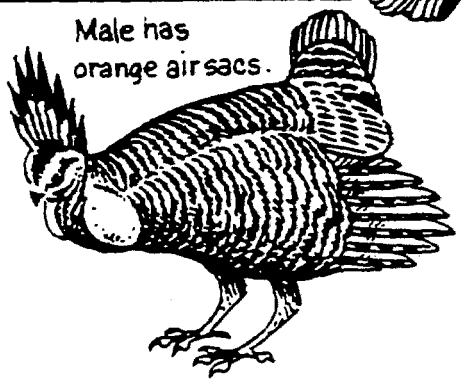


_____

brown, yellow throat and breast, black V crosses breast

_____

Male has orange air sacs.



_____

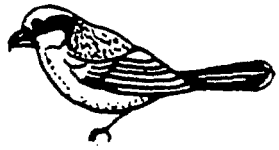
streaked brown or gray, white rump

_____

streaked brown, 13-17" tall

_____

gray, black and white, black mask



_____

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LIFE-SIZE COLORING SHEET

MOURNING DOVE

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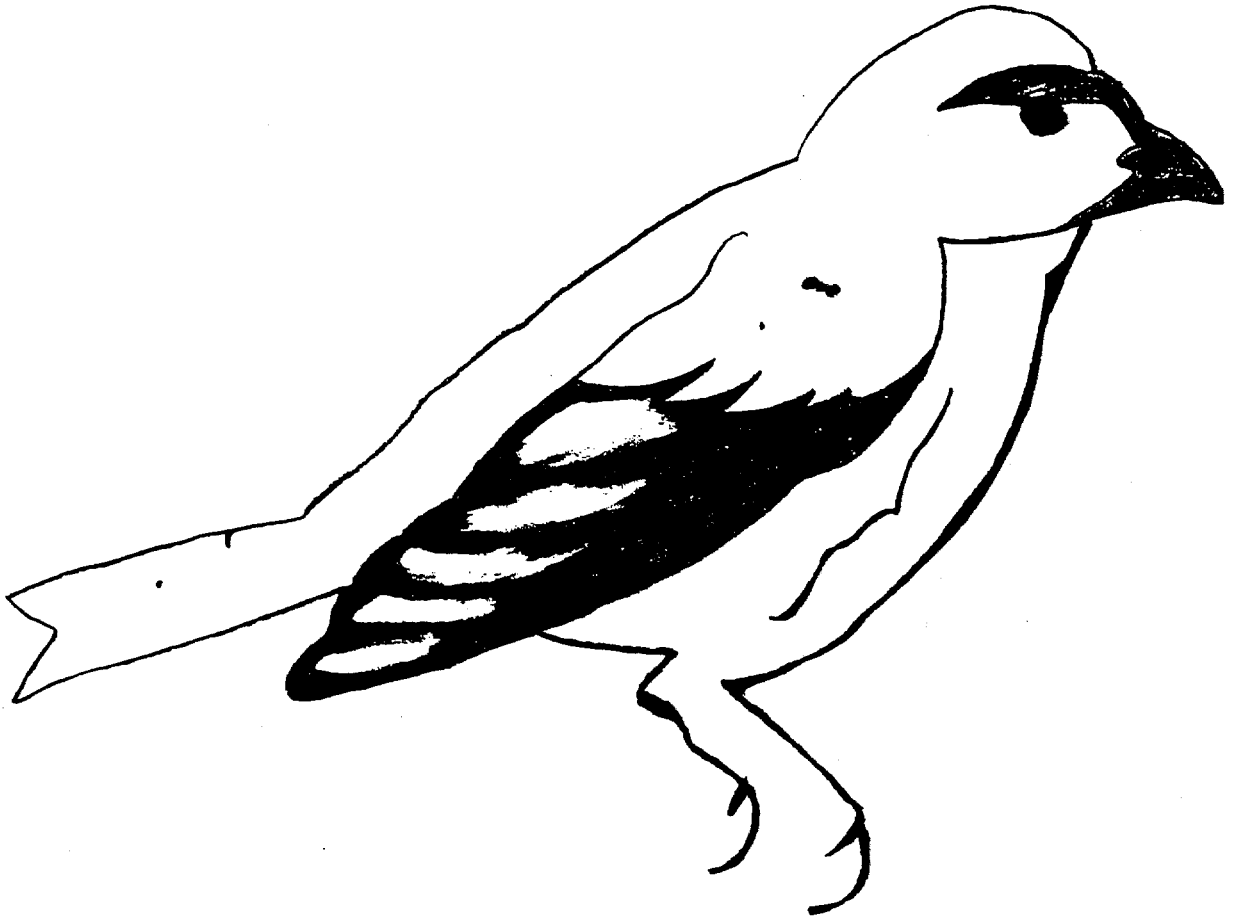
LIFE-SIZE COLORING SHEET



DICKCISSEL

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LIFE-SIZE COLORING SHEET

SHRIKE

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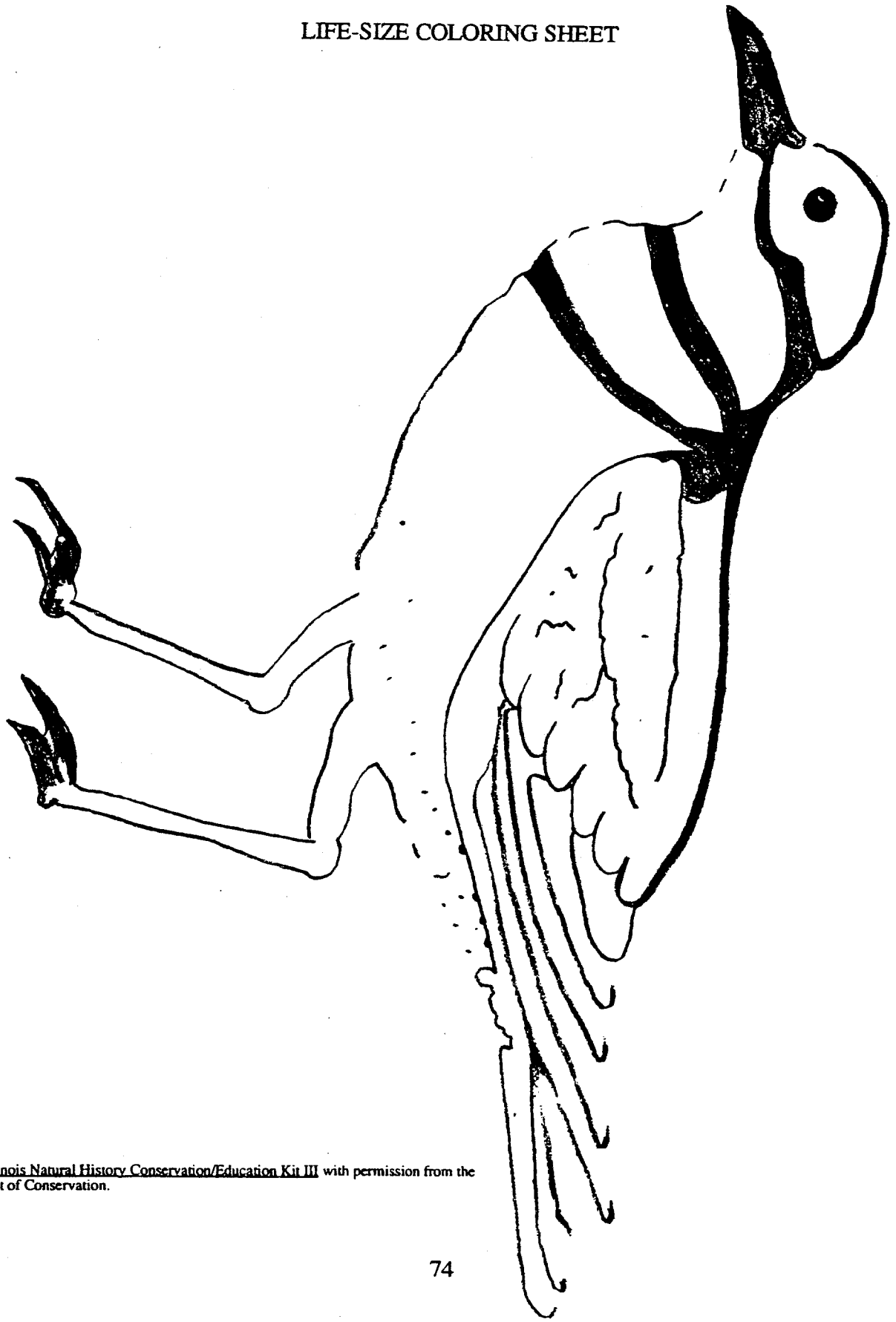
LIFE-SIZE COLORING SHEET



KILLDEER

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LIFE-SIZE COLORING SHEET

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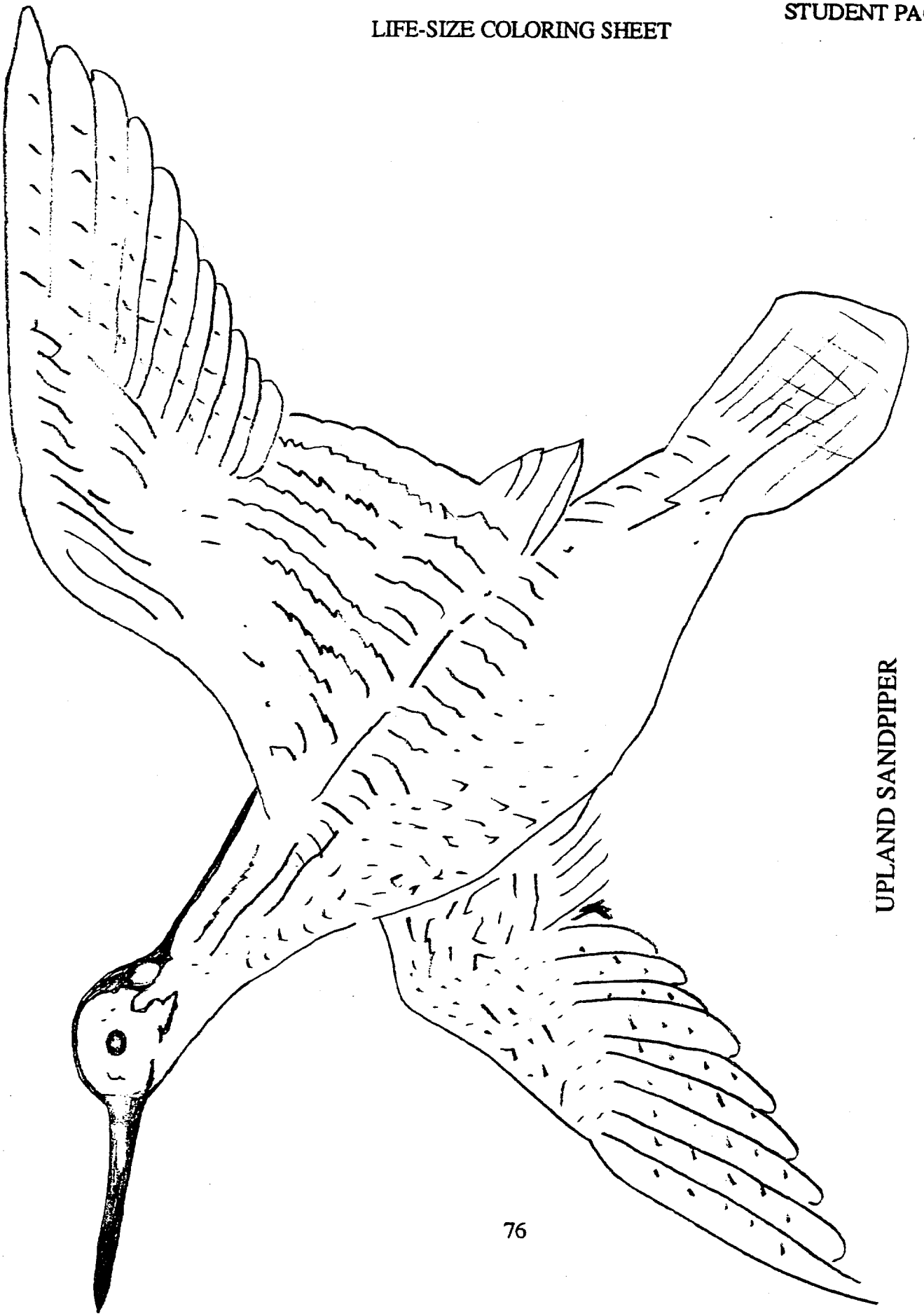
nois Department of Conservation.

LIFE-SIZE COLORING SHEET



UPLAND SANDPIPER

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BOBOLINK

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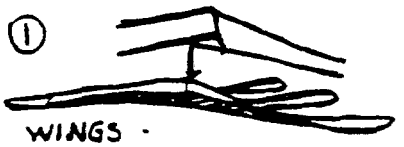
The Marsh Hawk

① 

WINGS - CAREFULLY FOLD ON DOTTED LINES - GLUE CUT OVER TO DOTTED LINE. TO CURVE, GENTLY CURL WITH SCISSORS.

②

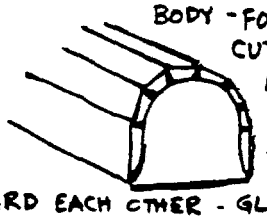
CUT ALL SLITS IN THE HEAD PIECE. GLUE THE BACK SLIT OVER THE X TO THE DOTTED LINE. (THE WINGS SLIDE INTO THE OTHER SLITS) GLUE THE SIDES OVER TO THE DOTTED LINES. THE SHAPE WILL BE LIKE A FLAT-TOP TENT.

③

EYE - PIECE - CUT SLITS & GLUE OVER TO DOTTED LINE - GLUE BACK SLIT OVER TO DOTTED LINE. CUT SLITS (FRINGE) AROUND FACE & FLUFF IT OUT

④

MATCH THE ROUNDED PART BENEATH THE EYE TO THE DOTTED LINES ON THE FRONT OF THE HEAD PIECE & GLUE IN PLACE

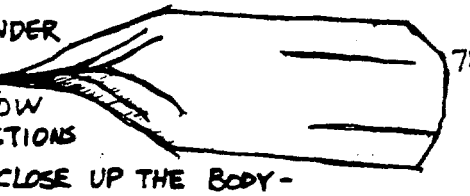
⑤ 

BODY - FOLD ALL DOTTED LINES - CUT ALL SLITS (SOLID LINES) - GLUE WHERE INDICATED - FOLD X TABS & SMALL TABS TOWARD EACH OTHER - GLUE FRONT FLAP OVER ALL TABS

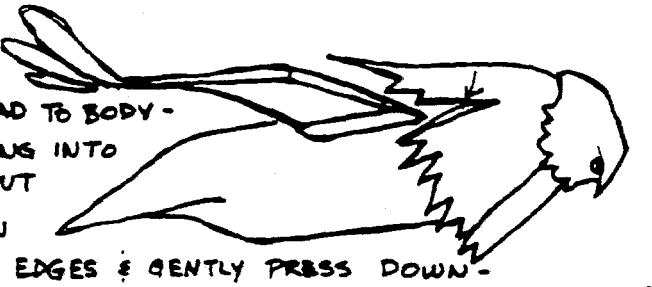
⑥

GLUE TAIL FLAP OVER THE O TABS

GLUE UNDER TAIL OVER Y TABS TO THE DOTTED LINE - NOW GLUE BOTH TAIL SECTIONS TOGETHER - THIS WILL CLOSE UP THE BODY -

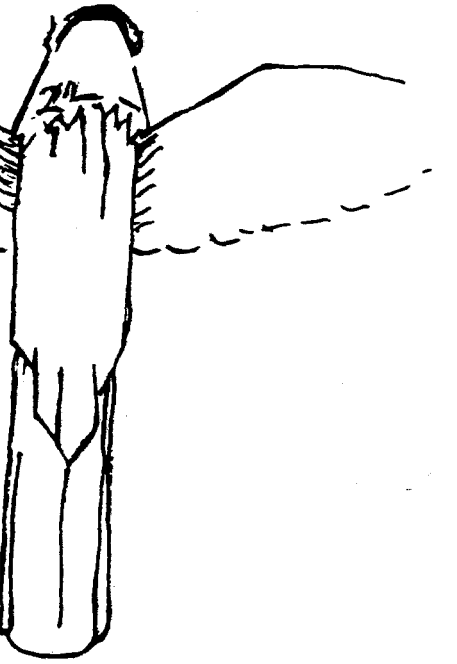


⑦ GLUE WINGS TO BODY AT A & B - GLUE FIRMLY!

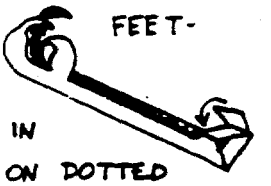
⑧ 

GLUE HEAD TO BODY - SLIDE WING INTO SLITS - PUT GLUE ON POINTED EDGES & GENTLY PRESS DOWN - MOLD TO BODY SHAPE - (HEAD WILL BE POINTED DOWN)

⑨ GLUE TAIL UNDER BODY TO THE DOTTED LINE. MOLD TO CURVE OF BODY -



⑩ FEET -



FOLD IN HALF ON DOTTED LINE. FOLD SQUARE ENDS OVER TO FORM TRIANGLE & GLUE. NOW GLUE FLAT SIDE UNDER BODY ON X

⑪ LEG FEATHERS - FOLD SIDES UNDER ON DOTTED LINE & GLUE TO BODY OVER TOP OF LEG.

⑫ BEAK - FOLD ON DOTTED LINES - GLUE TIPS OF BEAK TOGETHER. ATTACH BEAK TO POINT ON HEAD. ADJUST IT TO FIT FACE.

⑬

HANGER - PUNCH HOLES - FOLD IN HALF - GLUE TO BIRD'S BACK. USE ONLY IF YOU WISH TO HANG THE HAWK IN FLIGHT.

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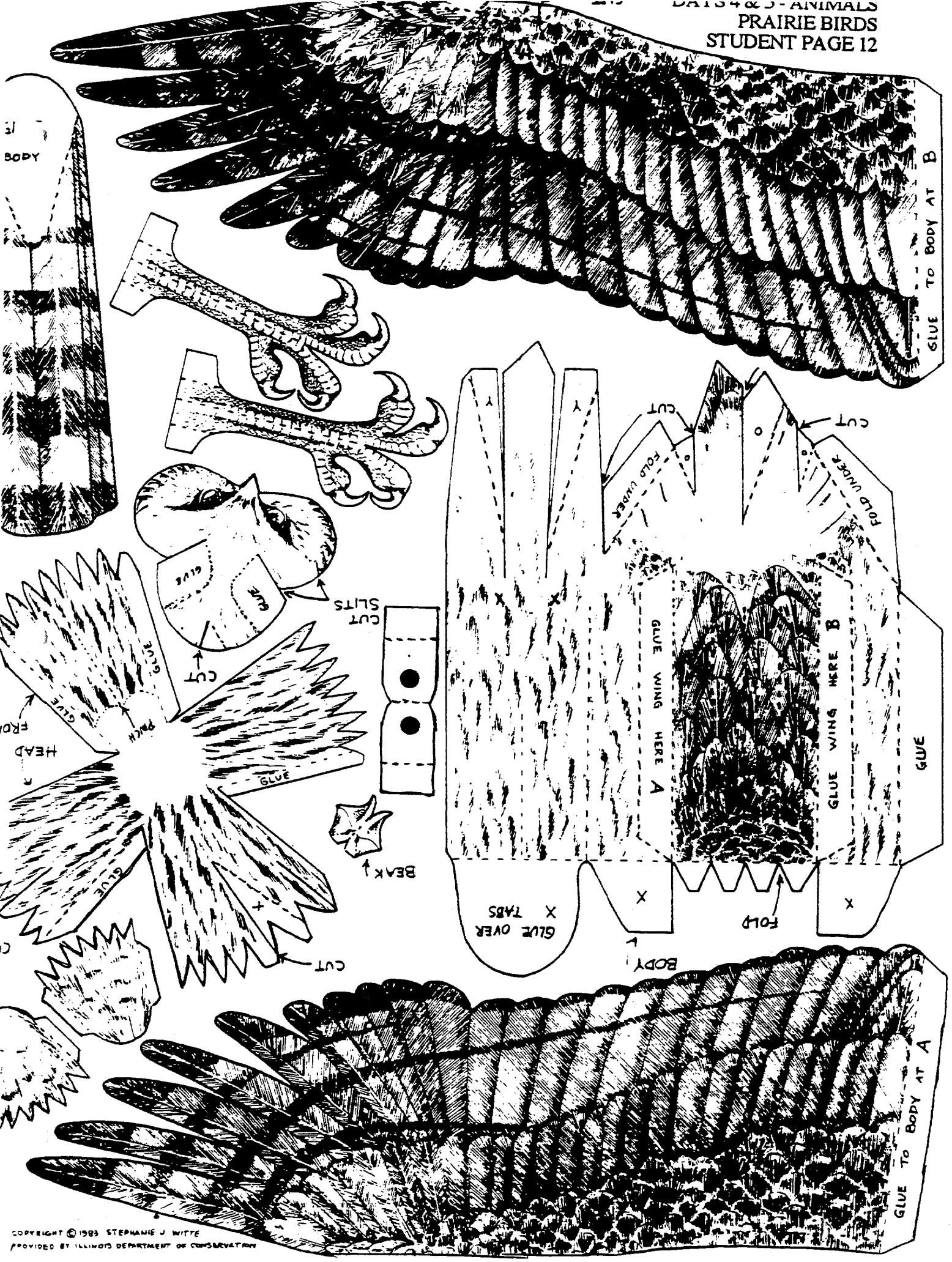

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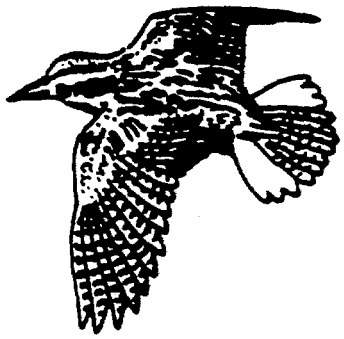
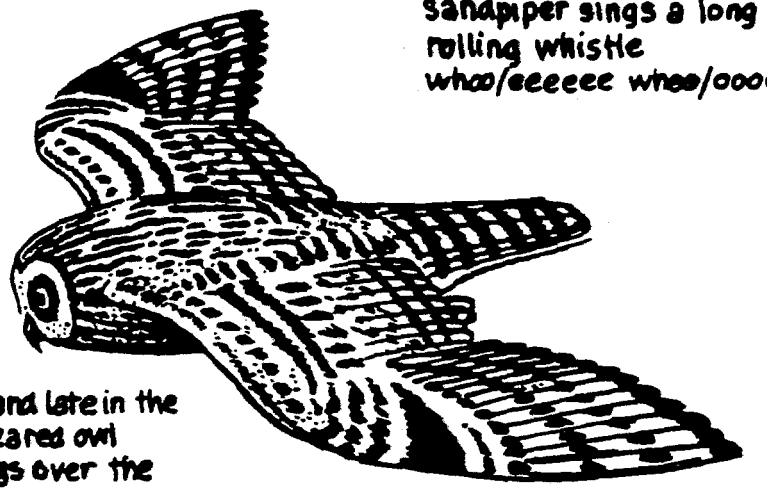
Prairie Birds

Birds add color, movement and beautiful sounds to the prairie.



The chunky brown meadowlark sports a brilliant yellow throat and vest crossed by a black V. When this bird flies, two broad patches of white can be seen on either side of the tail.

The song of the upland sandpiper is one of the most beautiful and mysterious sounds on the prairie. While circling slowly in the sky, the sandpiper sings a long rolling whistle whoo/eeeeee whoo/ooooo



Early in the morning and late in the afternoon, the short-eared owl patrols on silent wings over the prairie. If it spots prey, it may hover and drop or it may snatch the prey from the ground and pass on without even checking its speed, so swift and skillful is its stroke.

The Role of Birds in the Prairie Ecosystem:

In addition to contributing to the beauty of the prairie, birds help the ecosystem function smoothly. Birds that pick apart the fruits of plants help scatter the seeds that will someday grow as new plants. Birds that eat only plant parts are known as *herbivores*.

Other birds on the prairie eat both plant parts and animals. These birds, known as *omnivores*, are important because not only do they help scatter seeds but they also help control the population of insects.

Birds of the prairie that are equipped with sharp talons and/or beaks are usually *carnivores*, which means they only eat other animals.

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Pollinators and Consumers

PURPOSE: To study the interrelationships between specific plants and animals.

OBJECTIVES: The students will:

1. Correctly identify specific pollinators, consumers, predators and plants involved in the study.
2. Accurately observe and report data.
3. Interpret data and accurately relate this interpretation to the definition of pollination and the balance necessitating predation in the prairie.

BACKGROUND: Pollination and predation are necessary events in the prairie ecosystem. In order for reproduction to take place, pollen must be removed from the stamen's anther on one plant and introduced to the pistal's stigma on another plant usually of the same species. Wind, and to a much lesser degree, water are pollinators, but much pollination is dependent upon insects.

In order to maintain a balance in nature, insects do a certain amount of plant damage and, some prey upon other insects in the prairie. These acts rather than being purely destructive are important in the maintenance of the ecosystem.

Because of the diversity of insects in a prairie, the student will concentrate on honeybees, bumblebees and butterflies as the primary pollinators, realizing, of course, that many other insects are involved in this process.

The observations of the consumers (herbivores and carnivores) will need to be somewhat generic in nature. Without access to understandable insect/arachnid field guides, a general description of the consumer will be sufficient. (i.e., spider, beetle, larva, etc.)

Students will be focusing on a wide variety of forbs (flowers) and will need to be familiar with the primary prairie plants if this lab is done on a prairie site. This exercise will be easily accomplished on an open field site near a school building with students observing insects on common flowers such as clover, dandelions, or garden flowers.

This lab can be adapted easily to a school field site if a local prairie is not readily available. The Fermilab prairie would be ideal for follow-up or as an on-site activity. Data collected will be site specific for Fermilab and may contribute to our overall efforts in determining the status of the educational prairie site.

MATERIALS:

* *Particles and Prairies Field Guide*, found in the Materials section of this book. (If lab is conducted on a prairie site.)
Clipboard
* Data sheets
Pencils with erasers
Watch with second hand or stopwatch
Binoculars - one pair per group. (Not mandatory, but very helpful.)
Insect medication if allergic to specific insect bites.
Perseverance, energy and P.M.A. (positive mental attitude).

PROCEDURE:

PRELAB

1. Prior to lab, students should develop the following hypotheses:
   - Will pollinators tend to visit only one kind of flower, or several different species?
   - Will a favored flower have specific features that make it more attractive? If so, what are these characteristics?
   - Will you see evidence of any animals eating or, in any way damaging plants in the prairie? If so, what do you think will be occurring?
   - Will you see evidence of any animals eating or, in any way damaging other animals in the prairie? If so, what do you think will be occurring?
   - Are insects good or bad for the prairie? Explain your response.
2. Ask students to individually contemplate their hypotheses and write them down on the Data Sheet 1.
3. As a class brainstorm hypotheses. Use newsprint or some other permanent method to record class consensus.
4. At the end of the exercise, students will use their data to draw conclusions.

LAB

1. Assign students to cooperative groups of three or four students. Students should divide observation and data collecting tasks within their group. No one set of students can accomplish all four tasks unless several trips to the field are scheduled. In each group at least one student should be assigned to each of the following tasks:
   - Locate and identify pollinator. (Data Sheet 2)
   - Observe every visit and the length of time at each flower, even if it is only a few seconds. (Data Sheet 2)
   - Identify all flowers the pollinator visits in a 10-minute period. (Data Sheet 3)
2. Student groups enter prairie or field to gather data, being careful NOT to trample vegetation in the process!

3. Students find and describe at least five different evidences of plant damage and attempt to identify source(s) of damage. (Data Sheet 4)
4. Students observe and record at least two examples of predation. (one animal capturing, killing or devouring another animal) (Data Sheet 5)

POSTLAB

1. Present list of hypotheses from prelab.
2. Collect and record class data for pollinators. (Data Sheet 6) (Reproduce on board or use overhead projector.)
3. Ask students to note similar data and any obvious deviations from expected results.
4. Repeat process for plant damage. (Data Sheet 7)
5. Repeat process for predators. (Data Sheet 8)
6. Compare data collected with hypotheses from prelab.
6. Process data collected with hypothesis from prelab. Be sure to note sources of error in class conclusion if necessary.

DISCUSSION QUESTIONS:

See Data Sheets (6,7, & 8)

1. Which original hypothesis was best supported? Which was disproven? Are you surprised? Why? Why not?
2. Can you think of sources of error?
3. Which forb appeared to be most popular? Why?
4. Were any forbs not visited at all? How might they be pollinated if not by insects?
5. List advantages/disadvantages of pollinators and consumers.
6. Were any pollinators also consumers? If so, name them.
7. Can we do without either pollinators or consumers? Why or why not?

CONCLUSION: Compile all data. Ask students to note all similarities and tendencies to construct class conclusion. Include all topics covered in hypothesis. Consider sources of error if necessary.

The *Particles and Prairies* Videodisc may be used to support this activity.

Name _____

Pollinators and Consumers
Data Sheet 1

Think about the kind of invertebrate life you may see on the prairie. What might these spiders and insects be doing? How might they be affecting the plants and other animals around them? Take time to write a well-constructed hypothesis for each of the questions below. The conclusions will be done at the end of the lab.

1. Will pollinators tend to visit only one kind of flower or several different species?

   Hypothesis:

   Conclusion:

2. Will a "favored" flower have specific features that make it more attractive? If so, what might these characteristics be?

   Hypothesis:

   Conclusion:

3. Will you see evidence of any animals eating, or in any way, damaging plants in the prairie? If so, what do you think will be occurring?

   Hypothesis:

   Conclusion:

4. Are insects good or bad for the prairie? Explain your response.

Name_____

Group #_____

Pollinators and Consumers

PURPOSE: To observe specific invertebrates as they move from flower to flower and to determine preferences to specific plants. To observe plant and animal destruction and to determine the source of this damage.

PROCEDURE:

1. In your group, decide who will do each of the following tasks:
   - Locate and identify pollinator. (Data Sheet 2)
   - Observe every visit and the length of time at each flower, even if it is only a few seconds. (Data Sheet 2)
   - Identity all flowers the pollinator visits in a 10-minute period. (Data Sheet 3)
2. Enter prairie or field to gather data. BE CAREFUL NOT to trample vegetation in the process!
3. Find and describe at least five different evidences of plant damage and attempt to identify source(s) of damage. (Data Sheet 4)
4. Observe and record at least two examples of predation. (one animal capturing, killing or devouring another animal) (Data Sheet 5)
5. Write a conclusion to your hypothesis recorded on Data Sheet 1.

Name _____

Group # _____

Pollinator Observation Sheet
Data Sheet 2

Record how much time in seconds the insect spends at a specific flower. Record flight interval times between revisits. At the end of the 10 minutes, add up the total amount of time in seconds at a flower and the total amount of time in seconds in flight. Divide by 600 (the # of seconds in 10 minutes) and determine the percentage of time at each activity.

Insect Observed_____

$$\frac{\text{Total number of seconds at flower}}{600} \times 100 = \text{percentage of time pollinating}$$

$$\frac{\text{Total number of seconds in flight}}{600} \times 100 = \text{percentage of time flying}$$

TIME IN SECONDS ON FLOWER	IN FLIGHT	FLOWER OBSERVED	TIME IN SECONDS ON FLOWER	IN FLIGHT	FLOWER OBSERVED

TIME IN SECONDS ON FLOWER	IN FLIGHT	FLOWER OBSERVED	TIME IN SECONDS ON FLOWER	IN FLIGHT	FLOWER OBSERVED

Total Number of Seconds on Flower_____ Total Number of Seconds in Flight_____

Pollinators and Consumers Data Sheet 3: Preferred Forb (Flower) Observation Sheet

Name_____

Group #_____

DIRECTIONS: Identify the type of forbs your pollinator visits. Be sure to use descriptive adjectives to develop a "word picture" of the plants. Remember, your insect may visit many or just a few types of plants. Record data for each TYPE of flower, not each individual visit. (Example: If your insect visits a clover 16 times, you only need to describe clover once.)

Name of Forb	Color	Forb Odor	Leaf Odor	# of Petals	Location of Pollen	Developmental State of Forb (open, bud, withered)	Other
Flower 1							
Flower 2							
Flower 3							
Flower 4							
Flower 5							

Pollinators and Consumers Data Sheet 4: Plant Damage Observation Sheet - Plants

Name_____

Group #_____

DIRECTIONS: Make an effort to find FRESH damage. It would be best to observe damage as it is occurring in order to identify the consumer. Find at least five examples.

Plant Being Consumed	Description of Damage	Location of Damage	General Condition of Rest of Plant	Description of Consumer	Name of Consumer

Pollinators and Consumers Data Sheet 5: Predation Observation Sheet - Animals

Name_____

Group#_____

DIRECTION: Do you see any evidence of predation? Note any instances where you observe an animal capturing, killing or devouring another animal. You will need at least two examples.

Predator	Description of Predator	Victim	Description of Victim	Scene of "Crime"	Cause of Death

Pollinators and Consumers
Class Data Sheet 6: Pollinators

DIRECTIONS: Student groups will take turns reporting data one source at a time until all data has been exhausted. (Many students may have similar data.)

Group #	Pollinator	# of Kinds of Forbs Visited	Names of Forbs	# of Visits to Forb
1				
2				
3				
4				
5				

Group #	Pollinator	# of Kinds of Forbs Visited	Names of Forbs	# of Visits to Forb
6				
7				
8				

Pollinators and Consumers
Class Data Sheet 7: Plant Damage

DIRECTIONS: Student groups will take turns reporting data one source at a time until all data has been exhausted. (Many students may have similar data.)

Affected Plant	Type of damage	Amount of damage minor, moderate, major	Consumer

Pollinators and Consumers
Class Data Sheet 8: Predators

DIRECTIONS: Student groups will take turns reporting data one source at a time until all data has been exhausted. (Many students may have similar data.)

Victim	Cause of Death	Consumer

Invertebrates in the Prairie and Forest

PURPOSE: To compare numbers and types of invertebrates that can be found within the vegetative litter or just at or below the soil surface of the prairie and the forest.

OBJECTIVES: Students will:

1. Identify six major groups of terrestrial invertebrates.
2. Use a dichotomous key.
3. Compare the invertebrate fauna of the prairie with that of the forest.

BACKGROUND: One of the most remarkable characteristics of the flowering prairie is its capacity to maintain itself. It is distinguished by the fact that it provides a rich food source for various forms of animal and plant life by the fact that its remains do not accumulate permanently. There is an inevitable piling up of materials on the prairie floor that remains until the area is burned. This activity is intended for a prairie that has not experienced fire for several years. Refer to *Fire Ecology* lab for the importance of the Prairie Fire.

The surface of the forest floor may appear to be a lifeless carpet of refuse and dead leaves, but immediately below the top layer are the decaying remains of other seasons, occupied by a busy community of tiny organisms. Deeper still, the humus, dark spongy material formed from the litter, is honeycombed with passageways and burrows of insects, worms, moles, and the roots of plants.

The invertebrates found within the vegetative litter or just at or below the soil surface are a major part of an ecosystem that often goes unnoticed. These animals represent a wide variety of feeding strategies and habitat requirements. A familiarity with the major invertebrate phyla found on the forest floor and the base of the prairie will help one to understand the complexities of these systems.

Materials:

* Particles and Prairies Invertebrate Field Guide
* Particles and Prairies Invertebrate Dichotomous Key
* Berlese Funnel Setup
* Particles and Prairies Invertebrate Wanted Posters

Sampling equipment such as:

- Trowels
- Assorted bags or containers
- Plastic petri dishes
- Probes (may be as simple as plastic straws cut on an angle)
- Magnifying lenses (Reflective light or dissecting microscopes are recommended.)

Procedure:

1. Select the sampling sites. (Invertebrate analysis using a Berlese funnel can be done in a variety of habitats. If access to a prairie or a forest is not available, two other ecosystems may be substituted.) Each student team (a four-member team is suggested) needs a small defined plot to sample. Sample plots may be defined with string, small hoops or other devices that can be standardized. A suggested plot size is about 30 cm^2.
2. Using the sampling equipment, the student should collect all the material within the plot including about one centimeter of the surface soil. The students should place the sample in a plastic bag or container and label the sample with the date, location and any other pertinent data you wish to include.
3. Upon your return to the classroom, set up the Berlese funnel apparatus according to the diagram. The students should empty the contents of their sample bags into the funnel. Label information should follow the sample. (Multiple Berlese funnel setups are useful for speeding up the collection process.) The light bulb should be positioned above the material close enough to provide heat and light, but not so close to promote a fire. Keep the light burning day and night for at least 24 hours. Depending on the type and amount of material collected, several days or more may be needed to drive all of the invertebrates into the collecting bottle.
4. Using a spoon, transfer small quantities of the collected material to open petri dishes. One collection jar should provide enough material for four or more dishes. Replenish the alcohol as it evaporates since it preserves the specimens and, when using magnification, provides uniform light diffraction.
5. Using magnification and a probe, students should analyze the material for invertebrates. Students should record the number and phylum for each invertebrate. Have the students sketch the organisms they find.

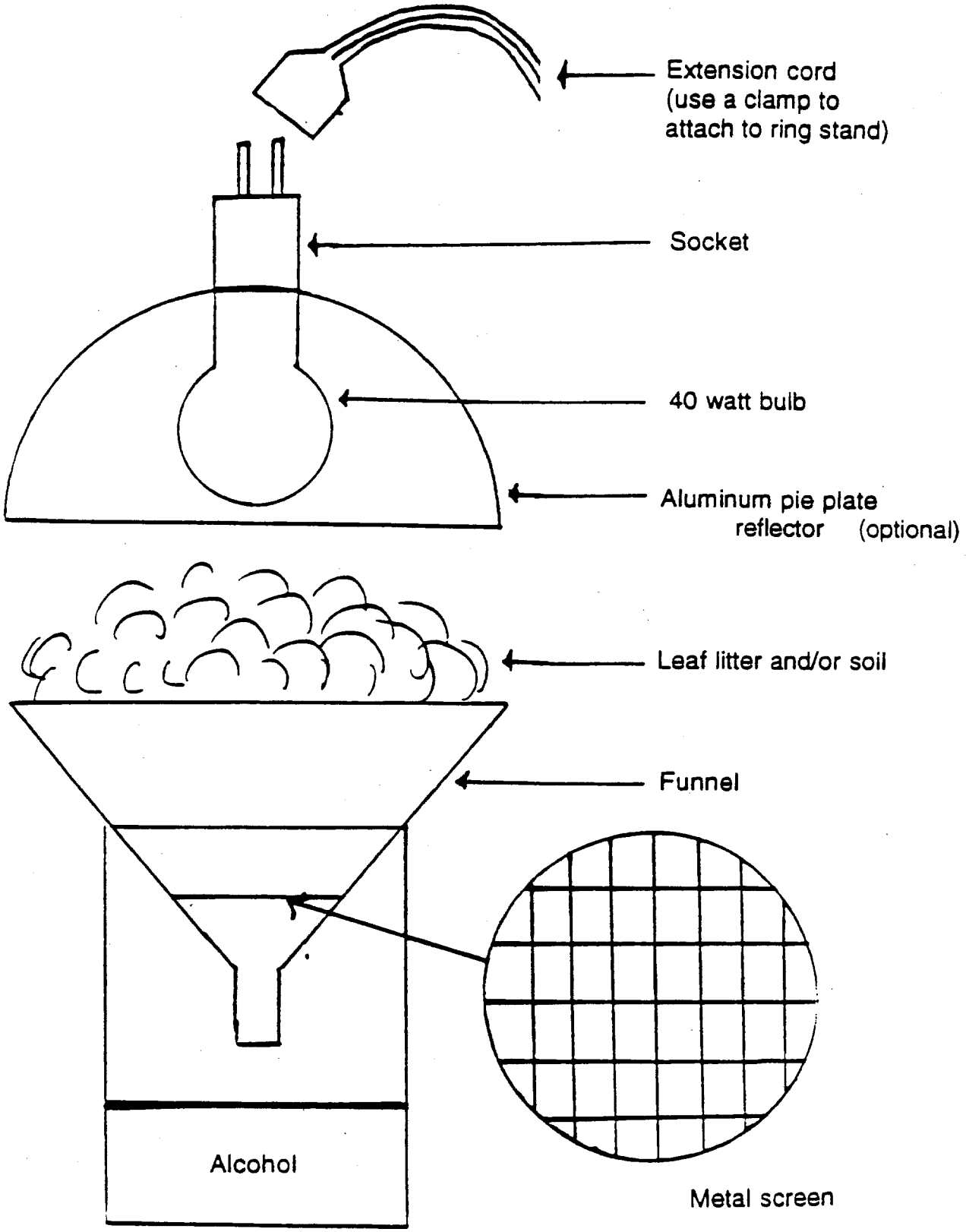
DISCUSSION QUESTIONS:

1. What are the differences and similarities between the invertebrate populations of the prairie and the forest?
2. Do the types of invertebrates found indicate certain environmental conditions? certain fauna or flora? (Life history research is helpful here.)
3. What questions can you pose about invertebrates, biomass and energy transfer in these ecosystems? What measurements might you make to answer your questions?

EXTENSION: Collect leaf litter from an area around school. (vacant lot, forest, etc.) Compare organisms.

The *Particles and Prairies* Videodisc may be used to support this activity.

Berlese Apparatus



Name_____

Sample Location _____
(prairie, forest, savannah, etc.)

Invertebrates in the Prairie and Forest Data Sheet

Name of organism	Sketch	Number Found	What do they eat?	NICHE: Scavenger, Herbivore, Carnivore, etc.

Abiotic Study: Prairie and Forest

PURPOSE: To compare the environmental conditions of the prairie to that of a forest.

OBJECTIVES: The students will:
1. Accurately record data.
2. Interpret data to draw conclusions about why plants grow where they do.

BACKGROUND: In the prairie different flowers bloom from mid-spring through the fall. In the forest next to the prairie we have only early spring wildflowers. Also, the plants found in these two ecosystems are different even though the two ecosystems are right next to each other. Why is this?

Although these ecosystems are very close to each other there must be some reason why the two ecosystems contain such different plants. In this study the students will collect the abiotic data that might help explain these plant differences.

One of the important abiotic factors in an ecosystem is the soil. Therefore you should know about how soil is formed. The land areas of the earth once were barren rock with no soil cover. These exposed rocky masses were constantly acted upon by winds, rains, ice (glaciers) and water. The rocks began to break down. When the first land plants, pioneer plants, moved onto the land, they were small and adapted to hold onto rock surfaces. The weathering actions of the physical forces along with the chemical influences of the early plants continued the breakdown of the rocks. Plants died and their bodies added nutrients to the soil in the making that gave it some of the properties we look for in productive soil. After a long period of time, all these forces produced soil pretty much like the soils of today. Soil building is still going on in many places, and some aspects of the process can be observed.

Mosses and lichens are pioneer plants. They are adapted to living on rock surfaces and they contribute to the disintegration of the rocks over long periods of time as part of the soil building. You can find exposed rocks or boulders in wooded areas and adjacent places. Many will already have begun to break down and will have lichens and mosses attached as well as some other plants which managed to find a place in a tiny crevice or in an accumulation of materials in a depression or cavity on the surface of the rock.

MATERIALS: Data sheets
For each group:
- Thermometer
- Wind gauge
- Psychrometer
- Light intensity meter
- Soil moisture meter
- Soil percolation tube
- Water supply
- Waste container
- Soil test kit with laminated instructions
- Stopwatch or wristwatch
- Meter stick

PROCEDURE:
1. The students will require instruction in the use of the meters, gauges and the soil test kit.
2. Collect data and answer discussion questions.

DISCUSSION QUESTIONS:
1. Which ecosystem had the highest temperature at each level?
   1 meter
   15 centimeters
   ground level
   5 centimeters below ground level
2. Which ecosystem had the most wind?
3. Which ecosystem had the highest relative humidity?
4. Which ecosystem had the greatest light intensity?
5. Which ecosystem had the most soil moisture?
6. High wind, low relative humidity and high temperatures all cause water to be lost from plants. In order to survive in an area like this the plants must be specially adapted. In which ecosystem would we probably find more plants adapted to prevent water loss?
7. Why do you think fewer plants grow on the forest floor?
8. The soil supplies the needed nutrients for the plants in both ecosystems. Unfortunately our prairie is not a virgin prairie with its thick rich soil. This area had been farmed for many years thus altering the soil. Three of the most important nutrients for good plant growth are Nitrogen (N), Phosphorus (P), and Potassium (K). Nitrogen is essential for proper plant cell metabolism and protein formation. Nitrogen gives plants their dark green color and helps the growth of leaves and stems. Phosphorus is the soil nutrient responsible for the formation of healthy roots. Phosphorus also encourages the blooming of flowers, seed formation and resistance to disease and weather extremes. Potassium is the soil nutrient that stimulates flowering and helps

produce sugar and starch during photosynthesis. Did you find any difference in the nutrient levels between the two ecosystems? If so, what was the difference?

9. The soil pH is very important to the plants of any ecosystem because it determines which nutrients will be soluble and therefore available to the plants. This is because plants can only take in nutrients that are dissolved in water. If the pH is wrong, then a nutrient might be present in the soil but not dissolved in the water around the plant and therefore cannot be taken in by the plant. At or near 6.7, all the different nutrients a plant needs are soluble, and therefore available. Was there any difference in the soil pH between our two ecosystems? If so, what was it? If there was a difference, which ecosystem had a pH closer to the ideal?
10. Soils are made of particles that vary in size and shape. These range from tiny clay particles to relatively large sand particles. This soil texture greatly determines the available water, minerals and nutrients to the the plants as well as how well the plants are able to germinate and take root.
11. Why do we find different species of plants living in these two ecosystems?
12. In the prairie the spring flowers are usually short followed by taller summer blooming plants and then very tall fall blooming plants. Why do you think this is?
13. In the forest we do not find this layering effect of flowers as we do in the prairie; we only find spring wildflowers. Why do you think this is?

PSYCHROMETER DIFFERENTIAL TABLE - WET BULB/DRY BULB

Dry-bulb temperatures (•C)	Difference between wet-bulb and dry-bulb temperatures (•C)																			
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
0	81	64	46	29	13															
2	84	68	52	37	22	7														
4	85	71	57	43	29	16														
6	86	73	60	48	35	24	11													
8	87	75	63	51	40	29	19	8												
10	88	77	66	55	44	34	24	15	6											
12	89	78	68	58	48	39	29	21	12											
14	90	79	70	60	51	42	34	26	18	10										
16	90	81	71	63	54	46	38	30	23	15	8									
18	91	82	73	65	57	49	41	34	27	20	14	7								
20	91	83	74	68	59	51	44	37	31	24	18	12	6							
22	92	83	76	69	61	54	47	40	34	28	22	17	11	6						
24	92	84	77	71	62	56	49	43	37	31	26	20	15	10	5					
26	92	85	78	72	64	58	52	46	40	34	29	24	19	14	10	5				
28	93	85	78	73	65	59	53	48	42	37	32	27	22	18	13	9	5			
30	93	86	79	74	67	61	55	50	44	39	35	30	25	21	17	13	9	5		
32	93	86	80	75	68	62	57	51	46	41	37	32	28	24	20	16	12	9	5	
34	93	87	81	76	69	63	58	53	48	43	39	35	30	28	23	19	15	12	8	5

Name_____

Date_____

Abiotic Study: Prairie and Forest

In the prairie different flowers bloom from the spring through the fall. In the forest next to the prairie we have only the spring wildflowers. Also, the plants found in these two ecosystems are different even though the two ecosystems are right next to each other. Why is this?

Although these ecosystems are very close to each other there must be some reason why the two ecosystems contain such different plants. In this study you will collect the abiotic data that might help explain the plant differences.

PURPOSE: To compare the environmental conditions of the prairie to that of a forest.

PROCEDURE: Complete collect data and answer questions.

MATERIALS: Data sheets

For each group:
- Thermometer
- Wind gauge
- Psychrometer
- Light intensity meter
- Soil moisture meter
- Soil percolating tube
- Water supply
- Waste containers
- Soil test kit with laminated instructions
- Stopwatch or wristwatch
- Meter stick

PRAIRIE DATA TABLE

Atmospheric Conditions

	Site 1	Site 2	Site 3	Average for Sites
Relative Humidity	%	%	%	%
Wind Speed	mph	mph	mph	mph
Light Intensity *				

* For light intensity use A = 1 , B = 2, etc. for averaging purposes.

Soil Conditions

Soil Temperature

	Site 1	Site 2	Site 3	Average for Sites
1 meter above				
15 centimeters above				
ground level				
5 centimeters below surface				

Soil Chemistry

Nitrate Nitrogen	ppm (NO_3^--N)
Phosphate Phosphorus	ppm (PO_4-P)
Potassium	ppm (K)

Soil texture _____

Soil pH _____ Soil perculation _____ liters per minute

FOREST DATA TABLE

Atmospheric Conditions

	Site 1	Site 2	Site 3	Average for Sites
Relative Humidity	%	%	%	%
Wind Speed	mph	mph	mph	mph
Light Intensity *				

* For light intensity use A = 1, B = 2, etc. for averaging purposes.

Soil Conditions

Soil Temperature

	Site 1	Site 2	Site 3	Average for Sites
1 meter above				
15 centimeters above				
ground level				
5 centimeters below surface				

Soil Chemistry

Nitrate Nitrogen	ppm (NO_3^--N)
Phosphate Phosphorus	ppm (PO_4-P)
Potassium	ppm (K)

Soil texture _____

Soil pH _____ Soil perculation _____ liters per minute

QUESTIONS:

General Abiotic Analysis

Which ecosystem had the highest temperature at each level?

1 meter above ground _____
15 centimeters above ground _____
ground level _____
5 centimeters below surface _____

Which ecosystem had the most wind? _____

Which ecosystem had the highest relative humidity? _____

Which ecosystem had the greatest light intensity? _____

Which ecosystem had the most soil moisture? _____

High wind, low relative humidity and high temperatures all cause water to be lost from plants. In order to survive in an area like this the plants must be specially adapted. In which of our two ecosystems would we probably find more plants adapted to prevent water loss? _____

Why do you think so few plants grow on the forest floor?

Soil Analysis

The soil supplies the needed nutrients for the plants in both ecosystems. Unfortunately our prairie is not a virgin prairie with its thick rich soil. This area had been farmed for many years thus altering the soil. Three of the most important nutrients for good plant growth are Nitrogen (N), Phosphorus (P), and Potassium (K). Nitrogen is essential for proper plant cell metabolism and protein formation. Nitrogen gives plants their dark green color and helps the growth of leaves and stems. Phosphorus is the soil nutrient responsible for the formation of healthy roots. Phosphorus also encourages the blooming of flowers, seed formation and resistance to disease and weather extremes. Potassium is the soil nutrient that stimulates flowering and helps produce sugar and starch during photosynthesis. Did you find any difference in the nutrient levels between the two ecosystems? If so, what was the difference?

The soil pH is very important to the plants of any ecosystem because it determines which nutrients will be soluble and therefore available to the plants. This is because plants can only take in nutrients that are dissolved in water. If the pH is wrong, then a nutrient might be present in the soil but not dissolved in the water around the plant and therefore cannot be taken in by the plant. At or near 6.7, all the different nutrients a plant needs are soluble, and therefore available.

Was there any difference in the soil pH between our two ecosystems?
If so, what was it?

If there was a difference, which ecosystem had a pH closer to the ideal?

Why do we find different species of plants living in these two ecosystems?

In the prairie the spring flowers are usually short followed by taller summer blooming plants and then very tall fall blooming plants. Why do you think this is?

In the forest we do not find this layering effect of flowers as we do in the prairie; we only find spring wildflowers. Why do you think this is?

Soils are made of particles that vary in size and shape. These range from tiny clay particles to relatively large sand particles. This soil texture greatly determines the available water, minerals and nutrients to the the plants as well as how well the plants are able to germinate and take root.

Was there a difference in the soil texture between the two ecosystems?

If there was a difference, try to you use it to explain some of the differences in plant species between the two ecosystems.

Water-Holding Capability

BACKGROUND: Soil is a major reservoir of water for plants and man. Its porous structure enables it to hold enormous quantities of water that fall as rain or snow. Soils differ in their ability to hold water. Good soils with their plant cover can absorb and hold much more water than sandy soils.

How do the water-holding capabilities of the prairie and forest soils compare?

What are some possible reasons for these differences?

Herbarium Specimen Collection

PURPOSE: To develop a permanent set of classroom prairie plant specimens.

OBJECTIVES: The students will:
1. Select and identify specific prairie plants.
2. Produce a series of herbarium mounts suitable for classroom display.

MATERIALS:
Plant press
Mounting paper
Diluted Elmer's glue
Plant labels
Selected plant specimens
Laminator (Optional)

PROCEDURE:
1. Select specimen.
2. Arrange specimen on plant press blotter paper.
3. Place in plant press.
4. Tighten plant press.
5. Allow specimen to dry for at least one week.
6. Carefully remove specimen by the stem from plant press when dry.
7. Position on mounting paper.
8. Apply several drops of glue along the stem, leaves, etc. (Not necessary if laminated.)
9. Label accurately with scientific name, common name, and short description. (See *Particles and Prairies Plant Key.*)
10. Laminate. (Optional)

Note* These samples could serve in future years as visual aids for the research component.

Nature Walk

PURPOSE: To provide an opportunity for students to witness organisms in their natural settings or to observe evidence of the organisms.

OBJECTIVES: The students will:
1. Observe living things accurately.
2. Record the signs of living things.

BACKGROUND: Animal observation records are of great value to Fermilab's Prairie Committee. The evidence of specific animal life is another barometer of a healthy ecosystem. Observation sheets compiled by students and recorded over a period of time in the same habitat will help Fermilab manage and maintain its diverse array of wildlife.

Early pioneers encountered countless hardships as they settled in the plains and valleys of Illinois. In an effort to capture the flavor of a time long past, Fermilab offers an opportunity for student and teachers to explore restored prairie sites and unspoiled woodland areas. As the teacher prepares students for the nature walk, encourage the students to picture themselves as pioneer kids. What might their clothing be like? What kind of chores would they be doing? What would they do for recreation?

Fermilab's on-site outdoor laboratory provides a unique combination of marsh, farmland meadow, prairie, savannah and forest. Each of these habitats provides a different environment which support a wide and varying array of plant and animal life. As your group is walking between study sites, have your students on the lookout for wildlife. The following check list of the common organisms should prove helpful. Have at least one check list per group. It would also be helpful if the students could become familiar with the bird calls for the common birds at the lab. These can be found on the laser disc.

MATERIALS: Observation checklist
Clipboards with pens or pencils
Binoculars (optional)

PROCEDURE:
1. Students must remain quiet to maximize the possibility of observing wildlife.
2. Instruct students to stay on designated walkways and paths. (There is an abundance of poison ivy year round.)
3. Care must be taken not to trample, pick or otherwise damage organisms.

Nature Walk Observation Sheet

Name _____

School _____

Nature of Observation

	visual	call	tracks	scat	nest	other
BIRDS						
Blue Jay						
Bluebird						
Bobolink						
Flicker						
Goldfinch						
Indigo Bunting						
Meadowlark						
Red-tailed Hawk						
Red-winged Blackbird						
Robin						
Sparrow						
Yellow Warbler						
Other						
MAMMALS						
Chipmunk						
Cottontail						
Coyote						
Deer Mouse						
Fox Squirrel						
Ground Squirrel, 13-lined						
Meadow Vole						
Opossum						
Raccoon						
Shrew						
Skunk						
White-tailed Deer						
Woodchuck						
REPTILES						
Garter Snake						
Fox Snake						
Other						
AMPHIBIANS						
American Toad						
Leopard Frog						
Other						

Quadrat Study: Reconstructed Prairie

PURPOSE: To find out if the planting and maintenance methods used at Fermilab are effective ways for improving the prairie.

OBJECTIVES: Students will look at two key things about the prairie to find out what is happening:

1. Are we increasing the species diversity? Species diversity refers to how many different species of prairie plants we have. In a true prairie we find hundreds of different species. Our restored prairie will not come close to this. We hope in time that our maintenance methods will increase the species diversity of prairie plants and decrease the diversity of weeds.
2. What plants are the most important at this time in the restoration area? This is an interesting question because it is not simply asking which plant is here in the greatest number. What if one plant is much larger than another or one plant is common only in one location? Thus with your data we can calculate an "Importance Value." This will give us an accurate picture of which plants are having the greatest impact on this area.

BACKGROUND: The prairie land presently on site at Fermilab is reminiscent of the original tall grass prairie that once covered 400,000 square miles of the Midwest. Currently, over 700 acres of prairie has been planted on the Fermilab site with plans for more in the future. This reconstruction process has been in progress for over 20 years. As prairie plants have been added, careful notice has been taken as to their progress and the succession of these plants.

MATERIALS: Per Group:

- Meter square quadrat
- Two meter sticks
- Small metric ruler
- Flora Field Guide
- Data sheet

PROCEDURE: In this exercise students will work in groups of three or four. Prior to the lab be sure to establish student roles, one as recorder, one as counter, and a collective effort to identify plants to help ensure success.

1. Show students where to set up quadrats.
2. Using two meter sticks and the following data page, students will map the location of the plants in their quadrat, drawing grasses first.

3. Once the grasses have been drawn in, students will use the meter sticks to get the exact location of each forb.
4. Students will get an accurate count for each species present in their quadrat and record this on the plant code sheet. This will be easy for the forbs but difficult for the grasses. For our purpose we will count each stem of grass as a separate plant. If there is simply too much grass to count this way, count the grass in a half or a quarter of your quadrat and multiply by the appropriate number.
5. Determine the percent cover for each species.

DISCUSSION QUESTIONS:

1. To get the most accurate analysis of the data collected we will look at all the quadrats sampled.
2. Proceed back to the Education Center and let each group enter their data into the computer. The computer is programed to add all the data and then to do a series of calculations.
3. The key value we are looking for is the <u>importance value</u> of a species. It tells us how important a particular plant is to the planting. The higher the value the greater the importance of that plant at this time. It will be interesting to see if and how these values change as future classes examine the study area using the class data.
   - What plant has the highest importance value?
   - What grass has the highest importance value?
   - What forb has the highest importance value?
   - What weed has the highest importance value?

   Obtain the importance values from last year. Are the same plants on both lists? Have students list any changes that have taken place.
5. For long-term analysis of this area we would like to get an idea of the species diversity and how many different plants are there per meter square. Have students enter into the computer the number of different species of prairie plants found in their quadrat and also the number of different weed species found. The computer will use the class data and calculate the species diversity for each.
   - Diversity of prairie plants.
   - Diversity of weedy plants.
   - Diversity of prairie plants last year.
   - Diversity of weedy plants last year.

   Have students explain any change in the diversity values and predict how we would like these values to change in the future.

Name_____

Quadrat Study: Reconstructed Prairie

PURPOSE: To find out if the planting and maintenance methods used at Fermilab are effective ways for improving the prairie.

OBJECTIVES: You will look at two key things about the prairie to find out what is happening:

1. Are we increasing the species diversity? Species diversity refers to how many different species of prairie plants we have. In a true prairie we find hundreds of different species. Our restored prairie will not come close to this. We hope in time that our maintenance methods will increase the species diversity of prairie plants and decrease the diversity of weeds.
2. What plants are the most important at this time in the restoration area? This is an interesting question because it is not simply asking which plant is here in the greatest number. What if one plant is much larger than another or one plant is common only in one location? Thus with your data we will calculate an <u>importance value</u>. This will give us an accurate picture of which plants are having the greatest impact on this area.

BACKGROUND: The prairie land presently on site at Fermilab is reminiscent of the original tall grass prairie that once covered 400,000 square miles of the Midwest. Currently, over 700 acres of prairie has been planted on the Fermilab site with plans for more in the future. This restoration process has been in progress for over 20 years. As prairie plants have been added, careful notice has been taken as to their progress and the succession of the prairie plants.

MATERIALS: Per Group

- Meter square quadrat
- Two meter sticks
- Small metric ruler
- Flora Field Guide
- Data sheet

PROCEDURE: In this exercise you will work in groups of three or four. You will use a chart quadrat of one square meter. A quadrat, as the name implies, is (usually) a square sample of the area to be studied. Because it is impractical, often impossible, to count and map every plant in an entire area we will concern ourselves with randomly selected samples from which we may draw conclusions. A chart quadrat is special in that we will not only count the number of each species but will draw the location of each.

Please remember the prairie is a fragile area; just our presence will have a detrimental effect; be as careful as possible and please do not pick any plants.

1. Your instructor will show you where to set up your quadrat.

2. Using two meter sticks and the following recording page, map the location of the plants in your quadrat. Your area is probably dominated by grasses; draw these in first using the crosshatching code on the plant code sheet. Remember, if you cannot identify which grass you have, check with your instructor.

3. Once the grasses have been drawn in, use the meter sticks to get the exact location of each forb (flowering plant). Transfer this information to the recording page. Again, use the plant code sheet to find the correct code for each plant.

4. Now, get an accurate count for each species present in your quadrat and record this on the plant code sheet. This will be easy for the forbs but difficult for the grasses. For our purpose we will count each stem of grass as a separate plant. If there is simply too much grass to count this way, count the grass in a half or a quarter of your quadrat and multiply by the appropriate number.

5. Now, determine the percent of cover for each species. This is an estimate of what percent of the meter square each species occupies. Again, grasses will probably have the greatest percent of cover. Record this on the plant code sheet.

6. Proceed back to the Education Center and enter your data into the computer. The computer is programed to add your data to the rest of the class data and then to do a series of calculations.

7. The key value we are looking for is the importance value of a species. It tells us how important a particular plant is to the planting. The higher the value, the greater the importance of that plant at this time. It will be interesting to see if and how these values change as future classes examine the study area using your data.

DISCUSSION QUESTIONS:

1. What plant has the highest importance value?

2. What grass has the highest importance value?

3. What forb has the highest importance value?

4. What weed has the highest importance value?

5. Obtain the importance values from last year. Are the same plants on both lists? If any changes have taken place, please list them:

6. For long-term analysis of this area we would like to get an idea of the species diversity and how many different plants are there per meter square. Enter into the computer the number of different species of prairie plants you found in your quadrat and also the number of different weed species you found. The computer will use the class data and calculate the species diversity for each.

   Diversity of prairie plants_____

   Diversity of weedy plants_____

   Diversity of prairie plants last year_____

   Diversity of weedy plants last year_____

7. Explain any change in the diversity values.

8. How do you think we would like these values to change in the future?

Prairie Plants Data Sheet

CODE	NAME	NUMBER FOUND	% COVER
R	RATTLESNAKE MASTER		
S	STIFF GOLDENROD		
D	PRAIRIE DOCK		
C	COMPASS PLANT		
W	ROSINWEED		
Y	YELLOW CONEFLOWER		
B	BLACK-EYED SUSAN		
T	TALL COREOPSIS		
A	SAW-TOOTHED SUNFLOWER		
F	SHOWY TICK TREFOIL		
E	WILD BERGAMOT		
M	MOUNTAIN MINT		
	BIG BLUESTEM		
	LITTLE BLUESTEM		
	INDIAN GRASS		
	SWITCH GRASS		
	PRAIRIE CORD GRASS		
N	NEW ENGLAND ASTER		
O	NODDING WILD ONION		
P	PURPLE CONEFLOWER		

H	WOOLY SUNFLOWER		
I	BUSH CLOVER		
L	BLAZING STAR		
J	FOXGLOVE BEARD TONGUE		
G	GRAY GOLDENROD		
K	CULVERS ROOT		
Q	WILD QUININE		

NUMBER OF DIFFERENT PRAIRIE PLANTS FOUND _____

Weeds Data Sheet

CODE	NAME	NUMBER FOUND	% COVER
1	BLACK RASPBERRY		
2	DAISY FLEABANE		
3	WILD CARROT		
4	WHITE SWEET CLOVER		
5	YARROW		
6	CURLED DOCK		
7	COMMON RAGWEED		
8	BIRDFOOT TREFOIL		
9	GROUND CHERRY		
10	TALL GOLDENROD		
11	COMMON MILKWEED		
12	RED CLOVER		
13	CANADA THISTLE		
14	REED CANARY GRASS		
15	TIMOTHY		
16	SQUIRRELTAIL		
17	ALSIKE CLOVER		
18	HAIRY VETCH		
19	HAIRY ASTER		

CODE	NAME	NUMBER FOUND	% COVER
20	BLACK MEDICK		
21	YELLOW WOOD-SORREL		
22	BULL THISTLE		
23	KENTUCKY BLUEGRASS		
24	HUNGARIAN BROME		
25	RAGWORT		
26	EARLY WINTER CRESS		
27	DRUMMOND'S ASTER		
28	DANDELION		
29	YELLOW SWEET CLOVER		
30	HEAL-ALL		
31	EVENING-PRIMROSE		

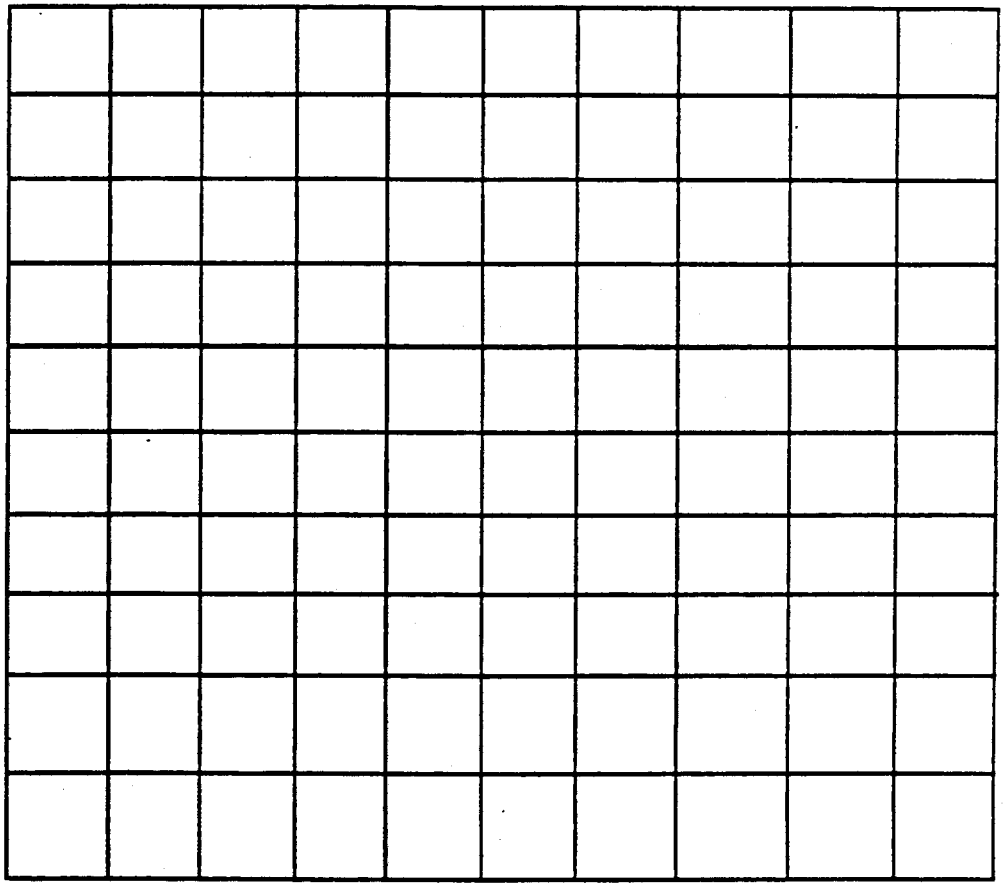
NUMBER OF DIFFERENT WEEDS FOUND _____

Name_____

Group number_____

Quadrat Study: Reconstructed Prairie

1 m^2 quadrat, scale 1 cm = 10 cm



Group Data

Number of different prairie plants found _____

Number of different weedy plants found _____

Fire Ecologies

PURPOSE: To become familiar with the positive and negative effects of prairie (and forest) fires on wildlife species and their habitat.

OBJECTIVE: Students will be able to identify, describe, and evaluate some possible positive and negative effects on wildlife that result from prairie (and forest) fires.

BACKGROUND: In managing public lands, government agencies for many years have been making a slow movement to change their attitudes toward fires. Whereas, once all fires were suppressed or vigorously fought, some now are allowed to burn as part of a natural cycle within the forest, savannah and prairie ecosystems. In fact, there has been a movement to "prescribe" fires under some conditions and in some places in an effort to replicate natural cycles that contribute to maintaining healthy ecosystems.

Such "prescribed burns" are planned and tended by qualified individuals. Such fires are designed to reduce the fuel load in a given area. Reducing the fuel load in a given area, for example, can prevent fires from getting so hot that they eliminate virtually all life forms and even scorch the soil, sterilizing it. That is, fires every two or three years, in the prairie, can maintain this grassland preventing trees and shrubs from taking over. In the forest, fires every five to ten years can clear away the heavy underbrush without harming the larger trees. A major fire, such as the Yellowstone fire of 1988, with a 70-year accumulation of brush and maturing timber, can cause intensively hot and destructive fires.

It is still correct, of course, that humans should take precautions in camping situations. "Smokey the Bear" and his "Only you can prevent forest fires," is still a warning against carelessness in causing fires through error and accidents.

It is still correct, of course, that fires can have negative as well as positive effects. Forest products companies would rather harvest trees than see them burn. If a fire is too large and too fast, wildlife cannot easily move to safety. Loss of vegetation can have a variety of effects, including impact on wildlife and increase in silting and sedimentation in the surrounding waters.

There are, however, some benefits as well, particularly in the case of those smaller burns that do not get exceedingly hot. For example, prairie and forest burns can:

1. Maintain and enhance fire, dependent habitats such as prairies, savannahs and jack pine forests.
2. Increase soil productivity by releasing and recycling nutrients tied up in litter and undergrowth.
3. Prepare soil for germination of some seeds.
4. Activate heat-dependent seed varieties, such as lodgepole pines.
5. Contribute to an "edge effect," providing a greater variety of food and shelter sources for wildlife.
6. Open up the habitat, generating new growth, diversity and abundance of food plants for some of the herbivores.

MATERIALS: Videos: *From Beneath the Ashes* (Argonne National Laboratory: The New Explorers Series) 28 minutes.*
Yellowstone's Burning Question (Nova) 60 minutes.*
* (These videos are available for previewing at the Fermilab Education Center.)
Reference material from library and/or site work involving soil analysis equipment.
Plant and animal identification guides
Student pages

PROCEDURE

1. Begin this activity with a discussion of prairie and forest fires. Students' reactions will probably be negative at first; point out that while one harmful effect is the destruction of habitat and the killing of wildlife, in some cases fire improves habitat and contributes to the long-term well-being of wildlife.
2. Brainstorm possible positive and negative consequences of prairie and savannah fires for wildlife. Specify wildlife and give examples. Discuss how prairie plants and animals survive fire.
3. Take a field trip to Fermilab or other site where the prairie or forest had recently been burned. This will be compared with a similar area that has not burned in recent history. (NOTE: If such a trip is not possible, *From Beneath the Ashes* may be used along with some reference work in the library.)
4. If the field trip is possible, prepare students to:
   a. make and record their observations of the variety and quantity of vegetation, evidence of wildlife;
   b. take small soil samples in the various areas for testing purposes. These soil samples should be tested for structure, organic and inorganic parts and chemical composition.
5. Ask the student to organize and present the findings of their research. See student worksheet. Ask students to summarize their findings, including short-term and long-term effects to wildlife in each area, both positive and negative. They should

include in their summary an assessment of the importance of fire in natural systems, as well as its effectiveness as a management tool. In the situations they studied, ask them to evaluate the role of fire, including its positive and negative consequences. Their findings should include a listing of those situations in which fire is generally most beneficial, those in which it is most harmful and those where it has little effect. Ask them to address any limitations in their study; that is, any aspect of their research which prevents them from generalizing their findings to all fires affecting wildlife.

EXTENSIONS:

1. Also discuss other impacts from wild and controlled burns. What is the public attitude toward fires in forest and grassland areas? What are the broad range of consequences of fires and lack of fires, on local economy, on aesthetic value, ecological value and agricultural value? What are the trade-offs in allowing and preventing fires? Come up with a set of recommendations for conditions under which fires should be allowed. Check your recommendations against present guidelines used by the U.S. Forest Service and state wildlife agency.
2. Find out the history of fire management in the U.S. Contrast policies of native American Indian people and federal agencies.
3. Add a study of succession to this activity.
4. Study the Yellowstone fire of 1988.

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Name_____

Consequences To Species

Animals	Plants	Short-Term Benefit	Long-Term Benefit	Short-Term Harm	Long-Term Harm

Name_____

	Soil Data	Plant Species	Associated Wildlife/ Evidence	Wildlife Observed
Recent Fire Area				
No Recorded Fire				

DAYS 6 & 7: PEOPLE OF THE PRAIRIE

OBJECTIVES

The students will be able to:
1. Describe Native American life on the prairie before white settlers arrived.
2. Describe early settlers' life on the prairie.
3. Discuss how the invention of the plow changed the prairie.
4. Discuss why fire is advantageous to the prairie.

BACKGROUND

See *Background* sheet.

MATERIALS

* Book, *Addie Across the Prairie*
  Journal
  Yellow markers, pens or pencils
* Student pages - *"Journal Entries" - Native Americans of the Prairies*
  Timeline: What and When
  Settlers of the Prairie
  Prediction Excercise
  Mosquito Problem
  Lost on the Prairie
  The Illinois Prairie - The Plow
  Illinois Map
  Check Up
* Teacher pages - *Background - Native Americans*
  Sample Timeline : What and When
  Background - Settlers of the Prairie
  Changing Prairie
  Culminating Activities
  Check Up Answer Page

* Transparency Master- *The Prairie*
  Sample Timeline: What and When

Starred (*) materials are included in this packet.

VOCABULARY

ancestors: Relatives that lived before you.

archaeologist: One who studies ancient life by excavating (digging) artifacts (objects).

fertile: Producing abundantly.

furrows: Long, narrow tracks in the soil cut by a plow.

gale: A very strong wind.

harrow: To use a heavy frame with iron "teeth" to break up the soil

hazardous: Dangerous.

migrate: To move from one place to another.

oxen (plural of ox): Animals, such as cattle, buffalo, and bison, that are trained for farm work.

rivulets: Little streams.

settlers: People who come to a new place to live.

slews: Swamp-like area (currently spelled "slough")

sow: Scatter seed on the ground.

stagnant: Not moving and not fresh.

timber: An area with many trees.

yoke: Wooden frame to fasten two work animals together.

PROCESS

Predicting, comparing and contrasting, critical thinking, inferences.

PROCEDURE

Native Americans

1. Brainstorm with the class on what life was probably like on the prairie for the Native Americans before the white settlers arrived. Use transparency to show where the prairie was located in the United States. Discuss things like shelter, food and use of land.

2. Have students read *Journal Entries of Native Americans.* Use discussion questions as desired.

3. Begin timeline.
   ****You may wish to practice the concept of the timeline with your students by allowing them to do a personal timeline outlining significant events in their lives (i.e. birthday, first day of school, etc.).****
   Hand out students' page *Timeline:What and When* and project the *SampleTimeline* transparency. Students may wish to fill in important dates from the transparency. Have students keep their timeline copies in their journals or other safe place so they can be referred to as the lessons progress.

Settlers

1 Read student pages *Settlers of the Prairie.* Consider large group work or cooperative groups.

2. Answer discussion questions on student pages.

3. Try a Prediction Exercise with *Mosquito Problem* and *Lost in the Prairie.*

4. Answer questions.

5. Continue timeline.

6. Continue ongoing activities.

Changing Prairie

1. Read and discuss *The Illinois Prairie - The Plow.*

2. Hand out student page *Illinois Map.*
   Project and discuss transparency of Illinois map in 1820 showing the extent of the prairie. Ask students to color on their map the amount of prairie in the state. Discuss the relationship of the forested areas to the rivers in Illinois.

3. Do culminating activities.

4. Complete timeline.

5. Continue ongoing activities.

EXTENSION ACTIVITIES

Native Americans

1. Read aloud: *Legend: Origin of the Big Dipper* found in Keepers of the Earth by Joseph Bruchas and Michael Caduto, published by Fulcrum, Inc..

2. Create a Word Web using TEN words related to Native Americans.

3. Talk to art instructor about correlating Native American art with this unit.

4. Native American Games.
   American Indians are great lovers of games, particularly those having to do with sports and those based on the element of chance. The equipment used for games was fashioned out of natural materials such as sticks, seeds, bones, pebbles or corn cobs. Pieces were decorated with color, small dots or lines to identify those belonging to individual players. Small flat bowls or leather bags were used as containers. Many of the sticks were beautifully carved. Gambling was often part of the game itself. Not everyone assembled would play, as some were needed to bet on the outcome. Unlike people of today who bet for personal gain, Native American wagers were for sport. Usually everyone "broke even" or at least ended with as much as they started with. The betting merely increased the suspense of the game, making it more enjoyable.

   A source for Native American games is American Indian Crafts and Games by Charles Blood, published by Franklin Watts.

5. Native American Recipe.
   (This was an oral retelling. It may be used for fun or copied and given to the students for homework.)
   Boiled Indian Pudding
   Indian pudding should be boiled four or five hours. Sifted Indian (corn) meal and warm milk should be stirred together pretty stiff. A little salt and two or three great spoonfuls of molasses, added; a spoonful of ginger if you like that spice. Boil it in a tightly covered pan or a very thick cloth; if the water gets in it will ruin it. Leave plenty of room because Indian (corn) meal swells very much. The milk with which you mix it should be merely warm; if it be

scalding, the pudding will break to pieces. Some people chop sweet suet fine, and warm in the milk; others warm thin slices of apple to be stirred into the pudding. Water will answer instead of milk.

Settlers

1. Refer to The Illinois Period, published by the Chicago Historical Society, for a wide variety of activities.

*2. Art Extension

*3. Poetry Extension

Changing Prairie

1.**Settlers and Native Americans*

INTERDISCIPLINARY CONNECTION

Art, language arts, mathematics, science, social studies.

ASSESSMENT

(Answer are italicized and refer to the Student Pages indicated below. Answers are also included on the corresponding teacher answer pages.)

Native Americans of the Prairie

1. Why do you suppose the journal entries on this page had to be imaginary? *(Not sure these people had written language; such records have not been preserved; factual information had to be speculated from the remains of the mounds, etc.)*

2. What did they use their mounds for? *(for burial and for worship)*

3. List several things in the Prairie the Native Americans used for food. *(maize, beans, squash, bison, deer, small game, etc.)*

4. What does it mean when Native Americans said they took only what they needed from the prairie? *(There was no waste; killed only for survival; respect for land and its conservation.)*

Settlers of the Prairie

Compare and contrast these people's impressions of the prairie.

1. What are the most distinguishing characteristics of the prairie? *(It stretched for miles, looked like an ocean of grass, beautiful, dangerous, etc.)*

2. Did all the pioneers and travelers have a favorable impression of the prairie? Why or why not? *(No, some felt it was wonderful; others disliked it and found it difficult.)*

3. What were some of the hardships encountered by pioneers and travelers on the prairie? *(Snow, insects, heat, fire, cold, swamps, loneliness)*

4. If caught in a terrible storm, how did some pioneers and travelers keep warm? *(They might slit open a horse and use the warmth of the animal's body.)*

5. What time of day did people travel on the prairie in order to keep the bugs from bothering their animals? *(During the night or early morning)*

Mosquito Problem

1. Can you imagine having to live in a cabin full of smoke just to keep mosquitoes from bothering you? Describe what this might be like. *(Answers may vary.)*

2. What are some of the problems you have living in the city or suburbs? *(Traffic, hard to go from place to place, too many people, pollution, crime, noise, etc.)*

3. When it's really hot in your house what do you do to stay cool? *(Open windows, use fans, turn on air conditioner, etc.)*

4. What do you do when the mosquitoes are biting you? *(Slap them, use insect repellent, go indoors, use bug lights, etc.)*

5. Is there ever smoke in your house? *(Answers will vary.)* Why? *(People smoking, cooking, fireplace working, etc.)* What do you do to get away from the smoke? *(Leave the room, turn on a fan.)*

6. Would you rather live during pioneer times or now? *(Answers will vary.)* Why?

7. What are some of the services provided by your community which make daily living more comfortable? *(Electricity, water, gas, sewer, garbage collection, police and fire protection, hospitals, grocery stores, gas stations, etc.)*

Lost on the Prairie

Since students finish the story on their own, answers will vary.

The following list suggests journal ideas or topic questions.

- If the Mound Builders had no written language, describe how you think they may have communicated.
- Tell what your life might be like if you were a Prairie Native American. How might you live day to day? How would this be different than your present life?
- Imagine it is 1870 and your family is moving westward. You are allowed to take five things as long as they fit in a bushel basket. What would you take and why?
- If you were going west in a Conestoga wagon, how would you feel if you traveled day after day with only prairie in sight? What would be your impressions? What could you do to entertain yourself? What games could you play or invent?
- Settlers were often seen as pioneers. The dictionary says pioneers are people who do something first or prepare the way for others. Choose one of the following and find out why that person could be called a pioneer.
  Jane Addams; Jean du Sable; Neil Armstrong; Amelia Earhart; Elizabeth Blackwell; Charles Lindbergh

Background

Native Americans of the Prairie

Mound Builders (300 B.C.-1500 A.D.)
Early man entered what is now called Illinois almost on the heels of the last retreating glacier. In fact, the Indians of the region told legends about an ice god who once roared down from the north and froze the entire world. The first known people in Illinois were hunters and gatherers who left little evidence of their civilization.

Between 300 B.C. and 500 A.D., Indians of the Hopewell Culture flourished in the Middle West. Thousands of Hopewellian earthwork burial mounds were built on scattered sites throughout the region. Many of the Illinois mounds have been excavated. A fascinating display of some of these excavations can be found at Dickson Mound State Museum near Lewistown in central Illinois.

Mound Builders of the Mississippian Culture lived in Illinois from A.D. 800 to 1250. The Mississippians were an advanced people who built great cities, usually along riverbanks. Their mounds were used as places of worship rather than as burial sites. Many of their mounds were shaped like flat-topped pyramids, indicating that the Mississippians probably had some contact with the sophisticated civilizations of Mexico and Central America. Monk's Mound at Cahokia near East St. Louis was the center of worship for a city that may have held as many as one hundred thousand people at the height of its development.

The mound-building cultures in Illinois dwindled about 1250 A.D. Since they had no written language, we know few details about their lives. We do know that the late Mound Builders were extensive travelers. Jewelry and tools from both the Gulf of Mexico area and the Rocky Mountains have been found in their ruins. We also know they were ambitious builders. The remains of about ten thousand mounds have been identified in Illinois alone. Some have been carefully preserved by archaeologists; others stand in the middle of farm fields, surrounded by grazing cows.

Native Americans (Approx. 1600 A.D.)
The word *prairie* (or the phrase *Prairie Plains*) is applied to the grasslands flanking the Mississippi and Missouri rivers. The difference between the Great Plains and the Prairie Plains is the amount of rainfall and the resulting type of vegetation. The Great Plains are drier than the Prairie Plains. As a result, there are more ponds and swamps on the prairies. And, with the more frequent rains, the Prairie Plains' grasses grow taller than the Great Plains' grasses. The Great Plains are located to the west of the Prairie Plains. To the east, the Prairie Plains give way to woodlands.

The Prairie Plains are located in what is now the central part of the United States. Iowa and Illinois are mostly prairie country. North Dakota, South Dakota, Nebraska, Kansas, Oklahoma, and Texas all have prairies in their eastern parts. Minnesota has prairies in its southern and western parts. Missouri has prairies in its northern and western parts. Indiana has prairies in its northern part. Ohio has prairies in its western part. Some of these states, especially Illinois and Iowa, are referred to as "Prairie States."

The Native Americans sometimes cited as Prairie Indians shared cultural traits with both the Northeast Indians and the Plains Indians. Many of them lived in semi-permanent villages along wooded river valleys. They lived for the most part in sizable earthlodges or in grass-covered, dome-shaped houses. They had extensive cultivated fields where they grew corn, beans, squash, tobacco, and other crops. They made use of pottery for cooking, carrying, and storage.

Yet many of the prairie peoples left their homes to hunt part of the year. While on the trail, they lived in temporary lean-tos, or portable tents, and used unbreakable containers made of animal skins. Their chosen game was buffalo. Late in their history, after the arrival of Europeans, they acquired use of the horse for hunting and raiding. In addition to teepees and buffalo-hunting, the Prairie Indians shared other cultural traits with the more nomadic Plains Indians to the west.

The Prairie peoples east of the Mississippi are generally classified in the Northeast Culture Area. These include the tribes of the western Great Lakes: Fox, Kickapoo, Menominee, Potawatomi, Sac (Sauk), Winnebago, as well as tribes to their south, the Illinois, Miami and Shawnee.

The Prairie peoples west of the Mississippi are generally classified as part of the Great Plains Culture Area. Most of them occupied territory in the stretch of land between the Missouri to the Mississippi rivers. Theses include the following tribes: Mandan, Hidatsa, Arikara, Iowa, Oto, Missouri, Kaw, Omaha, Osage, Ponca, Quapaw, Pawnee, Wichita and some of the eastern bands of Sioux.

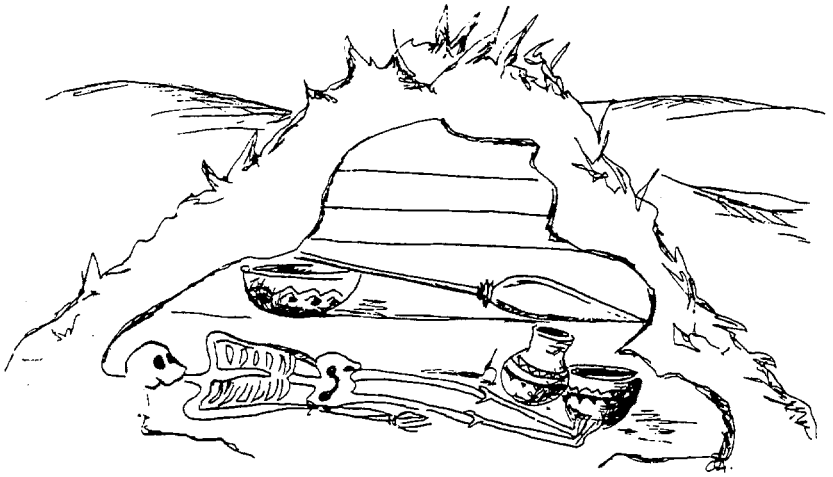
"Journal Entries"

Native Americans of the Prairie

Artist's rendition of Mound Builders community

Mound Builders (300 B.C.-1500 A.D.)

Imagine ancient people said this: "Our ancestors told us of a world of ice. We believe our ice god created this frozen world. As the huge walls of ice left us, what remained was rich fertile land to be used as the giver of life. The land became our heart and soul."



These people were Mound Builders living between 300 B.C.-500 A.D. These people used their mounds for places of worship and as burial sites. They traveled far, perhaps even to Central America trading goods such as jewelry and tools. Since the Mound Builders had no known written language, archaeologists have guessed about these travels because of what they have found in the mounds. Some of the mounds which have been opened have contained skeletons, cooking utensils, tools, pottery, weapons, and other items.

Prairie Native Americans (Approx. 1600 A.D. - . . .)

A possible description by a Native American before white settlers came to the prairie around 1600 may sound something like this:

"Life on the prairie is not easy for us. It is hot and dry in the summer and cold in the winter. Storms of rain, snow, and sleet come down and the great prairie winds blow strong all year.

The land is good to us. We plow small garden plots and raise crops of maize (corn), beans, and squash in the fertile soil. Two times a year, once after spring planting and again in winter, we migrate to the best hunting ground. Here we hunt bison, deer, and small game. We chase them on foot and use our spear and arrows. Sometimes we set the prairie on fire to chase up the big herd of bison.

We live in harmony with the bison, elk, and antelope who roam freely. We listen to the 'booming' of the prairie chickens as they dance in the grasses. We watch the marsh hawk and short-eared owl soar in the sky. We take only what we need from the prairie and it stays good to us."

Discussion Questions:

1. Why do you suppose the journal entries on this page had to be imaginary?

2. For what purpose did the early Native Americans use their mounds?

3. List several things in the prairie the Native Americans used for food.

4. What does it mean when Native Americans said they took only what they needed from the prairie?

Discussion Questions:

1. Why do you suppose the journal entries on this page had to be imaginary?
   (Not sure these people had written language; such records have not been preserved; factual information had to be speculated from the remains of the mounds, etc.)

2. For what purpose did the early Native Americans use their mounds?
   (for burial and for worshop)

3. List several things in the prairie the Native Americans used for food.
   (maize, beans, squash, bison, deer, small game, etc.)

4. What does it mean when Native Americans said they took only what they needed from the prairie?
   (there was no waste; killed only for survival; respect for land and its conservation.)

Timeline: What and When

NAME_____

EVENT	DATE

EVENT	DATE

Sample Timeline: What and When

(Student answers may vary)

EVENT	DATE
Mound Builders - Hopewell Culture	300 B.C. - 500 A.D.
Mound Builders - Mississippi Culture	800 A.D. - 1500 A.D.
15,000,000 Native Americans in the United States	before 1600
Prairie Native American journal	1600
21,000,000 acres of prairie in Illinois	1600
Louis Joliet and Fr. Jacques Marquette are the first Europeans to explore the Illinois region	1673
Robert Cavalier, Sieur de La Salle and Henri de Toni reach the mouth of the Mississippi; upon their return to Illinois, they build Fort St. Louis atop Starved Rock. All this land is claimed for France.	1682
Congress passed the Ordinance of 1787, establishing the Northwest Territory. Illinois was one of the five states formed from this territory.	1787
Statehood of Illinois: the 21st state admitted to the Union.	1818
The Black Hawk War, a 15 week conflict in which the Sauk and Fox Indians fought to keep their land in Illinois. The Indians lost the battle. This was the last Indian uprising in the Old Northwest.	1832
Town of Chicago organized. Indians cede the last Illinois land.	1833
John Deere invents the steel plow.	1837
Laura Ingalls Wilder is born.	1867
The time of the novel *Addie Across the Prairie*.	1870
200,000 Natuve Americans in the United States	Late 1800's
Approximately 2,000 - 3,000 acres of prairie in Illinois	TODAY

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Math Extension
-Determine time passed between dates
-Calculate population growth or decline

Background

Settlers of the Prairie

WHO WERE THEY? HOW DID THEY GET TO ILLINOIS?
WHY DID THEY COME TO ILLINOIS?

The earliest settlers in Illinois were the French, who had established small settlements and trading posts during the first quarter of the eighteenth century in what is today the southern third of Illinois. This land was then a part of the area referred to as the Northwest Territory. With the signing of the Treaty of Paris in 1763 the title to the Illinois region passed from France to Great Britain. The British never firmly established settlements in this region due to Indian hostilities and the obligation to curtail expenses. Thus in 1779, during the American Revolution, this region was taken from the British by the Americans with little resistance. Failure of the territory to attract settlers during the late eighteenth and early nineteenth centuries was a result of the confusion and long delay in opening the land offices in Illinois and the news of Indian hostilities. For those who did come to Illinois in those days, life was rough and often precarious.

With the establishment of statehood in 1818, pioneers began moving in greater numbers into this land of vast prairies and forests. The early pioneers came from Kentucky and Tennessee and settled in the river valleys of southern Illinois. Northern Illinois was later settled by Scotch Irish people; those of German and English descent came from New England and New York. Many, especially the Germans, Scandinavians, English and Irish, came directly from their European homelands to settle in Illinois.

The people who came to Illinois represented a variety of classes and economic statuses. Rugged woodsmen who loved the wilderness and adventure came to Illinois to escape civilization. They often lived in half-faced shelters or small, crude cabins erected without the help of a companion. Most of their time was occupied by hunting and fishing. If they had a spouse and family they would clear a small plot of land and plant crops. Many times when civilization began to encroach on the wilderness, these woodsmen would abandon their holdings and push farther west into the untamed lands. The old hunter's rule applied to their lifestyle, "When you hear the sound of a neighbor's gun, it is time to move away."

In the early years of statehood, Illinois also attracted poor farmers and craftsmen from the East and Europe who sought a land of opportunities where there was no class distinction, the soil was good, and services might be needed. These pioneers came to fulfill their dreams of prosperity and happiness in Illinois.

Affluent and ambitious entrepreneurs came to Illinois, too. They bought and sold land, established towns and churches, and increased their wealth and social position in newly established communities.

Many pioneers left the South because of a dislike for slavery either on philosophical grounds or because they could not compete economically with the planters class. They came to Illinois because after 1824, Illinois was the only free state with cheap land.

In their trek to Illinois, the pioneers used many different land and water routes and forms of transportation. Some walked, while others came on horseback, in carts, wagons, keelboats, flat-boats, arks and steamboats. The pioneers coming from the South trudged over the mountains at the Cumberland Gap into Kentucky and then up into Illinois often by way of the Mississippi River.

Easterners and Europeans could take a more direct route by trekking out to Pittsburgh and then floating on a boat down the Ohio River to the Mississippi. The Ohio River served as a natural highway for these pioneers.

By 1820 pioneers who could afford passage could take a steamboat down the Ohio River and up the Mississippi River into Illinois. With the opening of the Erie Canal in 1825, connecting Albany to Buffalo, pioneers could travel to the Midwest with relative ease. They could take a packet boat through the canal and then travel by steamboat through the Great Lakes to Illinois.

Many guide books, almanacs and pamphlets were published in England and Europe to promote emigration to the United States, particularly the Midwest. These books provided practical information on how to get to the United States, the price of land in the West, opportunities for craftsmen, the weather and the quality of the soil. They also included elaborate descriptions of different regions to entice people to come to the United States.

Prediction Exercise - The prediction exercise is another way to focus pre-reading predictions from vocabulary. It is a charting process which requires students to organize vocabulary in relationship to the structure of the selection. Ask the students to classify the vocabulary according to how they would predict that the author might use it in the selection to tell about the setting, or to tell about the characters, the problem, actions, solution or feelings, and mood. Discussion of placement can precede reading. This offers students input from peers and helps the teacher gauge the state of their knowledge.

Settlers of the Prairie

Background Information

When European explorers came to the Illinois country in the 1600s, they were amazed at what they saw. They had seen oceans of water, but they had never seen land that looked like an ocean of grass. Since they had no word to call this land, they used the French word "prairie," which means meadow, to describe the great grassland ocean.

When the first white settlers came to the Illinois country in the early 1800s, they were very impressed with the beauty of the prairie. They had come from the eastern United States where the land is rolling and covered with forests. Many of the settlers had felt hemmed in by the hills and trees of the East, and as they walked out onto the flat, sunny prairie and faced the prairie wind, they felt a rush of freedom.

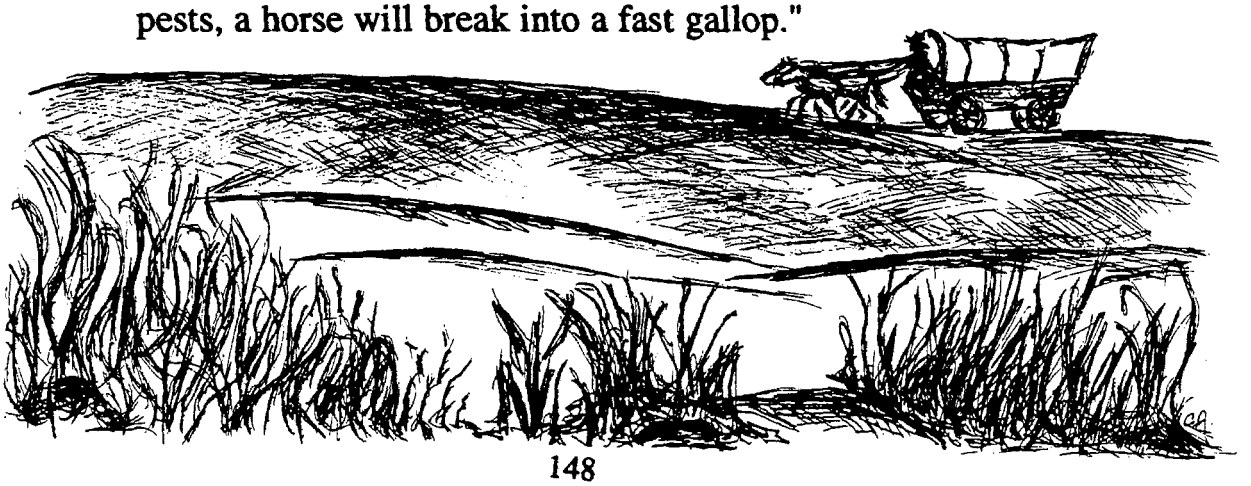
By reading the letters, journals, and personal accounts of the Illinois pioneers you can learn a great deal about the people and their journey to the prairie and their experiences in Illinois.

This letter was written by Lucinda Rutherford, shortly after she settled in eastern Illinois. She wrote the letter to her mother in Pennsylvania to tell her about the Illinois country.

> "The prairies here were delightful, they are from 12 to 20 miles wide, and 150 long, instead of the timber surrounding them, they surround the timber, at this season they are most beautiful. The green grass has sprung up and covered the whole bosom of these wastes; with that grass there springs up a multitude of flowers of every hue, form, and scent. It is delightful to ride over this level land and every step, tramping those gems of nature underfoot. Their beautiful heads can be seen as far as the eye can reach waving in the summer wind."

This is a description of the prairie by Fred Gustorf, who visited Illinois in 1835:

> "The prairies in this state are charming - great stretches of flat land, covered with wild meadows which are hemmed by thin forests. The prairies are covered all summer long with flowers that change color every month - yellow, blue, then red. By wandering from one meadow to another, one encounters a series of surprises. Huge green surfaces of unbelievable high grass which waves in the wind like the sea against a wooded background more beautiful than the English parks. These prairies are from ten to one hundred miles across, because of their size one can travel over them by horse only. In the winter, when the trails are covered with snow, people get lost and cannot find shelter. I have heard of instances when travelers, lost in the snow on the prairies, have had to slit the bellies of their horses for warmth of their bodies. In summer the prairie insects are so numerous that the horses often are stung to death by them. Therefore, one must travel during the night or the early morning hours. Flies settle by the thousands on the horses, and after a ride of several hours the blood can be seen trickling down their sides. To get relief from these pests, a horse will break into a fast gallop."



Though beautiful, the prairies were also hazardous. Summer brought mosquitoes and flies which pestered the animals. There are many accounts of animals bleeding and dying as a result of insect bites. The summer sun was unbearably hot, and the treeless prairies offered no shade for the traveler or farmer. Fall brought the threat of fire. The vast expanses of prairie grass became dry, and lightning or a careless person could set these vast expanses ablaze. Winter brought freezing temperatures, blinding blizzards and deep snow drifts which immobilized both the pioneer and animals. Warm spring weather melted the snow and turned the prairies into vast swamps and bogs which proved treacherous to travelers.

Some pioneers fell in love with the open prairies and others found the prairies desolate and lonely places. The following is a description of the prairie by Chandler R. Gilman in 1835 as he was travelling in Illinois by stagecoach:

> "The appearance of the prairies disappointed me very much; the tall brown grass, coarse and scattered, gave to the whole a ragged appearance; the ground was low and marshy, and at short intervals we passed through what they here call slews. I thought, at first, that these slews were rivulets, whose streams were dried up by the long drought; but I believe their true character is long narrow ponds, or

rather mud holes. There is little or no water visible; here and there a small dark pool dots the surface of the soft black mud. Clumps of grass, the size of my hat, are also sprinkled around. 'Twas by the help of these clumps that we crossed these mud holes, as the carriage sank so deep we were all obliged to get out to enable the horses to drag it through."

All excerpts from letters, journals and personal accounts are from original materials in the collection of the Chicago Historical Society.

Discussion Questions:

Compare and contrast these peoples' impressions of the prairie.

1. What are the most distinguishing characteristics of the prairie?

2. Did all the pioneers and travelers have a favorable impression of the prairie? Why or why not?

3 What were some of the hardships encountered by pioneers and travelers on the prairie?

4. If caught in a terrible snow storm, how did some pioneers and travelers keep warm?

5. What time of day did people travel on the prairie in order to keep the bugs from bothering their animals?

Discussion Questions:

Compare and contrast these peoples' impressions of the prairie.

1. What are the most distinguishing characteristics of the prairie?
   (It stretched for miles, looked like an ocean of grass, beautiful, dangerous, etc.)

2. Did all the pioneers and travelers have a favorable impression of the prairie? Why or why not?
   (No, some felt it was wonderful; others disliked it and found it difficult.)

3 What were some of the hardships encountered by pioneers and travelers on the prairie?
   (Snow, insects, heat, fire, cold, swampy, lonely.)

4. If caught in a terrible snow storm, how did some pioneers and travelers keep warm?
   (They might slit open a horse and use the warmth of the animal's body.)

5. What time of day did people travel on the prairie in order to keep the bugs from bothering their animals?
   (During the night or early morning.)

PREDICTION EXERCISE

Predict how the journals will include these words:

PRAIRIE LOST MUD FIRE

TRAMPING BEAUTIFUL UMBRELLA

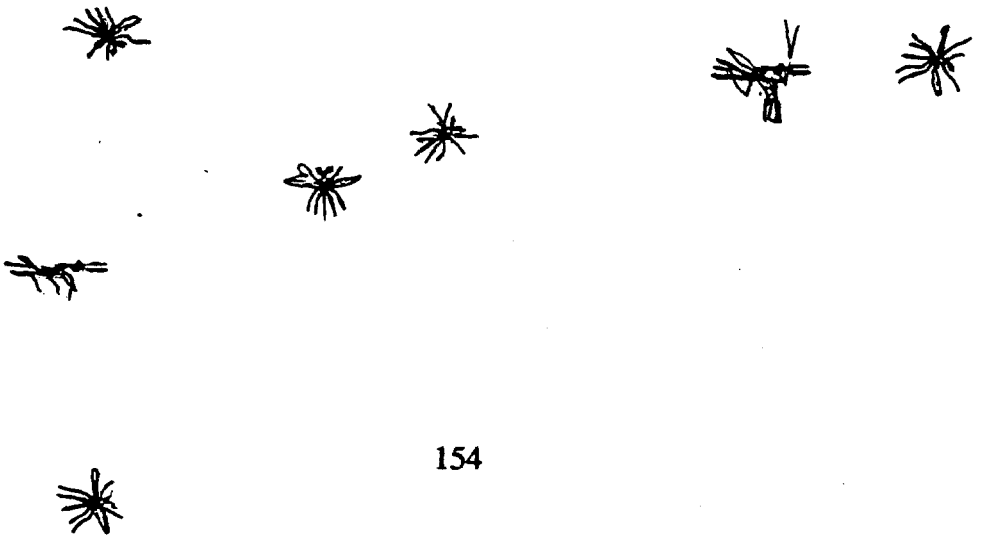
MOSQUITOES

SETTING	CHARACTERS	PROBLEM	SOLUTION	MOOD
_____	_____	_____	_____	_____
_____	_____	_____	_____	_____
_____	_____	_____	_____	_____

Mosquito Problem

The pioneers had to endure many hardships living on the prairie. The following is an account of the awful mosquito problem encountered by Mary Emily Blatchford:

> "In this rough cabin, the household goods were placed giving all the comfort possible under the circumstances. The cabin was built in the midst of a hazel patch, which had to be cleared before a garden plot could be made. This close growth proved to be the shelter of swarms of mosquitoes, which during that first summer caused my mother constant annoyance for her babies. The only relief was what was called a smudge. A fire was made in an iron pot, causing a smoke which indeed drove out the mosquitoes, but made life almost unendurable for human beings. When the fire burned low, the mosquitoes would renew their attack, and my mother has told me that she often awoke in the night to find her babies heads positively black with the merciless insects. That was the summer of 1834."



Discussion Questions:

1. Can you imagine having to live in a cabin full of smoke just to keep mosquitoes from bothering you? Describe what this might be like.

2. What are some of the problems you have living in the city or suburbs?

3. When it's really hot in your house what do you do to stay cool?

4. What do you do when the mosquitoes are biting you?

5. Is there ever smoke in your house?

   Why?

   What do you do to get away from the smoke?

6. Would you rather live during pioneer times or now?

   Why?

7. What are some of the services provided by your community which make daily living more comfortable?

Discussion Questions:

1. Can you imagine having to live in a cabin full of smoke just to keep mosquitoes from bothering you? Describe what this might be like.
   (Answers may vary.)
2. What are some of the problems you have living in the city or suburbs?
   (Traffic, hard to go from place to place, too many people, pollution, crime, noise, etc.)
3. When it's really hot in your house what do you do to stay cool?
   (Open windows, use fans, turn on air conditioners, etc.)
4. What do you do when the mosquitoes are biting you?
   (Slap them, use insect repellent, go indoors, use bug lights, etc.)
5. Is there ever smoke in your house?
   (Answers will vary.)

   Why?

   What do you do to get away from the smoke?
6. Would you rather live during pioneer times or now?
   (Answers will vary.)

   Why?
7. What are some of the services provided by your community which make daily living more comfortable?
   (Electricity, water, gas, sewer, garbage collection, police and fire protection, hospitals, grocery stores, gas stations.)

Lost on the Prairie

Morris Birkbeck, a wealthy English farmer, emigrated to the United States in 1817 to establish a colony. The following is one of his accounts of his travel experiences in Illinois:

> "Our first experiences in prairie life were not very comfortable. Camping for the night near a pool of stagnant water, we lay down to rest, turning our horses loose to graze. In the morning our horses were missing. We wandered all day in vain search. I had separated myself from my companions in my roving. The second night found me in a small prairie, about three miles west of the one we first entered. I lay down in the open prairie without fire or supper; my umbrella, a walking stick by day, at night a house for my head. In the morning, somewhat stiff and cold, I again began my search, and soon became as wet as if I had walked through a river, from the dew on the tall grass. For once, I felt glad of the hot sun, to warm and dry me. As a resource in an emergency, I carried a small bag of ground parched cornmeal mixed with some sugar and a little ground ginger. A tablespoon of this, with water, in some shell or the hollow of your hand, is very grateful, prevents extreme hunger, and gives reasonable nutrition. On this I subsisted for a couple of days."

All excerpts from letters, journals and personal accounts are from original materials in the collection of the Chicago Historical Society.

Discussion Questions:

1. Using your imagination finish this frontier story.

2. Does this man find the horses?

3. Does he find his traveling companions?

4. Does he meet any pioneers?

5. What does he do when his food runs out? Remember he does not have a gun, just an umbrella.

6. Draw a picture of this man sleeping under his umbrella in the tall prairie grass.

7. Have you ever gotten lost? Describe where, when, and how you got lost.

8. What did you do when you got lost?

9. Did you have any things with you to help you? (money to make a phone call, food, a map)

10. List the differences between your experience of being lost and Mr. Birkbeck's experience of being lost on the prairie.

Background

The Changing Prairie

Illinois Prairie Settlement: Illinois earned the nickname "Prairie State" because over half the state was covered by vast prairies. Most of the central and northern region of Illinois is prairie land. The timbered regions are found in southern Illinois. When pioneers saw the prairie for the first time, many were overwhelmed by these flat and seemingly endless expanses of tall grass and flowers. The pioneers first chose to settle in wooded areas where they could continue to use the skills and techniques of Eastern and European farming - clearing the land of trees and using their wooden plows with cast iron blades to break up the soil for planting. The wooded areas also provided a cheap and accessible source of building material and fuel.

Many pioneers believed the vast treeless prairies could not support crops because no trees grew on them. Later they discovered how rich the prairie soil was and then began to farm the prairie. Many new farm tools and techniques were developed to farm the prairies. For example, John Deere perfected the steel plow in 1837 which cut cleanly through the sod and required less animal power.

The settlers had worked hard to come to Illinois, and they were determined to tame the land and make it work for them. So, just like a person "breaks" a wild horse, the settlers "broke" the prairie by plowing up the prairie grasses and wildflowers and planting the seeds of corn and wheat in the prairie soil. And if they didn't plow up a piece of prairie, they grazed cows on it and the delicate prairie plants soon became what was called "eat out." In this way, the hungry cows broke the prairie as surely as the sharp blades of the steel plow.

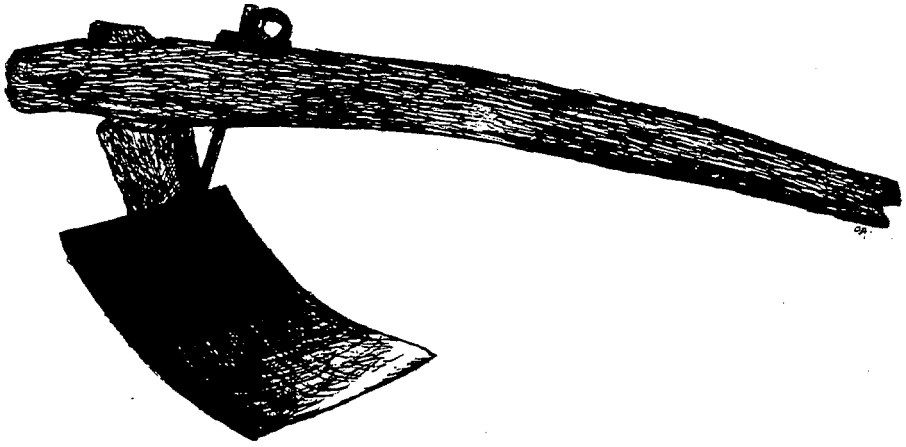
The Illinois Prairie - The Plow

Since they needed logs to build their cabins, most pioneers shunned the prairies and settled near the forests. But when the woodlands were fully occupied, settlers were forced to try farming on the prairies. At that time, it was widely believed the treeless prairie land would not be fertile enough to support crops. But the new farmers quickly discovered the prairie soil was rich beyond their dreams. Plowing the thick, gummy sod, however, was a frustrating chore. Wooden plows broke, and the "gumbo," as the sod was called, clung stubbornly to iron plowshares. Then, in 1837, a young Illinois blacksmith named John Deere invented a new type of polished steel plow that cut effortlessly and cleanly through the prairie sod. Deere built a factory in the town of Moline to manufacture his new plows and eventually became a millionaire.

The fertility of the black prairie soil so astounded farmers that they wrote excited letters to relatives who owned less-productive farms in other parts of the country. Mattie Huffman recalled:

> "On April 1, 1875, we got to our home near the southern state line. Father had located the place several months before. All the improvements that the place had on it was a meager log house from which the chimney had fallen out. We had barely gotten unloaded when a neighbor man rode up on a donkey and brought us the key to our house. You are no doubt wondering what was locked in the house. Well, it was something very precious - a plow. Father had stored it there after he had located the place. It was to be our means of support. Not a single tree was there; just bare prairie."

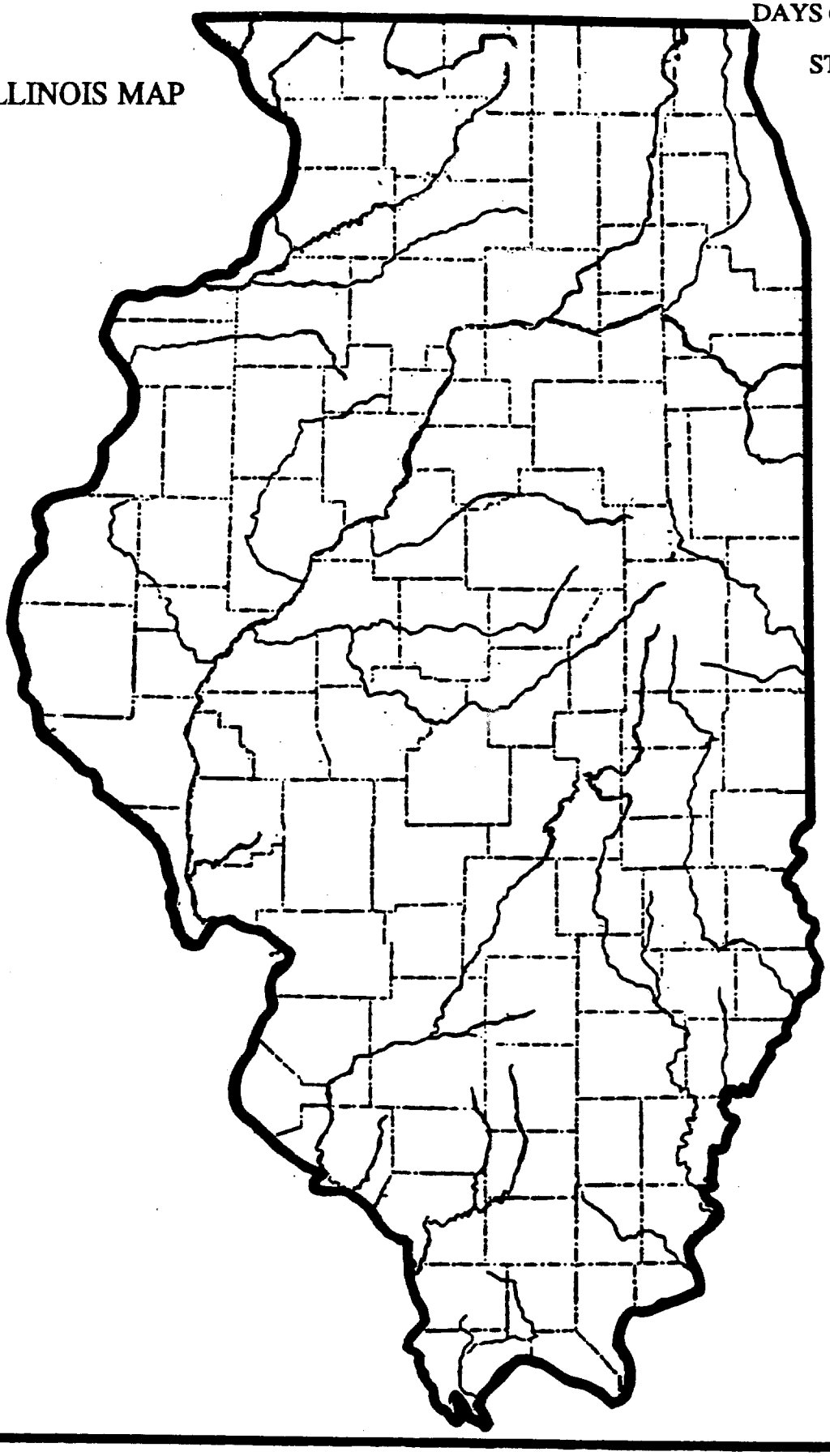
Usually, it took the strength of several yoke of oxen and several hardy farmhands to push the plow through the rigid soil. Turning a strip of sod twenty to thirty inches wide, the farmers were ready to sow their seeds. "We prepared the soil for planting with a breaking plow," explained Mrs. J. H. O'Loughlin, "and then used an ax or hatchet to make a hole in the sod, then dropped the seed and closed the hole with our heels. The ground squirrels got part of our seed, but we had very good crops the first year. The next year we ran the sod cutter over this ground, harrowed it, and then seeded it with wheat."



John Deere's invention of the plow in 1837 changed the prairie forever.

All the excerpts from letters, journals and personal accounts are from original materials in the collection of the Chicago Historical Society.

ILLINOIS MAP



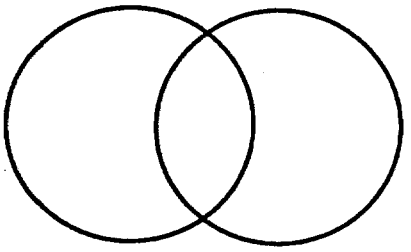
CULMINATING ACTIVITIES

Use of prairie, food, clothing, transportation, tools, animals, chores, homes, values, communications. Below are some formats may be used to record student answers.

1. Chart

Native Americans	Settlers	Other

2. Venn Diagram



3. Illustrations

4. Role Playing

5. Creative Writing -
   a. Students take on roles of either Native Americans or Settlers and describe their lives.
   b. Students then compare and contrast Native Americans to Settlers and to themselves.

Check Up

1. What did the grassland look like to the European settlers?

   What word did the explorers use to describe the grassland?

2. Describe how the Native Americans made a living on the prairie.

   How did the Native Americans live in harmony with the prairie?

3. Why were the first white settlers impressed with the prairie?

4. How and why did the settlers "break" the prairie?

Did the settlers live in harmony with the prairie?

5. How much prairie is left in Illinois and where can it be found?

6. Who is responsible for protecting and caring for our prairie natural heritage?

Why do *you* think it is important to take care of our natural heritage?

Check Up

1. What did the grassland look like to the European settlers?
Some thought it was beautiful, charming and fell in love with it. Others found it desolate and lonely, disappointing and ragged.)

   What word did the explorers use to describe the grassland? *(Prairie)*

2. Describe how the Native Americans made a living on the prairie.
(Plowed small plots to raise corn, beans, and squash; hunted bison, deer and small game with spears and arrows; sometimes started fires to chase bison.)

   How did the Native Americans live in harmony with the prairie?
(There was no waste; killed only for survival, respect for land and its conservation.)

3. Why were the first white settlers impressed with the prairie?
(Felt freedom in the flat sunny prairie. They had come from the eastern states where land was rolling and forested. They felt hemmed in by the trees.)

4. How and why did the settlers "break" the prairie?
(Used a plow to break the soil to plant crops)

   Did the settlers live in harmony with the prairie?
(No)

5. How much prairie is left in Illinois and where can it be found?
(2,000 - 3,000 acres; mostly in small restored plots)

6. Who is responsible for protecting and caring for our prairie natural heritage?
(Each of us.)

   Why do *you* think it is important to take care of our natural heritage?
(Answers will vary.)

Sample Timeline: What and When

(Student answers may vary)

EVENT	DATE
Mound Builders - Hopewell Culture	300 B.C. - 500 A.D.
Mound Builders - Mississippi Culture	800 A.D. - 1500 A.D.
15,000,000 Native Americans in the United States	before 1600
Prairie Native American journal	1600
21,000,000 acres of prairie in Illinois	1600
Louis Joliet and Fr. Jacques Marquette are the first Europeans to explore the Illinois region	1673
Robert Cavalier, Sieur de La Salle and Henri de Toni reach the mouth of the Mississippi; upon their return to Illinois, they build Fort St. Louis atop Starved Rock. All this land is claimed for France.	1682
Congress passed the Ordinance of 1787, establishing the Northwest Territory. Illinois was one of the five states formed from this territory.	1787
Statehood of Illinois: the 21st state admitted to the Union.	1818
The Black Hawk War, a 15 week conflict in which the Sauk and Fox Indians fought to keep their land in Illinois. The Indians lost the battle. This was the last Indian uprising in the Old Northwest.	1832
Town of Chicago organized. Indians cede the last Illinois land.	1833
John Deere invents the steel plow.	1837
Laura Ingalls Wilder is born.	1867
The time of the novel *Addie Across the Prairie*.	1870
200,000 Natuve Americans in the United States	Late 1800's
Approximately 2,000 - 3,000 acres of prairie in Illinois	TODAY

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ART EXTENSION

Prairie Quilt (for 30 students) -

Tape neutral/white butcher paper together to form a 5 ft. X 6 ft. rectangle. Give each student a 9" X 11"sheet of white construction paper. During the course of the unit, each child can illustrate an incident, flower, creature, etc. related to the Prairie which can then be attached onto the butcher paper as a "square" on the quilt. Have children illustrate a border when complete, or trim the excess to fit the children's artwork. Teacher may want to read or pass around *The Josefina Story Quilt* by Eleanor Coerr, as a beginning activity.

POETRY EXTENSION

DIAMANTE - a diamond-shaped poem which begins with a topic noun and ends with its opposite. Transition occurs in line 4 with last two nouns in that line.

Example:

jungle
abundant, soggy
growing, stretching, living
vegetation, overgrowth, void, wasteland
decaying, drying, dying
brown, arid
desert

Line 1 - one topic noun
Line 2 - two adjectives
Line 3 - three words ending in -ing or verbs
Line 4 - two nouns relating to topic noun
Line 5 - three words ending in -ing or verbs
Line 6 - noun which is opposite of topic noun

Suggestion: Have children create a diamante poem using "Native American/Settlers" or "Prairie Then/Prairie Now" topics.

CINQUAIN - an oriental pattern poem of five lines.

Example:

winter
icy, cold
piercing, chilling, freezing
changing greenness into white
winter

Line 1 - title - noun
Line 2 - description of title - two adjectives
Line 3 - action of title - three verbs
Line 4 - statement or feeling - four-word phrase
Line 5 - repeated title or synonym - noun

Suggestion: Have children create a cinquain about Native Americans, Pioneers, Prairies, etc. They may choose to illustrate them, also.

CONCRETE POETRY - a poem written in the shape of an object or thought relating to the poem itself.

Settlers and Native Americans

Most experts agree that there were at least 15,000,000 people inhabiting the continental United States before European settlers arrived in the 1600s. By the late 1800s, however, American census figures showed there were only 200,000 Native Americans left. One historian noted that such a big change in population would be comparable to the present-day United States being reduced to the population of Cleveland, Ohio.

Here in Illinois, the prairie and its native people were doomed. By 1835, the mighty bison, which needed wild land to survive, had fled its Illinois home for the still-untamed lands of the West. About the same time, the last Native Americans were being forced to leave their ancestral home in Illinois and herded to a reservation in Kansas.

The Black Hawk War

The Rock River country in northwestern Illinois was once the exclusive territory of the Sauk and Fox Indians. When settlers entered this region, skirmishes broke out between them and the Indians. In 1831, the federal government ordered the Indians to move beyond the Mississippi River to Iowa. Most of the Fox and Sauk left immediately. Only the followers of a determined Indian leader named Black Hawk refused to be pushed off the land where they had been born. Finally, pressure from the United States Army forced even Black Hawk and his people to move west of the Mississippi.

The following spring, Black Hawk and about four hundred Sauk Indians recrossed the Mississippi. Although they wanted simply to plant corn in Wisconsin, frontier settlers believed Black Hawk was on the warpath. The army was called in and an ugly war broke out. Both sides committed acts of savagery

that included scalpings, the murder of women and children, and the torture of captives. An editorial in a Galena newspaper called for a "war of extermination until there shall be no Indian [with his scalp on] left in Illinois."

Facing a huge army, Black hawk tried to retreat across the Mississippi. The last battle in the war was one of shocking cruelty. Black Hawk and his people were trapped with the Mississippi River at their backs and hundreds of soldiers in front of them. Though Black Hawk tried to surrender, the soldiers' fury had raged out of control. Troops set upon the Indians with clubs, knives, and guns. The massacre lasted eight hours. One observer claimed that the waters of the Mississippi River were "tinged with the blood of Indians."

The Black Hawk War closed the sad chapter of Indian history in Illinois. By the end of the 1830s, few Indian communities remained in the state. The original Illinoisans moved farther west while the relentless settlers took over the land the Indians had once called their own.

Even though Black Hawk was not a chief, he was an important leader. This is an excerpt from Black Hawk's surrender speech:

"I fought hard. But your guns were well aimed. The bullets flew like birds in the air, and whizzed by our ears like the wind through the trees in the winter. My warriors fell around me. . . . The sun rose dim on us in the morning, and at night it sunk in a dark cloud, and looked like a ball of fire. That was the last sun that shone on Black Hawk. . . . He is now a prisoner to the whitemen. . . . He has done nothing for which an Indian ought to be ashamed. He has fought for his countrymen, the squaws and papooses, against white men, who came year after year, to cheat them and take away their lands. You know the cause of our making war. It is known to all white men. They ought to be ashamed of it. Indians are not deceitful. The white men speak bad of the Indian and look at him spitefully. But the Indian does not tell lies. Indians do not steal."

DAY 8: FIRE

OBJECTIVE

The students will:
Recognize the importance of fire to the creation and maintenance of prairies.

BACKGROUND

At one time in history, fire was the greatest discovery known to ancient peoples. It created warmth, food, protection and gave its possessors great power over other tribes.

American Indians utilized fire on the once-vast prairies of North America not only for personal convenience but primarily for hunting. Bison attempted to escape fires and were directed towards Indians where hunters could kill as many as a hundred in a single day. These planned fires helped to create the prairies of yesterday and the soil of today.

Fire has played an important role in the history of the United States even before it attempted to become an official country in 1776. The American prairie owes its existence to fire. For tens of millennia, fires, for the most part set by man, have deformed the vegetation over large plains of the world (Sauer, 1950).

Records show that 50 to 60 square miles of prairie would burn at one time. The flames of fire would swell up to 40 feet high and the entire sky as far as one could see would be bright red. The wind drove the flames like giant waves over the prairie. The prairie on fire looked like an ocean of fire.

Fire is the best friend of the prairie. Fire burns off any young trees trying to grow on the prairie. If those trees were allowed to grow, they would soon overshadow the prairie grasses, and the prairie would become a forest. Fire helps the prairie in other ways too. It burns off the dead layers of grasses, thereby clearing the prairie floor so that the delicate stems of new plants will have room to push up through the soil. In the ashes left by the fire on the prairie floor there are important nutrient elements. Those nutrient elements enter the soil and are stored there until they are used to help new plants grow. Fire befriends the prairie by helping prairie plants grow and preventing the growth of trees. The really fascinating thing about the prairie and fire is that the prairie plants, unlike trees, can survive fire.

Thousands of years later fire has lost most of its mysticism (except with the very young or young at heart) but it still provides the same functions it did thousands of years ago. Then came the Yellowstone fire of 1988 which ravished 989,000 acres of the majestic park. It burned for five months challenging man to confront it. The fire rekindled ancient fears and humbled all who saw it.

The Yellowstone fire was not a planned fire. It resulted from careless disposal of cigarette butts and lightning; however, it was allowed subsequently to take its natural course. The fire and drought took a toll on the wildlife in the park. The elk and bison populations decreased somewhat, but the fire also created outstanding food opportunities for eagles, ospreys, falcons, hawks, herons, cranes and owls.

The Yellowstone fire created an opportunity to revisit historical prairie fires. The prairie environment can be visited in "museums" throughout our country, but the prairie fires that used to ravage miles of grassland have been lost to history. Small-scale burns can still be observed at local sites, but the impressiveness of what used to be can only be viewed through similar experiences such as the Yellowstone fire.

MATERIALS

* Book, *Addie Across the Prairie*
  Journal
  Prairie Mural construction materials
* Student page - *Prairie Fires*
* *From Beneath the Ashes* video

Starred (*) materials are included in this packet.

VOCABULARY

disembowel: To slice open and remove internal organs.

insulator: A layer that prevents the loss or gain of heat.

slay: To kill.

PROCESS

Observing, critical thinking.

PROCEDURE

1. Introduce background information about the importance of fire. View *From Beneath the Ashes,* if you have not viewed it in its entirety on Day 1. Discuss the positive and negative aspects of the Yellowstone fire. Relate the Yellowstone fire to prairie fires using *Addie Across the Prairie* as a reference.

2. Distribute the student background information on prairie fires. Have the students read and answer the questions as a homework assignment or as a whole-class activity.

3. Continue ongoing activities.

EXTENSION ACTIVITIES

*1. *From Beneath the Ashes*; Lesson 1: Fire at Yellowstone.

*2. *From Beneath the Ashes,* Lesson 3: Fire on the Prairie.

INTERDISCIPLINARY CONNECTION

Art, language arts, mathematics, science.

ASSESSMENT

(Answer are italicized and refer to the Student Pages indicated below. Answers are also included on the corresponding teacher answer pages.)

1. If you were a settler caught on the prairie with a fire coming at you, what could you do? *(Run toward the fire if it is a narrow wall of flame. Start a small fire and wait on the burned area as the large fire goes by on either side of you. In an emergency, kill your horse, cut it open and crawl inside of it.)*

2. Give several reasons why fire could be called "the prairie's friend." *(Prevents trees from growing. Helps improve the quality of the soil. Burns dead plants. Removes dead grass. Helps plants grow in the spring.)*

3. Explain how prairie plants survive fires. *(Deep root systems)*

4. Describe what happens when fire is prevented from occurring in prairies. *(The prairie is overgrown by trees. Prairie grasses and forbs die in the shade.)*

5. How did the Native Americans use fire on the prairie? *(Used it to clear space around their camps to grow new grass and to prevent surprise enemy attacks and to aid in hunting.)*

6. How do you suppose the settlers viewed prairie fires? *(Answers will vary. Settlers saw fires as destructive.)*

Draw a picture of what a prairie fire would look like, or of the Yellowstone fire.

The following list suggests journal ideas or topic questions.

- Describe how prairie plants survive fire.
- Pick one - Fire is Good/Bad for the prairie. Now persuade someone who isn't sure.
- Write about your experiences or impressions of viewing a prairie fire or the Yellowstone fire.

Name_____

Date_____

Prairie Fires

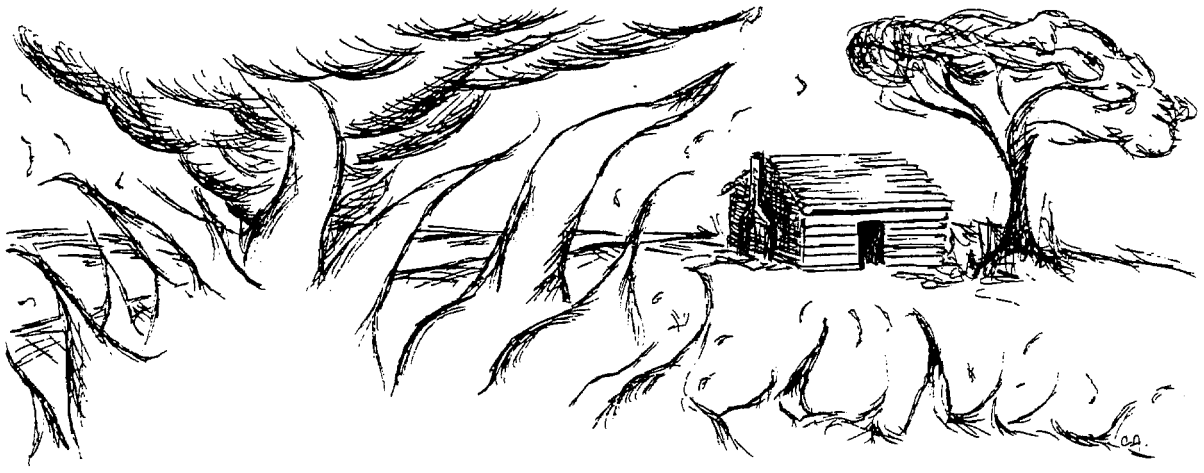
Background

Fires are a natural part of the prairies. Prairie fires were started by lightning or were started by Indians. The Indians used fire to clear space around their camps so they would have a clear view which would help prevent a surprise enemy attack. The Indians also knew that after the prairie burned, tender new grass would sprout. Bison were attracted to these areas of new grass which made them easy to hunt. The Indians commonly started fires to help in hunting. The animals ran away from the fire and were driven to places where they could be killed more easily. Fires were also started accidentally by stray sparks from campfires.

Prairie fires are very intense. The grasses and flowers are very thin and burn quickly. The fire soon becomes a very hot wall of flame 40 feet high, that can be miles wide. Since the grass is thin, the fire does not last in one place very long. The very hot fire burns the dead plant stems and leaves to ashes in just minutes. The wall of fire moves as fast as the wind is blowing and in the old days might roar across the prairie for days, burning 50 to 60 square miles, stopping only at major rivers, or when the wind changed, or a sudden rainstorm occurred. One such fire is described on the next page:

> In November, 1836, a fire started on (the) Spoon River (Stark County) about 10 o'clock in the morning, and with a strong southwest wind, it traveled about 10 miles per hour . . . . having a front eight miles in width, and its roaring could be heard for many miles distant. Before sundown, this fire had burned to the banks of (the) Rock River, where Rockford now stands, passing over a county of about 60 miles in extent (Matson, 1872).

It was rare for someone to be caught by surprise by a prairie fire. At night, the glow of a distant fire was bright enough to read a newspaper. Nicolas A. Woods wrote in 1861 that to escape a large prairie fire, a man had to "ride madly before the wind" ten miles ahead of the flames while lighting small fires behind him. He would then turn his horse around and go through the small fire area that had already burned. The large fire would then go on either side of the burned area while the man waited.



This method would not work in August, when the grass was tallest, because even the small fires would be too large and the path too hot for the horse to step down on. In such cases, according to Woods (1861), the only thing left to do to save his life would be "to slay and disembowel the horse, and literally creep into the cavity till the flames have passed."

Even though a prairie fire can heat the surface of the soil to 400 degrees Fahrenheit in a few minutes, the soil is a good insulator and the fire travels quickly. The temperature as little as one-half inch underground may not change. The roots and other underground stem parts of the prairie plants remain safe below ground, ready to push fresh, green leaves above ground. Many prairie animals have underground tunnels where they are safe from fire or are fast enough to run away.

Fire does not harm a prairie. In fact, it could be called the prairie's friend. Fire kills most of the young trees and shrubs that were growing on the prairie. If the trees were allowed to grow, they would make shade. Prairie grasses and flowers die in shade. The prairie would slowly become a forest.

A second way that fire helps a prairie is by removing the layer of dead grass that is left from the years before. On unburned prairie, the dead plant material at the end of the season does not rot very quickly. Each year more dead material builds up. The dead material acts something like a lid to an ice chest. It keeps the sun and warm air from reaching the ground and warming it. In the cold soil, plants begin growing weeks later and much slower than usual. Some kinds of plants may die off. Another harmful thing about this layer is that in the spring flowers may not be able to grow through it. Fire removes this dead material, allowing the sun to warm the soil. In fact, some people think that the black color from the fire causes the ground to warm up from the sun even more quickly. This warming causes faster plant growth.

When the pioneers arrived, prairie fires were prevented because they could harm farm animals, burn buildings, farm crops and people. As the prairie was plowed and turned into farmland, and as roads were built, they made firebreaks that would stop any fires that began. Many places where there is forest today were once prairie. In the few small remaining prairies, carefully controlled fire is used as a "tool" to keep the prairie "healthy."

Pioneers learned very quickly to guard their property against prairie fires by plowing wide and numerous furrows around all their property - cabins, barns, fields and stacks of hay or grain. Prairie fires most often occurred in the fall when the tall prairie grass was killed by the autumn frost and then dried by the sun. The prairies became tinder boxes waiting for a spark to set them blazing. Often these prairie fires were caused by nature - lightning from a storm - and sometimes by a careless person.

The following is a description of a prairie fire by Alfred Brunson in 1835:

> "The last 12 miles we travelled after sundown, and by fire light over Prairie, it being on fire. This was the grandest scene I ever saw, the wind blew a gale all day, the grass was dry, and the fire being in the Prairie, at a distance, where we entered it some men were kindling fire to burn it away from their fences. As the dark came on, the fire shone more brilliant. A cloud of smoke arose on which the fire below shone, and the reflection could be seen for miles - in some instances 40. We passed 3 different fires in this 12 miles, having to turn out and get round them when they reached the road. . . We had in view at one time from 1 to 5 miles of fire in a streak, burning from 2 to 6 feet high. In high grass it sometimes burns 30 feet high, if driven by fierce winds. By the light of this fire we could read fine print for a half mile or more. And the light reflected from the cloud of smoke, enlightened our road for miles after the blaze of the fire was out of sight."

Discussion Questions:

1. If you were caught on the prairie with a fire coming at you, what could you do?

2. Give several reasons why fire could be called "the prairie's friend."

3. Explain how prairie plants survive fires.

4. Describe what happens when fire is prevented from occurring in prairies.

5. How did the Native Americans use fire on the prairie?

6. How do you suppose the settlers viewed prairie fires?

Discussion Questions:

1. If you were caught on the prairie with a fire coming at you, what could you do? *(Run toward the fire if it is a narrow wall of flame. Start a small fire and wait on the burned area as the large fire goes by on either side of you. In an emergency, kill your horse, cut it open and crawl inside of it.)*

2. Give several reasons why fire could be called "the prairie's friend." *(Prevents trees from growing. Helps improve the quality of the soil. Burns dead plants. Removes dead grass. Helps plants grow in the spring.)*

3. Explain how prairie plants survive fires. *(Deep root systems.)*

4. Describe what happens when fire is prevented from occurring in prairies. *(The prairie is overgrown by trees. Prairie grasses and forbs die in the shade.)*

5. How did the Native Americans use fire on the prairie? *(Used it to clear space around their camps to grow new grass and to prevent surprise enemy attacks and to aid in hunting.)*

6. How do you suppose the settlers viewed prairie fires? *(Answers will vary. Settlers saw fires as destructive.)*

FIRE AT YELLOWSTONE

OBJECTIVES

The students will:

1. identify positive as well as negative effects of forest fires.
2. describe the forest as a cyclical and dynamic ecosystem in which fire is a natural successional event.

BACKGROUND

People have always had an ambivalent attitude towards fire. On the one hand, fire is destructive; unchecked, it consumes everything in its path. On the other hand, fire is necessary for human survival and civilization.

This ambivalence to fire was often expressed in early myths. One of the most enduring of these is the Assyrian myth of the Phoenix, a bird which lives for five hundred years. At the end of its life span, the Phoenix builds a funeral pyre of cinnamon and other aromatic spices on top of an oak or palm tree. From the body of the burned bird rises its offspring. The first act of the offspring is to carry its parent's body to the temple of the sun in Egypt. The five-hundred-year cycle repeats itself as the Phoenix matures, constructs its own pyre, and succumbs to a new flame from which its successor springs. The myth suggests that destruction by fire is essential for the survival of the species.[1]

The myth of the Phoenix, the bird that rises from beneath the ashes, is an ancient expression of an ongoing human dilemma: What is the appropriate human response to fire? If fire is a natural event, should it be allowed to shape the ecosystem at will, or should people intervene in the face of destruction of the ecosystem as it currently exists?

The 1988 fires in Yellowstone National Park, our nation's oldest and one of its most spectacular national preserves, dramatized this dilemma. On the one hand, millions of people watched in horror as daily news clips showed the raging fire consuming nearly half of Yellowstone's 2.2 million acres. On the other hand, new growth and increased diversity of species in the aftermath of the fire have affirmed scientists' theories that fire is necessary to the survival and continued vitality of forest ecosystems.

The film *From Beneath the Ashes* explores some of the regenerative aspects of the fire at Yellowstone:

- Fire maintains the mosaic pattern of growth in a forest. It clears away areas of older growth.
- The ashy residue that covers the soil is a rich source of nutrients for new plant life, including species that have lain dormant for years because the older forest environment was inhospitable to them. The new plants and the seeds provide food for small mammals and birds and for larger ruminants.
- Forest plants are so adapted that fire is necessary to the continuation of the species, e.g. the lodgepole pine has serotinous cones which release their seeds only when stimulated by fire, and the aspen's underground structure responds to fire by sending up as many as 500 new shoots to replace one fire-felled old aspen.

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[1]Bullfinch, Thomas, *The Age of Fable or Beauties of Mythology* (New York: New American Library, 1962), 352-354.

- An increased amount of decaying wood attracts and sustains large insect populations which provide food for small birds which, in turn, attract larger birds of prey.

MATERIALS

Butcher paper
Drawing paper, crayons, markers
* *From Beneath the Ashes* videotape
Terrarium and instruction for making one
Large posters of forest fire and of a forest with animals
Aerial photograph of urban and rural mosaic patterns
Overhead projector (optional)

Starred (*) materials are included in this packet.

PROCEDURE

Part 1:

1. Write the words FOREST FIRE on a large piece of butcher paper. Ask the students what adjectives and images these words evoke.

2. After a brief discussion, ask the students to record their thoughts and feelings about forest fires in drawings, paragraphs, and/or poems. The students may compile their drawings and writings into a collage on the butcher paper around the words FOREST FIRE. They may write adjectives and phrases describing forest fires on the collage. (Save the collage for later reference.)

3. Discuss the images in the collage. Which are positive? Which are negative? Are there more positive or negative images? Why? From where did the students get their images and ideas of forest fires?

4. Introduce the idea of the Phoenix as a bird whose death by fire is necessary for survival of the species (see background information). Ask if the students can think of ways in which forest fires might help the forest survive.

Part 2:

1. Review and list any positive effects of forest fires that were mentioned in the previous session. Tell the students to note any positive effects that are mentioned in the video.

2. View the tape up to the first break.

3. Discuss positive effects and add to the list. Ask how the word "mosaic" was used in the film. Show aerial photos of urban and rural areas as examples of mosaic patterns. Or ask the students if any of them have every flown in an airplane. What did it look like when they looked down at the ground? This will illustrate the mosaic effect.

4. Introduce the idea of forest succession: during various stages of maturity, different plants are prevalent. Show the students the terrarium and demonstrate how to make one. Give the directions to the students so that they can make one at home. In subsequent lessons observe changes.

FIRE ON THE PRAIRIE

OBJECTIVES

The students will:

1. compare and contrast the role of fire in maintaining and/or changing forest and prairie ecosystems.
2. identify prairie adaptations for survival from fire and compare them with forest adaptations.
3. identify ways in which humans use fire to conserve the prairie.

BACKGROUND

The lesson learned from Yellowstone is that fire is a natural force necessary to the evolution and overall health of the western forest ecosystems. Fire is just as necessary to the survival of the prairie ecosystems of the Midwest. Whereas the issue in the western forest is whether to suppress fire or to let it burn, the issue in the Midwest is whether to deliberately set fires.

Much of the original prairie has been destroyed by farming and grazing policies. Many of the original prairie plants and animals are threatened with extinction. Recently, there has been much interest in conserving what little virgin prairie remains and in restoring former prairie lands to their original condition. Fire plays a major role in both conservation and restoration.

Prairie plants are particularly adapted for survival in fire. Many, like the aspen in western forests, have underground systems which may extend more deeply into the earth than does the stalk above the earth. Fire burns off shallow-rooted immigrant plants, thus leaving room for deeply-rooted native plants to send shoots above the ground. Many prairie animals are also adapted for survival during fire. They live in underground burrows which are not touched during the fires.

MATERIALS

* The second part of *From Beneath the Ashes* video
* Poster: Fermilab Prairie Flora and Fauna

PROCEDURE

1. Review the positive role of fire in the forest and the adaptive mechanisms of plants and animals. Show the students the posters of the forest and the prairie. Ask how the prairie differs from the forest. Discuss whether fire would have a similar or different effect on the prairie and on the forest, and whether adaptive mechanisms of prairie plants and animals would be similar or different from those of forest plants and animals.

2. Show the remainder of the tape.

3. Discuss similarities and differences between:
   - effects of fire on the prairie and in the forest.
   - the adaptive mechanisms of the plants and animals.
   - the fire policies.

4. Display poster, Fermilab Prairie Flora and Fauna. Discuss evidence of plant and animal adaptation in the poster.

DAY 9: RESTORATION/CONSERVATION

OBJECTIVES

The students will:
1. Identify the importance of the prairie.
2. Generate ways of protecting, restoring and conserving the prairie.

BACKGROUND

Awareness of the importance of the prairie is the first step in becoming environmentally conscious.

The prairie is the home of animals and other organisms. It has the best type of soil for trees and other vegetation. It is a refuge of wild animals.

Erosion depletes the soil. As part of the environment it is the responsibility of man to protect and conserve the soil.

Between two and three thousand acres of prairie remain in Illinois. Fortunately, most of this prairie is within Illinois Nature Preserves. It is protected by law from being plowed or harmed in any way. There are smaller tracts of prairie along roadsides, railroad beds and in pioneer cemeteries. These little prairies are unprotected and can be destroyed at any time. The biggest prairie in Illinois is at Goose Lake Prairie State Park where there are 1,537 acres of prairie. Altogether, though, precious little prairie remains in Illinois. It is estimated that only one-hundredth of one percent of the prairie is left in the Prairie State.

What has happened to the animals? Some prairie animals, like the meadowlark and thirteen-lined ground squirrel, have been able to substitute other open grassy habitats for their old prairie homes. These animals have learned to live in open habitats such as pastures, old fields, grassy roadsides, cemeteries, golf courses, fencerows, parks and lawns.

Most prairie animals, however, have not been so lucky. These animals, like the bison, must have a large prairie home to survive. These prairie animals have left Illinois for good. Other animals, like the prairie chicken, upland sandpiper, white-tailed jackrabbit and even the marsh hawk, are endangered in Illinois. These animals, along with many prairie plants, are in danger of extinction because there is so little prairie habitat left for them.

It is not possible to return to the days of vast expanses of prairie in Illinois. It is interesting, exciting, and even a little romantic to read about them, but they are gone forever. Today, we need to protect, manage and learn from the prairie remnants. We must plan for the prairie's future in restoration and landscape design.

There are many reasons for entering into a prairie restoration or landscaping project, including the creation of wildlife habitat, aesthetics, education or the sheer enjoyment of prairie plants. Unlike gardens where annual flowers are planted to produce a luxuriant garden in one year, prairie plants will require approximately three years to develop from seed. However, once established, prairie sites can be maintained with a minimal amount of effort.

What Can We Do? In preserving and restoring the prairie resources we have remaining, we are attempting to preserve what is left of the diversity of wildlife habitat vital to the health of an ecosystem. Without preservation and restoration we would discard the above-mentioned benefits as well as any possible undiscovered benefits these plants have to offer. We would further disrupt our environment, endangering the lives of more wildlife and plant species by depriving them of their natural habitat. We would be contributing to the drastically accelerated rate of extinction of species on our planet which reduces our own chances for survival. If we can come to an understanding of the prairie and all the benefits of preserving its components, we can reverse this destructive trend. We can plant new prairie parcels which will help to carry on the species. We can take action with stewardship groups that are contributing physical labor to preserve and protect prairie remnants and restoration projects. And we can fight the political battles sometimes required to save a prairie remnant. But first we have to care.

MATERIALS

* Book, *Addie Across the Prairie*
  Journal
  Prairie mural construction materials
* Student pages - *Prairie Conservation Practices*
  Prairie Restoration Practices
* Teacher pages - *Prairie Conservation Practices Answer Page*
  Prairie Restoration Practices Answer Page

Starred (*) materials are included in this packet.

VOCABULARY

conservation: Preserving something or keeping it unimpaired.

ecology: The study of organisms and their environment.

restoration: Bringing back to the original state.

PROCESS

Recognizing relationships, drawing conclusions.

PROCEDURE

1. Review what the students have learned about the prairie. This is a perfect time to go back to the students' journals. Encourage a sharing time.

2. Imagine that you could start with 100 students, each one representing one percent of the original tallgrass prairie found in Illinois. How many of those 100 students would there be today? (one-hundreth of one percent - a finger)

3. Discuss the importance of the prairie. Emphasize the food web, soil fertility and habitat.

4. Do *Prairie Restoration Practices*. Allow time for discussion and group work.

5. After discussing various conservation practices, allow them time to complete the *Prairie Conservation Worksheet.*

6. Continue ongoing activities.

EXTENSION ACTIVITY

Plant a schoolyard prairie.

INTERDISCIPLINARY CONNECTION

Art, language arts, mathematics.

ASSESSMENT

The following list suggests journal ideas or topic questions.

- Make a list of things that can affect prairies and how.
- List things you could do to help conserve/preserve prairie areas.

Prairie Restoration Practices

NAME:________________________

Seed Selection	Site Selection

Planting	Maintenance

Prairie Conservation Practices

NAME:_____

Plants	Animals
_____	_____
_____	_____
_____	_____
_____	_____
_____	_____
_____	_____
Soil	**Fire**
_____	_____
_____	_____
_____	_____
_____	_____
_____	_____
_____	_____

Prairie Restoration Practices

Seed Selection	Site Selection
1. mature	1. Have permit
2. variety	2. under the sun
3. grasses/forbs	3. enough drainage
4. nature	4. good proportion of soil particles
5. seasonal blooming	5. consult a prairie specialist
6. consult a prairie specialist	

Planting	Maintenance
1. scatter not in rows	1. periodic burning (fire)
2. start seedlings early	2. weed but don't mow
3. condition the seeds	3. don't pick flowers or collect seeds
4. consult a prairie specialist	4. consult a prairie specialist

Prairie Conservation Practices

Plants	Animals
1. don't pick or step on them	1. look, don't touch or disturbe them
2. don't mow	2. no trapping
3. seed bare spots	3. consult a prairie conservationist
4. consult a prairie conservationist	
Soil	**Fire**
1. seed bare spots	1. don't attempt to do it yourself, but consult a specialist
2. stay off the soil	
3. consult a prairie conservationist	

DAY 9: CAREER AWARENESS

OBJECTIVE
The students will:
Identify scientific careers related to the prairie.

BACKGROUND
Careers are discussed in the unit about the prairie. Without these careers it would be difficult to know and gather all the content of this study. These careers include the biologist, botanist, agronomist, herpetologist, historian, conservationist, prairie experts and others.

Science is interwoven in our technological society. In order for our society to survive, a scientifically literate population is necessary. Educators are urged to continue teaching students an understanding of the true work of scientists while reminding students that they are the future of the nation.

MATERIALS
* Student pages - *Career Summaries*
  How to be a Good Scientist

Starred (*) materials are included in this packet.

VOCABULARY
career: Occupation, job.

scientist: A person trained in some field of science who studies our universe through observation and experimentation to discover and test theories.

PROCESS
Identifying, drawing conclusions.

PROCEDURE
1. Discuss class stereotypes of scientists using this suggested question:
   What is your mental picture of a scientist? (Students may talk about their aptitudes, physical features, clothing they wear, and what they do.) Have students draw a picture of and describe a scientist.

2. Distribute the career summary sheet. Discuss the job descriptions and familiarize the students with the careers related to the study of the prairie.

3. Talk about the qualities of a good scientist. Distribute the handout to the students.

4. Have students redraw their idea of a scientist. Compare with earlier picture.

EXTENSION ACTIVITIES

Have students cut ads from newspapers and record the careers related to science.

INTERDISCIPLINARY CONNECTION

Art, language arts, mathematics.

ASSESSMENT

The following list suggests journal ideas or topic questions.

- If you could select any related career, what would it be and why? What would you have to do to prepare for this career? How would you help the environment?
- Write a narrative about one of the careers from the career summary sheet.

Career Summaries

agronomist: conducts experiments in field crop problems and develops new methods of growing crops to make farming more efficient and environmentally kind.

biologist: studies living organisms - plants, animals, and viruses - and their relationships to their environments.

botanist: a biologist who studies plants

floriculturist: directs the propagation, cultivation, and care of shrubs, trees, and plants.

forester: plans and supervises the growth, protection, and utilization of trees. One area of interest to them is the use of the outdoors for recreational purposes.

geologist: studies the structure, composition, and history of the earth's crust. The earth's resources are located by geologists.

herpetologist: studies reptiles and amphibians.

horticulturist: propagates and cultivates flowers, identifies and labels plants, and also manages nonflowering plants.

nursery manager: is responsible for the growing, transplanting, and moving of trees, shrubs, and other perennial plants.

prairie specialist: (prairie manager) is responsible for prairie identification, reconstruction, and maintenance.

science technician: works closely under the supervision of a professional scientist and follows written procedures as outlined by the scientist.

soil conservationist: develops programs which make the most productive use of land without damaging the land.

tree surgeon: inspects trees and shrubs for the purpose of maintaining healthy plants. If needed, they perform tree surgery to eradicate any disease found.

zoologist: a biologist who studies animals

Other related careers:

firefighter: controls and helps prevent fires.

historian: writes about things and events related to the past.

environmental journalist: writes information and covers news about the environment to be published in newspapers, magazines, etc.

How To Be A Good Scientist

Are you interested in finding answers to puzzling problems? Good! Then you're great scientist material.

Here are some hints for you to follow as you continue being a scientist.

BE CURIOUS

Keep your eyes wide open and watch for unusual things. Wonder about everything; don't take anything for granted. Constantly ask questions such as: "What will happen?" and "Why is this happening?" and "What did I learn from this?"

BE ORGANIZED

Get all your materials together before you start an investigation. Read and follow directions carefully. Keep good records! Write down what you see and what you learn in a notebook.

BE WISE

Follow all the rules for safe science, and take good care of your science equipment and supplies. You don't want to have a fun science adventure spoiled by an accident or broken equipment.

BE INVENTIVE

Don't be afraid to try different things, to ask more questions, to make guesses about what might happen, or to come up with a different way of checking out something. If something didn't work out or something is still puzzling you, try another experiment. Keep asking questions such as:
"What might happen if I tried this?" and "What more could I find out?"

BE PATIENT

Take plenty of time to perform your experiment or investigation. And if it doesn't work right, be willing to try again. Try to analyze why it didn't work, and keep trying.

ENJOY THE "DOING"!

Don't worry if you don't understand everything or find every answer. Even the most brilliant scientists don't understand everything. There are still lots of mysteries in the world of science. All the fun isn't in getting the answers; most is found in the process of looking for them!

BE AWARE

Appreciate your environment. Remind yourself constantly of your responsibility to help protect and conserve it.

DAY 10: CULMINATION

OBJECTIVE
The students will:
Experience activities as a culmination for the entire prairie unit.

BACKGROUND
This section provides a variety of activities that may only take a short time to complete (Word Search) to activities that may take much longer (School Yard Prairie Restoration).

MATERIALS
* Book, *Addie Across the Prairie*
  Journal
  Prairie mural construction materials
* Student page - *Word Search*
* Teacher pages - *Prairie Pursuit: A Game for the Classroom*
  Word Search Answer Page

Starred (*) materials are included in this packet.

VOCABULARY
See Word Search.

PROCESS
Inquiry, critical thinking, discovery.

PROCEDURE
Choose one or several of the following:

1. Do *Word Search.*

2. Have students give oral reports - (unless these have already been given during mural completion or if students have completed individual research projects).

3. Play Prairie Pursuit.

4. Take a field trip(s) to a prairie site(s).

5. Finish ongoing activities.

EXTENSION ACTIVITIES

1. Read another novel about the prairie.

2. Plant a schoolyard prairie.

INTERDISCIPLINARY CONNECTION

Art, language arts, mathematics, science, social studies.

ASSESSMENT

The following list suggests journal ideas or topic questions.

- Trade your journal with a partner and think about the similarities and differences in your entries. Write a note to your partner telling him/her which ideas he/she used that you thought were clever, and why.
- React to or tell what you have learned about the prairie. How have your ideas changed?

PRAIRIE UNIT WORD SEARCH

D	E	C	O	M	P	O	S	I	T	I	O	N	M	E	S	B	V	R	0
C	M	O	D	I	R	E	I	R	I	A	R	P	E	C	O	S	M	A	T
F	E	W	E	N	A	I	B	I	H	P	M	A	T	N	W	E	B	D	Q
D	T	E	C	S	I	Y	O	K	E	L	M	S	A	E	M	R	O	F	N
P	A	A	O	E	L	O	A	M	C	G	A	I	R	D	L	O	N	W	U
R	M	D	M	D	C	R	L	R	S	M	M	O	B	N	I	V	E	R	I
E	O	A	P	I	H	G	R	E	E	E	M	L	E	E	O	I	N	L	E
D	R	P	O	M	A	A	S	P	R	T	A	R	T	P	S	B	I	H	C
A	P	T	S	E	B	N	O	T	O	S	L	S	R	E	P	R	C	P	O
T	H	A	E	N	I	I	I	I	V	Y	S	S	E	D	O	E	H	M	S
O	O	T	R	T	T	S	L	L	I	S	O	B	V	R	T	H	E	Y	Y
R	S	I	S	L	A	M	B	E	N	O	X	R	N	E	L	O	V	N	S
S	I	O	P	M	T	S	V	C	M	C	E	O	I	T	S	I	L	T	T
A	S	N	E	U	Y	M	O	E	O	E	N	F	S	N	E	C	X	Y	E
W	R	L	P	R	E	Y	N	D	S	L	E	W	S	I	B	F	D	U	M
J	A	H	A	R	R	O	W	E	D	L	A	I	N	N	E	R	E	P	Q
G	K	B	R	E	B	M	I	T	K	L	N	O	I	S	O	R	E	R	N
M	A	N	P	A	N	T	H	R	O	P	O	M	O	R	P	H	I	S	M
V	G	E	T	A	R	G	I	M	L	S	R	I	V	U	L	E	T	S	H
M	F	E	R	T	I	L	E	N	O	I	T	A	N	I	L	L	O	P	T

adaptation
amphibian
anthropomorphism
decomposers
decomposition
ecosystem
erosion
fertile
forbs
gale
habitat
harrowed
herbivores
interdependence
invertebrate
loam
mammals
metamorphosis
migrate
niche
nymph
omnivores
organisms
oxen
perennial
pollination
prairie
predator
prey
reptile
rivulets
sediment
silt
slews
sod
soil
sow
timber
topsoil
yoke

Prairie Pursuit

OBJECT OF THE GAME: To pursue knowledge of the prairie by answering questions about its past, present and future.

MATERIALS:
Question and answer sheets for teacher
Blackboard for scorekeeping

DIRECTIONS:
1. Divide group into teams of 4-6 players. Players will confer with each other in a team effort to answer each question. Have teams select a team name.

2. Draw a chart on the blackboard for scorekeeping.

	PAST	PRESENT	FUTURE
Team 1			
Team 2			
(etc.)			

3. Set a time limit for the game and for each answer.

4. Each team, in turn, selects a question category--Past, Present, or Future--in which to answer a question.

5. The teacher reads a question. Team members consult and answer within the time limit.

6. Some questions may lead to classroom discussions, others may have more than one correct answer. Teachers have some flexibility in deciding when a correct answer has been given.

7. A correct answer earns the team 1 point in the correct column of the scoreboard. If an answer is incorrect the next team will have a chance to earn the point with a correct answer. Questions continue to be passed from team to team until a correct answer is given or each team has had a turn.

8. Each team has a maximum limit of 6 points in each category. Eighteen points, 6 in each category, wins the game. If time runs out before a team has earned 18 points, the team with the most points wins.

POSSIBILITIES: Endless! The teacher is encouraged to add his/her questions to give added meaning to classroom emphasis and experiences.

Adapted from "Prairie Pursuit A Prairie Game for the Classroom," The Morton Arboretum, 1989.

Prairie Pursuit Questions

PAST

1. Early prairie settlers could not find enough time to build barns, houses, and fences. (true or false)
2. The Indians burned the prairie to:
   a. help them hunt bison and other animals they needed.
   b. Bring rain.
   c. Worship the Great Spirit.
   d. Get rid of mice.
3. We learned to live in harmony with the prairie. Who are we? (Native American Indians)
4. Many settlers found prairie life difficult because:
   a. It was too shady.
   b. There weren't enough trees for building and fuel.
   c. It was mountainous.
5. What kept many trees out of the prairie? (fire)
6. Who invented the steel plow? (John Deere)
7. Early settlers usually built homes with brick. (true or false)
8. Pioneers called the prairie a sea of _____. (grass)
9. Ten thousand years ago the prairie was covered by _____. (ice, glaciers)
10. The Native Americans killed most of the bison so that today there are few left. (true or false)
11. Early prairie houses were made of _____. (sod or logs)
12. In the 1800s, Illinois prairie was turned into _____. (farmland)
13. The first humans to live on the prairie were from France. (true or false)
14. What was the largest mammal of the prairie? (bison)
15. The settlers did like the prairie because:
    a. It made great golf courses.
    b. The winters were mild and summers cool.
    c. The soil was good for growing crops.
    d. Disney World was there.
16. Prairie soil began with the help of a glacier. (true or false)
17. How did the settlers come to Illinois? (conestoga wagons, boats on rivers and the Great Lakes)
18. The major change in the prairie since 1832 is the absence of _____. (fire)
19. The first pioneers to settle the prairie believed the prairie soils were not fertile because there were few trees. (true or false)
20. A prairie fire was not dangerous. (true or false)
21. The mosquito disappeared with the plowing of the prairie. (true or false)
22. All the pioneers needed to prepare the prairie for crops was the wooden plow. (true or false)

Prairie Pursuit Questions

PRESENT

1. What are two kinds of plants found on the prairie? _____ and _____.
   (grasses, forbs, trees, shrubs, vines, mosses, lichens)
2. I bend in waves with the prairie wind. Who am I? _____. (prairie grass)
3. Name a predator of the prairie. (hawk, fox, wolf, coyote, spider, human)
4. A prairie is valuable because:
   a. It makes a good soil.
   b. It is beautiful.
   c. It is a home for plants and animals.
   d. All of the above.
   e. None of the above.
5. It is always cool out on the open prairie. (true or false)
6. Fire is a friend to the prairie. (true or false)
7. Illinois prairies have taller grasses than Colorado prairies. (true or false)
8. The prairie always looks green. (true or false)
9. The layer of soil that holds the most nutrients is called _____. (top soil)
10. Prairie fires help keep too many trees and weeds out of the prairie, remove dead plant material, and fertilize the prairie. (true or false)
11. When prairie roots die and decompose, the soil becomes more _____. (fertile, rich, useful, nutritious)
12. Animals need plants for food, oxygen, and shelter. (true or false)
13. Lots of people in the prairie state still live in sod houses. (true or false)
14. Snakes are not good for prairies. (true or false)
15. Prairie grasses are all over 5 feet tall. (true or false)
16. The forests we have in Illinois today are just like the woods we had 150 years ago. (true or false)
17. More top soil is eroding than is being added. (true or false)
18. Prairie plants are easy to find because they grow in any local field. (true or false)
19. Is it reason enough to save prairie remnants for their beauty? (yes)
20. Erosion isn't a problem in Illinois because more top soil is produced than we need. (true or false)
21. Diversity of plants is important to the health of a prairie. (true or false)
22. Are people becoming more aware of prairies? (yes)

Prairie Pursuit Questions

FUTURE

1. To keep the prairie healthy, it should be plowed every year. (true or false)
2. How can we have prairies in the future?
   a. Preserve what prairies remain.
   b. Plant new prairies.
   c. Stop paving everything in sight.
   d. All of the above.
3. To keep the prairie healthy, we should burn the prairie frequently. (true or false)
4. In the United States, farmland that once supported prairie plants and animals is now being made into housing developments. (true or false)
5. If there were no prairies in the future, prairie plants would grow in:
   a. Highway median strips.
   b. Corn fields.
   c. Pine forests.
   d. None of the above.
6. If every family were to plant prairie plants in their yards, the suburbs would become a wild prairie again. (true or false)
7. Give one reason why we should try to save prairies for future generations. (beauty, diversity, habitat, possible medicinal/economic plants, etc.)
8. To restore some of Illinois' prairies would be:
   a. A smart thing to do.
   b. An impossible thing to try.
   c. Not worth the effort.
9. There are no valuable plants in the prairie so there is no need to save it for future generations. (true or false)
10. The future of the Illinois prairie is:
    a. In your hands.
    b. In the politicians' hands.
    c. In your parents' hands.
    d. All of the above.
11. Will wild bison ever freely roam on the Illinois prairie again? (no)
12. If all insects on the prairie were killed the prairie would be better off. (true or false)
13. If we are to have diversity of plants and animals in the future, we must have many different kinds of habitats, including prairies. (true or false)
14. Once lost, top soil is easily and quickly replaced by the natural system. (true or false)
15. There is nothing you can do about prairies and their future. (true or false)
16. The best thing you can do to help preserve prairies is to:
    a. Learn about them.
    b. Appreciate and understand them.
    c. Tell others about them.
    d. All of the above.
17. Right now we have use for the plants farmers grow. Therefore, we won't need prairie plants in the future. (true or false)

18. Prairies will be places for your children to learn about our:
    a. History.
    b. Plants.
    c. Animals.
    d. Insects.
    e. All of the above.
19. Some people in our class may spend their lives studying plants and animals. These persons could help keep them from becoming extinct. (true or false)
20. If the prairie survives, it will be because of the decisions made by:
    a. Older people.
    b. Kids.
    c. Neighborhoods.
    d. Schools.
    e. All of us.
21. Some people living in towns and cities are planning to restore small prairies in their parks, school grounds, and backyards. (true or false)
22. How will Illinois best continue to be the "Prairie State?"
    a. By protecting and extending its remaining prairies and valuing and protecting our prairie heritage when developing land.
    b. By building bigger and better highways.
    c. By opening more shopping malls.

PRAIRIE UNIT WORD SEARCH

D	E	C	O	M	P	O	S	I	T	I	O	N	M	E	S	B	V	R	0
C	M	O	D	I	R	E	I	R	I	A	R	P	E	C	O	S	M	A	T
F	E	W	E	N	A	I	B	I	H	P	M	A	T	N	W	E	B	D	Q
D	T	E	C	S	I	Y	O	K	E	L	M	S	A	E	M	R	O	F	N
P	A	A	O	E	L	O	A	M	C	G	A	I	R	D	L	O	N	W	U
R	M	D	M	D	C	R	L	R	S	M	M	O	B	N	I	V	E	R	I
E	O	A	P	I	H	G	R	E	E	E	M	L	E	E	O	I	N	L	E
D	R	P	O	M	A	A	S	P	R	T	A	R	T	P	S	B	I	H	C
A	P	T	S	E	B	N	O	T	O	S	L	S	R	E	P	R	C	P	O
T	H	A	E	N	I	I	I	I	V	Y	S	S	E	D	O	E	H	M	S
O	O	T	R	T	T	S	L	L	I	S	O	B	V	R	T	H	E	Y	Y
R	S	I	S	L	A	M	B	E	N	O	X	R	N	E	L	O	V	N	S
S	I	O	P	M	T	S	V	C	M	C	E	O	I	T	S	I	L	T	T
A	S	N	E	U	Y	M	O	E	O	E	N	F	S	N	E	C	X	Y	E
W	R	L	P	R	E	Y	N	D	S	L	E	W	S	I	B	F	D	U	M
J	A	H	A	R	R	O	W	E	D	L	A	I	N	N	E	R	E	P	Q
G	K	B	R	E	B	M	I	T	K	L	N	O	I	S	O	R	E	R	N
M	A	N	P	A	N	T	H	R	O	P	O	M	O	R	P	H	I	S	M
V	G	E	T	A	R	G	I	M	L	S	R	I	V	U	L	E	T	S	H
M	F	E	R	T	I	L	E	N	O	I	T	A	N	I	L	L	O	P	T

adaptation
amphibian
anthropomorphism
decomposers
decomposition
ecosystem
erosion
fertile
forbs
gale
habitat
harrowed
herbivores
interdependence
invertebrate
loam
mammals
metamorphosis
migrate
niche
nymph
omnivores
organisms
oxen
perennial
pollination
prairie
predator
prey
reptile
rivulets
sediment
silt
slews
sod
soil
sow
timber
topsoil
yoke

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Glossary

ADAPTATION: A way that a living thing's body or behavior is special to allow it to live more successfully in a certain area.

AMPHIBIAN: Animals who live on both land and water and have a smooth, moist skin without hair or scales. They go through metamorphosis to become adults.

ANCESTORS: Relatives that lived before you.

ANTHROPOMORPHISM: Projecting human feelings onto animals. A good example would be people feeling sorry for the bunny rabbit caught by the hawk, but no one feeling jubilation for the hawk finding nourishment to sustain life.

ARCHAEOLOGIST: One who studies ancient life by excavating (digging) artifacts (objects).

CAREER: Occupation, job.

CARNIVORE: Meat eater.

COLD BLOODED: Having blood that varies in temperature with the outside air, water or land.

CONSERVATION: Preserving something or keeping it unimpaired.

CYCLICAL: Recurring in cycles or periods of time in which certain events or phenomena repeat themselves in the same order at the same intervals.

DECOMPOSERS: The animals, plants and microorganisms which break down dead plants and animals. This process helps to enrich the soil.

DECOMPOSITION: The breaking down of dead things into smaller parts or elements.

DISEMBOWEL: To slice open and remove internal organs.

ECOLOGY: The study of organisms and their environment.

ECOSYSTEM: The living and nonliving things existing cooperatively together.

EROSIONS: The loosening and movement of soil by wind, raindrops, moving water, ice, or landslides.

FERTILE: Producing abundantly.

FIREBREAK: A ditch or clearing created to prevent a forest fire from spreading.

FORBS: Prairie wildflowers.

FOOD WEB/FOOD CYCLE: A series of interrelated food chains. For example, plants are eaten by carnivores (meat eaters). Plants and animals can be eaten by omnivores (plant and meat eaters), all which will eventually die and be eaten by decomposers thus continuing the cycle.

FURROWS: Long, narrow tracks in the soil cut by a plow.

GALE: A very strong wind.

HABITAT: A place where plants and animals grow, live, and reproduce.

HARROW: To use a heavy frame with iron "teeth" to break up the soil.

HAZARDOUS: Dangerous.

HERBIVORE: Plant eater.

HUMUS: A brown or black substance resulting from the partial decay of leaves, roots, and other vegetable matter; organic part of the soil.

INSECT: A group of small, air-breathing arthropods (invertebrates with jointed legs) with a body clearly divided into three segments (head, thorax, abdomen). Insects have only three pairs of legs.

INSULATOR: A layer that prevents the loss or gain of heat.

INTERDEPENDENCE: Living and nonliving things relying on one another in an ecosystem.

INVERTEBRATE: An animal without a backbone.

LARVA or NYMPH: The young of an insect before metamorphosis.

LOAM: A soil containing sand, silt, and clay.

MAMMALS: Warm-blooded animals, with hair, which usually bear their young live. The females have the capability to nurse their babies.

METAMORPHOSIS: A change in appearance.

MIGRATE: To move from one place to another.

MOSAIC: A pattern or picture made by placing together small pieces of glass or stone of different colors; any patchwork pattern.

NICHE: The special role a species plays in an ecosystem.

NUTRIENT: A substance that supplies nourishment for an organism to live.

NYMPH or LARVA: The young of an insect before metamorphosis.

OMNIVORE: Plant and animal eater.

ORGANISM: A living thing.

OXEN (plural of ox): Animals, such as cattle, buffalo, and bison, that are trained for farm work.

PARENT MATERIAL: Materials, such as rock or dead plants, that break down or decay to form soil.

PERENNIAL: Plants that come up from roots and other underground parts year after year.

POLLINATION: The transfer of pollen for the fertilization of plants.

PRAIRIE: A large expanse of land, with few trees, which contains specific plants and animals.

PREDATOR: The hunter.

PREY: The hunted.

REGENERATIVE: Able to give new life or vigor to.

REPTILE: Cold-blooded animals that produce eggs which hatch into young. These young are miniature replicas of the adults (color may change).

RESTORATION: Bringing back to an original state.

RIVULETS: Little streams.

SCAVENGER: An animal that cleans up food scraps.

SCIENTIST: A person trained in some field of science who studies our universe through observation and experimentation to discover and test theories.

SEDIMENT: Soil that is deposited by water or wind.

SEROTINOUS: Relating to the latter and usually drier part of the summer; responsive to heat.

SETTLERS: People who come to a new place to live.

SILT: A medium-sized soil particle. Silt helps the soil become rich and loose.

SLAY: To kill.

SLEWS: Swamp-like area (currently spelled "slough").

SOD: A surface layer of earth containing grass and their matted roots.

SOIL: A dynamic mixture of broken-down rocks, air, water, and plant and animal material.

SOW: Scatter seed on the ground.

STAGNANT: Not moving and not fresh.

SUCCESSION: Following in order.

SUPPRESSION: Putting an end to the activity or existence of.

TIMBER: An area with many trees.

TOPSOIL: The uppermost layer of soil. This is the richest, most productive layer of soil.

VIRGIN PRAIRIE: Prairie that is in the original pre-settlement state.

YOKE: A wooden frame to fasten two work animals together.

Field Trip Suggestions

Any of the prairies listed in the Appendix.

NATIVE AMERICANS

Field Museum of Natural History
Roosevelt Road at Lake Shore Drive
Chicago, IL 60605
(312) 922-9410
contact person: Alexia Tryzna

Schingoethe Center for the Native American Cultures
Aurora University
347 S. Gladstone
Aurora, IL 60506
(708) 844-5402
contact person: Marcia Lautanen-Raleigh

Isle a la Cache Museum
501 E. Romeo Road
Romeoville, IL 60441
(815) 886-1467
contact person: Jack MacRay

PRAIRIES

Fermilab Prairie Interpretive Trail
Fermilab
P.O. Box 500, M.S. 333
Batavia, IL 60510-0500
(708) 840-3161
contact person: David Abler

Morton Arboretum
Rt. 53
Lisle, IL 60532
(708) 968-0074
contact person: Beth Robinson

Garfield Farm Museum
Box 403
LaFox, IL 60147
(708) 584-8485
contact person: Jerry Johnson

SETTLERS

Chicago Historical Society
1601 N. Clark
Chicago, IL 60614
(312) 642-4844
contact person: reservation's desk

Garfield Farm Museum
Box 403
LaFox, IL 60147
(708) 584-8485
contact person: Jerry Johnson

Naper Settlement
201 W. Porter
Naperville, IL 60540
(708) 420-4161
contact person: Peggy Nowicki

Illinois Prairies

Directions to Prairies

BELMONT PRAIRIE
Take Ogden Avenue to Belmont Road (about 2 miles east of IL Rt. 53). Turn south on Belmont. After about 1 mile, turn west (right) on Haddow St. (just south of Puffer School). Turn north (right) at the end of Haddow and look for sign to prairie.

BRAIDWOOD SAVANNAH
Take I-55 south to the Braidwood exit (Rt. 113). Follow Rt. 113 through town and look for the entrance gate on the right side (south) of the road not long after you pass the school.

BREWSTER CREEK
Take Roosevelt Road (Rt. 38) to IL Rt. 59. Turn north (right) on Rt. 50 and go to Army Trail Road (a stop light - about 6 miles). Turn west (left) on Army Trail and proceed for about 1.5 miles to Powis Road. Turn north (right) on Powis to the entrance to Pratts Wayne Woods Forest Preserve. Enter the preserve and proceed to the furthest parking lot.

CHURCHILL PRAIRIE
Take Roosevelt Road (Rt. 38) east to IL Rt. 53. Turn north (left) on Rt. 53 and proceed to St. Charles Road (a stop light). Turn west (left) on St. Charles and after one block look for the Churchill Woods Forest Preserve west area parking lot on the south (left) side of the road.

FERMILAB PRAIRIE
Take Roosevelt Road (Rt. 38) west to IL Rt. 59. Turn south (left) on Rt. 59 and proceed to Batavia Road (a stop light). Turn west (right) on Batavia Road and go to the main building of the lab.

GOOSE LAKE PRAIRIE STATE PARK
Goose Lake Prairie is located in Grundy County about 25 miles southwest of Joliet. Take I-55 south toward St. Louis. Exit right (west) on Lorenzo Road and go 7 1/2 miles west to the park sign. Turn right (north) on Jugtown Road and go about 1 mile to the main entrance. Meet by the visitor center. Allow about 1 1/2 hours to get there.

LOCKPORT PRAIRIE
Lockport Prairie is located near the Illinois State Penitentiary in Lockport. Take Rt. 53 south past Romeoville. Look for Lewis University and Rt. 7. Continue south to Division Street (police radio tower on right). Turn left on Division Street ignoring the bridge out sign. Go 1/2 mile. The Lockport Prairie is on the right. Park on the side of the road by the sign.

GENBERG-MARKHAM PRAIRIE
Take the Tri-State south and get off at 127th St. Continue south on Cicero Ave. (Rt. 50), to 159th St. Take a left turn (east). Go east until Troy St., which is one block east of Kedzie. On Troy, turn left (north). Troy is a dirt road. Continue on Troy north which brings you directly to the prairie.

MCKEE MARSH
Take Butterfield Road (Rt. 56) west to Batavia Road (a stop light). Turn north (right) on Batavia and proceed to Williams Road (about 1/2 mile). Turn north (right) on Williams. At the end of Williams Road, turn west (left) on Mack Road. Parking lot is about 300 feet from intersection on the north (right) side of Mack Road.

MORTON ARBORETUM PRAIRIE
Take IL Rt. 53 south from Butterfield Road (Rt. 56) or Roosevelt Road (Rt. 38) to the entrance to the Morton Arboretum. Proceed to the west side of the Arboretum and park in lot #25. Follow trail to prairie.

MURRAY PRAIRIE
Take Roosevelt Road (Rt. 38) west to IL Rt. 59. Turn north (right) on Rt. 59. Go to IL Rt. 64 and turn west (left). Proceed west on Rt. 64 to Randall Road in St. Charles. Turn north (right). Take Randall Road north about 1/4 mile across the railroad tracks. Turn left (west) on Dean Street. Go about 4/10 of a mile on Dean Street to the parking lot for the Great Western Nature Trail.

POVERTY PRAIRIE
Take Roosevelt Road (Rt. 38) east to IL Rt. 53. Turn south (right). Take Rt. 53 south to 75th Street (a stop light - about 8 miles). Turn east (left) on 75th and proceed to Cass Avenue. Turn south (right) on Cass. Just south of I-55 there is a parking lot for Waterfall Glen Nature Preserve (right side of road). Trail from parking lot leads to prairie. (It is, however, about a 3-mile walk to the prairie.)

SHOE FACTORY ROAD PRAIRIE
Take Roosevelt Road (Rt. 38) west to IL Rt. 59 and turn north (right). Go north on Rt. 59 to Shoe Factory Road and turn west (left). Look for sign on south (left) side of Shoe Factory Road (about 1/2 mile).

WEST CHICAGO PRAIRIE
West Chicago Prairie is located in West Chicago. Take Roosevelt Road (Rt. 38) west past Rt. 59 and the Fabyan Parkway to Kress Road. Turn right (north) on Kress Road. After you cross the Chicago and Northwestern railroad tracks and a small road next to it, take the second concrete road named Western to the right. It dead ends at Industrial Drive. There you will find room to park and a sign for the prairie.

WOLF ROAD PRAIRIE
Take Butterfield Road (Rt. 56) east to Highland Avenue. Turn south (right) on Highland and cross the tollway. Turn east (left) on 31st Street and follow it all the way to Wolf Road. Park along the north side of 31st.

WOODWORTH PRAIRIE
Take the Toll Road (294) north to Dempster Street. Go east on Dempster and take a left at the first stoplight (Potter Road). Continue north on Potter Road to Golf and turn east on Golf Road. Go east on Golf Road to Greenwood which is a large intersection. Go left (north) on Greenwood to Milwaukee. Turn left on Milwaukee Ave. The Peacock Prairie is located next to the McDonald's Restaurant (north) on the east side of Milwaukee.

Illinois Native Prairie Nature Preserves

BOONE COUNTY

FLORA PRAIRIE: Southwest corner of county, east of Illinois Central railroad tracks on north side of Poole Road, 1/2 mile west of Wheeler Road -- A 10-acre dry dolomite prairie owned by Boone County Conservation District; parking and trails.

CARROLL COUNTY

AYERS SAND PRAIRIE NATURE PRESERVE: Three miles southeast of Savanna, 1/2 mile east of Highway 84 -- A dry sand prairie of 115 acres owned by the Department of Conservation; parking, no trails.

CARROLL & WHITESIDE COUNTIES

THOMSON-FULTON SAND PRAIRIE NATURE PRESERVE: Between Thomson and Fulton, west of Burlington-Northern railroad right-of-way -- Dry sand prairie owned by the Department of Conservation, U.S. Fish & Wildlife Service, and Corps of Engineers; scientific study area; parking, no trails.

COOK COUNTY

GENSBURG-MARKHAND PRAIRIE NATURE RESERVE: In Markhand, east of Kedzie Avenue, west of Interstate 294 and between 155th and 157th Streets -- 95 acres of dry-mesic, mesic, and wet-mesic sand prairie owned by Northeastern Illinois University; access by permission only, phone (312) 583-4051.

MORTON GROVE PRAIRIE NATURE PRESERVE: In Morton Grove, at northeast end of 16-acre Prairieview Park, just east of Caldwell Road on Dempster and Newcastle -- 1.9 acres of mesic and wet-mesic prairie owned by Morton Grove Park District; parking and nature trail.

SAND RIDGE NATURE PRESERVE: Near Calumet City, east of Torrence Avenue, west of Penn Central railroad tracks, north of Michigan City Road -- 70 acres of dry-mesic and wet sand prairie owned by Cook County Forest Preserve District, River Forest; no parking or trails.

SHOE FACTORY ROAD NATURE PRESERVE: East of Elgin on south side of Shoe Factory Road, between Sutton Road (Route 59) and Elgin, Joliet, and Eastern railroad tracks -- Nine acres of dry-mesic gravel prairie owned by Cook County Forest Preserve District, River Forest; access only by permission of naturalist at Crabtree Nature Center, phone (312) 381-6592.

SOMME PRAIRIE: Northbrook, 1/2 mile west of Waukegan Road, north of Dundee Road in Somme Woods Forest Preserve -- 18 acres of wet-mesic prairie owned by Cook County Forest Preserve District; no parking or trails.

JAMES WOODWORTH PRAIRIE: Glenview, on east side of Milwaukee Avenue, 1/2 mile north of Golf Road -- Five acres of mesic prairie owned by University of Illinois at Chicago Circle; interpretation center building open and trail guides available daily 10 a.m. - 3 p.m. June through September.

DUPAGE COUNTY

BELMONT PRAIRIE NATURE PRESERVE: Downers Grove, south of Ogden Avenue (Rt. 34), west of Belmont Road at end of Prairie Avenue, on Cross St. -- 10 acres of wet to mesic prairie owned by The Nature Conservancy; parking area to be developed, trails exist.

EFFINGHAM, FAYETTE, & MARION COUNTIES

12-MILE PRAIRIE: From Watson to Kinmundy between Illinois Central Railroad tracks and Illinois Highway 37 -- Mesic black soil prairie maintained by Illinois Department of Transportation.

FORD COUNTY

PROSPECT CEMETERY PRAIRIE NATURE PRESERVE: Southeast edge of Pacton on Vermilion St. -- Five acres of mesic prairie owned by Patton Township Cemetery Trustees; parking on street, no trails.

GRUNDY COUNTY

GOOSE LAKE PRAIRIE NATURE PRESERVE: Southeast of Morris, north of Lorenzo Road, on Jugtown Road -- 1,513 acres including dry-mesic, wet-mesic and wet prairie, and prairie potholes owned by the Department of Conservation; interpretive center and trails.

IROQUOIS COUNTY

IROQUOIS COUNTY CONSERVATION AREA: Northeast of Beaverville in southern and eastern parts of conservation area -- 1,240 acres of wet to dry prairie and marsh; parking provided, no trails.

JERSEY COUNTY

PERE MARQUETTE STATE PARK: West of Grafton on Illinois 100 -- Fifteen 20-acre areas of loess hill prairie within state park; trails and interpretive program provided.

JOHNSON COUNTY

HERON POND - WILDCAT BLUFF NATURE PRESERVE: Four miles southwest of Vienna -- 5.9-acre limestone glade on Wildcat Bluff within 1,861-acre nature preserve owned by the Department of Conservation; parking and trails provided.

CAVE CREEK HILL PRAIRIE: 3 1/2 miles south of Vienna on the east side of Route 45 -- Two-acre limestone glade within 20-acre natural area owned by the Department of Conservation; no trails.

LAKE COUNTY

BERKELEY PRAIRIE: Highland Park, south side of Berkeley Avenue, west of Ridge Road -- 18 acres of mesic prairie owned by Lake County Forest Preserve District.

ILLINOIS BEACH NATURE PRESERVE: Southern part of Illinois Beach State Park, Zion -- 829 acres of wet to dry sand prairie; interpretive center and trails.

WADSWORTH PRAIRIE NATURE PRESERVE: East of U.S. 41, west of the Milwaukee Road Railroad and 1/4 mile north of Wadsworth Road -- 176-acre marsh and prairie owned and managed by the Lake County Forest Preserve District; no trails developed at present.

LIVINGSTON COUNTY

SUNBURY PRAIRIE: 8.5 miles west of Dwight along the abandoned Illinois Central Gulf Railroad -- 20 acres of mesic prairie within the abandoned right-of-way of a railroad owned by the Nature Conservancy.

LEE COUNTY

GREEN RIVER CONSERVATION AREA: 12 miles south of Dixon on County 12 -- Wet to dry sand prairie scattered throughout 2,330-acre conservation area owned by the Department of Conservation.

MASON COUNTY

REAVIS NATURE PRESERVE: 5 1/2 miles south of Easton, eight miles east of Kilbourne, south of County Highway 5 -- 53 acres of loess hill prairie owned by the Department of Conservation.

SAND PRAIRIE - SCRUB OAK NATURE PRESERVE: Nine miles south of Havan and three miles east of Bath, south of County Highway 17 -- 1,460 acres of dry sand prairie and forest; parking and trails on east side of area; owned by the Department of Conservation.

MCHENRY COUNTY

QUEEN ANNE PRAIRIE - ECKERT CEMETERY CONSERVATION AREA: On Queen Anne Road north of Charles Road, northeast of Woodstock -- One-acre mesic prairie leased by the McHenry County Conservation District; interpretive trail around cemetery.

MCLEAN COUNTY

WESTON CEMETERY PRAIRIE NATURE PRESERVE: 1/2 mile east of Weston, north of Route 24 -- Five-acre mesic prairie owned by Yates Township and managed by Illinois State University.

MONROE COUNTY

FULTS HILL PRAIRIE NATURE PRESERVE: One mile east of Fults, on Mississippi River bluffs, north side of Bluff Road -- 532 acres including loess hill prairie owned by the Department of Conservation; parking and trails provided.

MOULTRIE COUNTY

CONEFLOWER HILL PRAIRIE: South of the laboratory building on the Lake Shelbyville Wildlife Management area -- Four acres of hill prairie owned by the Corps of Engineers; leased and managed by the Department of Conservation.

OGLE COUNTY

BEACH CEMETERY NATURE PRESERVE: South of Davis Junction on north side of Big Mound Road -- 2.25-acre dry-mesic prairie managed by Natural Land Institute, Rockford; access by permission only, phone (815) 964-6666.

BICENTENNIAL PRAIRIE NATURE PRESERVE: On Crestview Road 1/2 mile south of intersection of Crestview and Kishwaukee roads in northeastern Ogle County -- 11.5 acres of dry dolomite and gravel prairie owned by the Prairie Preservation Society of Ogle County, Inc.

STEPHENSON COUNTY

FREEPORT PRAIRIE NATURE PRESERVE: South edge of Freeport on Walnut Road -- Five acres of dry dolomite prairie owned by Jane Addamsland Park Foundation of Freeport; parking and trails.

TAZEWELL COUNTY

ST. CREVE COEUR NATURE PRESERVE: South end of Fort Creve Coeur Park in Creve Coeur -- Two acres of glacial till hill prairie; owned by the Village of Creve Coeur; a trail is provided.

GRAVEL TERRACE PRAIRIE: 6.5 miles north of Manito on the north side of the Manito Road -- A 19-acre bluff prairie owned by the Department of Conservation; access by permission of Site Superintendent at the Spring Lake State Park, phone (309) 968-7135.

WILL COUNTY

GRANT CREEK PRAIRIE NATURE PRESERVE: In Des Plaines River Conservation Area, east of Interstate 55, one-half mile south of Blodgett Road -- 78 acres of mesic and wet prairie owned by the Department of Conservation; no trails.

BRAIDWOOD DUNES AND SAVANNA: One mile southwest of Braidwood south of Route 113 -- 145 acres of sand prairie and savanna; owned by the Will County Forest Preserve District.

WINNEBAGO COUNTY

BELL BOWL PRAIRIE: Southwest edge of Greater Rockford Airport, north of Belt Line Road -- 15 acres of dry gravel prairie owned by Greater Rockford Airport Authority; managed by Natural Land Institute; access by permission only, phone (815) 964-6666.

HARLEM HILLS NATURE PRESERVE: East of Route 173 and south of Nimtz Road; one mile southwest of Rock Cut State Park -- 53-acre dry-mesic gravel hill prairie owned by the Department of Conservation; parking and trails.

SEARLS PARK PRAIRIE: Northwest edge of Rockford on Central Avenue -- 42 acres of wet to mesic prairie in southeast area of park owned by Rockford Park District; parking and trails.

LEDERMAN SCIENCE CENTER FIELD TRIP GUIDE

INTRODUCTION

The purpose of this guide is to furnish teachers with the types of activities their students would participate in if they were brought to the Lederman Science Center, at Fermilab, Batavia, Illinois. The activities presented could be adapted to any field trip site if it were not possible for students to experience the Lederman Science Center program.

This field trip consists of three segments: the prairie, the forest, and the bison herd. This trip should be a culminating experience following the presentation of the **Beneath The Ashes** unit of study. This guide is divided into three sections: Prairie Field Trip, Forest Field Trip, and Bison Herd Visit.

Rules for the Fermilab field trip are:

*Students must stay on trails.

*Students are not allowed to collect living or non-living material. Do not collect material for the classroom. All examinations of plants, animals, etc. must be done in the field

*Chaperones must assume responsibility for discipline and take an active role in enforcing good behavior.

Each student should have a clipboard with paper and something to draw or write with. The clipboard could be made from cardboard that has paper stapled to it.

PRAIRIE FIELD TRIP

INTRODUCTION:

Illinois is on the edge of what was once a giant grassland. To the east of Illinois was forest that extended all the way to the Atlantic Ocean. To the west was once 400,000 square miles of grassland. It went from Illinois west to the Rocky Mountains and from Canada south to the Gulf of Mexico.

Most of Illinois grasses were the tall variety, like big bluestem and switchgrass. These grasses grew up to ten feet tall and a person could easily get lost trying to walk through them. Many beautiful wildflowers grew alongside the grasses making the Illinois country a colorful place.

Today only one one- hundredth of one percent of Illinois tallgrass prairie is left. This field trip should help you picture what Illinois once looked like. It will review many of the things that you learned in the classroom.

PRAIRIE EXPERTS

If the class constructed a life-size prairie mural as one of the activities in **From Beneath the Ashes**, there should be individual students or small, cooperative groups of students who should be able to identify "their" plant. If this is the case, stop near a good example of the plant without pointing it out. Ask the cooperative group of "experts" for that plant if they can find it and show the class. With some luck this technique may also be used for some of the prairie animals, such as butterflies.

Several prairie plants deserve to be pointed out. Below is some additional background information on some typical tallgrass prairie plants. The instructor may wish to read this information to the class as the plant is found and identified:

BIG BLUESTEM GRASS. Another name for this grass is turkey foot grass. The seeds usually divide into three branches that resemble a bird's toes. The roots of this plant may go down to depths of twelve feet. The leaves have a blue-green color which becomes reddish after a frost. The Chippewa Indians made a medicine for stomach aches from this plant.

SWITCHGRASS. The loose seed head of this grass reminds some people of a Fourth of July sparkler with the seeds being the sparks flying off.

INDIAN GRASS. This is a very showy grass. It is sometimes used as a border to flower gardens. The seeds are a golden color that have many soft looking hairs in them.

COMPASS PLANT. The leaves of this plant are very large and usually have the thin edge of the leaf facing north and south. This way, they do not get the full force of the hot noon sun. This prevents the leaves from heating up and losing water. Conserving water in the dry prairie habitats is very important. Compass plant also has a very thick root that may grow ten feet or more into the soil. This assures a steady supply of water. The golden yellow blossoms bloom from June to early September.

PRAIRIE DOCK. The large leaves of prairie dock are rough, like sandpaper. The leaves at the base surround a tall leafless stalk that is from three to eight feet tall. The flowers are yellow. Its deep roots supply water to the leaves. As the water evaporates, it keeps the leaves cool. Pioneers often put these large, cool leaves under their hats for some relief from the heat of the treeless prairie. Prairie dock blooms from June to late September.

RATTLESNAKE MASTER. The long, stiff, narrow leaves of rattlesnake master have teeth and spikes along the edge. The plant resembles a desert plant called a yucca. The flowers do not look like a typical flower, They are compact, greenish-white, spiny globes. Rattlesnake master blooms from July to early September. It may have earned its name from the rattling sound that the dried seeds are said to make when the wind blows.

STIFF GOLDENROD. There are many kinds of goldenrod. You can tell if it is stiff goldenrod by gently patting the top of the plant. It will feel stiff. Goldenrods are often mistakenly blamed for causing hay fever. They do not; ragweed plant causes it. Ragweed flowers, however, are small, green, and not easily noticed. They both bloom about the same time so the showy Goldenrod flowers are often mistakenly blamed for causing hayfever.

PRAIRIE ARTWORK

Tell the students that later in the tour they will be given time to make a sketch of a plant, insect, or other natural prairie life that they really like. They should be thinking about the kind of thing that they might want to draw as they walk and do other activities.

When it is time to make the sketch, set limits of where they are allowed to go and how much time they will be allowed. For example, students must stay on the trail and must stay on the section of the trail that is limited to the area between two parent field trip helpers. The students will have five minutes to make their drawing so they must locate something to draw fairly quickly. (Watch progress of students and allow more time as needed).

After allowing time to draw, have the group join together again. Ask some students to describe or show what they have drawn. Students should carefully save their drawing because they will be using them to write something later.

POINT OF VIEW

Tell the students that in a little while they will each receive a hand lens to help them imagine that they are ants. Before handing out hand lenses, establish rules. For example, they must stay on the trail and view the plant from the trail. Parent helpers can be used to stand at the limits of how far the students may spread down the trail. Remind the students that they are not allowed to pick or break the plants. They are not to use the lens to burn anything and are not to look toward the sun with it.

The students should think about these ideas before starting the activity:

> You are an ant. What does the ground at the bottom of the plant look like? Look up at the plant that you are about to climb. What does it look like? As you use the hand lens to "climb" the stem, are there any obstacles that you need to get past? What would the plant feel like to the ant? If you were to meet another ant, how would you talk? What would you say? Do you meet

any other bugs or enemies? Pretend that the ant took a bite of the plant (You are not allowed to actually taste the plant. It may be harmful to you). What do you think it would taste like? What would it smell like? If there is a flower at the top of the plant, use the hand lens to get an ant's-eye view. What would it feel like to walk on a flower? What sounds would the ant hear while on the plant? What is the view from the top?

When it seems that most of the students have finished, have them rejoin as a group. You may wish to collect the hand lenses again to prevent distractions. Reread the suggested idea questions one at a time and ask for answers.

If you wish, ask the group for ideas of what the prairie might look like to a soaring hawk.

PRAIRIE POETRY

Have the students take out the drawing that they made. Tell them that they will be writing a type of poem called a cinquain about their drawing. The term cinquain is taken from French and Spanish words for five. A cinquain has five lines. The five lines do not rhyme, but each line has simple directions.

Have the students stay close enough to you to easily hear these directions, but to spread out on either side of you so that they will not be bothered by other students. They could sit on the path if that is the most comfortable. Read the instructions line by line, allowing the students time to write. They should write the poem on their drawing.

The first line of a cinquain is one or two words long. It is the title. For example, the title could be the name of a plant. If you don't know the real name, make up a good name that pioneer children may have used.

The second line of a cinquain is two to four words long describing the title. (You could ask for examples of adjectives. Color and size words are often given).

The third line of a cinquain is three to six words describing something that it does (action). These words often end in "i-n-g". (You could ask for examples like growing, waving, swaying, moving, etc.).

The fourth line of a cinquain is four to eight words long. This line either tells a feeling about what you drew or describes a job that it does in nature. (Feeling words might be happy, sad, lovely. Jobs might be making food, air, seeds, or attracting butterflies)

The fifth line of a cinquain is one or two words that restates the title.

You may wish to give an example:

RATTLESNAKE MASTER (1-2 word title)
ODD LOOKING, SHARP SPINES (2-4 word description)
GROWING, SWAYING, WAVING (3-6 word "i-n-g" action words)
FOOD FOR ANIMALS (3-6 word job in nature....or MAKES ME HAPPY 3-6 words for feeling)
SPIKE PLANT (1-2 word restated title)

After writing, regroup and ask for some students to share their poems by reading them aloud. Tell the students to carefully save their drawings and poems. They could be included as part of the prairie mural bulletin board at school or they could be put together as a book of prairie poems for all students in the class to have.

SETTLER IMAGINATION

Ask students to envision themselves as settlers crossing the prairie in a covered wagon. Ask them the following questions:

How would you feel? Consider the weather, your clothing, your thoughts, etc. Would you feel positive or negative? Remember, you've just left the comfort of your homes and all of your friends and relatives.

What would you do if you got sick? What would you do if your horse or oxen died?

What might you see as a child walking beside the wagon? What might you see if you were on the wagon seat?

Why do you think prairies were described as oceans of grass?

What might be some of your responsibilities or chores.? What would you do if you were separated from your wagon train?

Imagine seeing a huge wall of smoke and fire in the distance (a prairie fire). What could you do to survive (run towards the fire if it is a narrow wall of flame, because you could probably run through it; build a firebreak around your wagon; or do nothing and kiss your relatives goodbye!)?

PLANT INTERVIEW

The students are placed in pairs. One student chooses any prairie plant of his or her choice. The other student becomes the interviewer. This student could ask any logical questions and the other student would have to answer as best as possible. The students should then switch roles to allow each student the opportunity to be the plant or the interviewer.

TWENTY QUESTIONS

Each student should write the name of at least one plant or animal on a slip of paper. The teacher then draws one and the students must ask yes or no questions until the identify of the plant/animal has been determined. Do not allow the students to just randomly guess.

ANIMAL CHART

On a separate piece of paper draw a simple chart to keep track of all of the different animals which were seen on the field trip. This could be the teacher's task, or it could be delegated to a student. It would be interesting to keep track of the animals seen on the prairie and in the forest. Discuss why you saw the animals in each area. Are there specific reasons for where each animal was located?

PRAIRIE TONGUE TWISTERS

Tongue twisters were originally taught in school to improve student diction. The students could make up their own prairie tongue twisters and share them with the group. This could be done individually or in small groups. Example: A big brown bison bravely bounced across the bumpy big bluestem.

FOREST FIELD TRIP

Before entering the forest area: Ask the students to determine where the safest place would be for a rabbit to make its nest (forest or prairie). Ask the students what predators rabbits have in both the forest and prairie (hawks, coyotes = prairie; owls = forest). The safest place for rabbits would be on the border between the prairie and the forest. If they were chased by a coyote or hawk, they could seek refuge in the forest and if chased by an owl, they could seek shelter in the prairie. If you were hunting rabbits for food, where would you look? (on the edge of the forest between the two habitats)

Upon entering the forest area: As soon as all of the students have entered the forest, ask them to note differences in light, temperature, and moisture levels. It usually gets darker, cooler, and more moist than it was in the prairie. Ask for students to explain why that happens.

Any of the following activities would be appropriate but a star is placed next to those activities which could be considered first choices.

HOW OLD IS THIS LEAF?

*Ask the students to find a 1 year old, a 5 year old, and a 10 year old leaf. Remind them that they must be able to support the ages of the leaves which they find. It is the thinking process that is being stressed here and there really are not any right or wrong answers as long as they can be adequately explained. Hint: Newer leaves will be near the top and older leaves will be underneath the top layers and they will have gone through different stages of decomposition. A ten year old leaf will probably be soil.

WANTED: DEAD AND ALIVE

*Find a log in the process of decomposing. The teacher could grab a handful of the decaying log and pass some of it around to the students in your group. Ask them what they think it is (soil). Ask them to explain their answers. Other questions may include: How old do you think this tree is? How did it get here? What kinds of things are living around, under, in, or on top of the log?

SOIL COMPARISON: PRAIRIE/FOREST

*Which area has the richest soil, the prairie or the forest? Early settlers often cleared forests for their fields and found that the soil was not as rich or thick as they had hoped it would be. The prairie soil was far superior to the forest soil. Ask the students to give reasons why this is true. (The deep root structure, 10,000 years of soil buildup, and the returning of nutrients to the soil resulting from fire.).

LIFE ON AND AROUND A TREE

Point out the different types of life found around a specific tree. These might include; the tree itself, insects, squirrels, worms, moss, birds, bacteria, etc. You might also see signs of life without finding the specific plant or animal. Nuts may be buried under the soil or bacteria may be decaying matter and fertilizing the soil. If anything is turned over, please return it to its original state.

LEAF/SEED STUDY

Ask the students to find two identical leaves or seeds. (That is impossible). Ask the students to find two similar leaves or seeds. All things in nature are similar and all things are different. Ask them to explain how their leaves are similar and how they are different. Then request that they compare themselves to their leaves. How are they similar and/or different from their leaves.

HOW DID THESE TREES GET HERE?

How old is this forest? How many different types of trees are there here? You could expand this to include how the entire area, prairie and forest, got to be here. The intent of this activity is to get students to use higher level cognitive processes.

DESCRIBE A TREE/FOREST

Students will use adjectives and adverbs to describe the forest environment. They should be encouraged to use as many words as possible. Adjectives describe nouns, and adverbs describe verbs. (The large tree swayed briskly in the forest.) Descriptions could also be given about the forest in general (cool, dark, damp, scary etc.).

COMPASS STUDY

While you are in the forest, test these old Indian sayings with your compass (If you did not bring one, make sure that you know which direction is north).

A. Moss grows thickest on the north side of a tree.
B. Bark has more growth on the north side of a tree.
C. Pine tops have a tendency to tip and point in an easterly direction.
D. The north side of a hill is quieter, more moist, and has more moss. The south slope is noisier with dried leaves and twigs.

FOREST ORCHESTRA

Ask the students to be perfectly quiet for 30 seconds to a minute. Tell them to pick out any one nature sound which they find interesting. It will then be their responsibility to reproduce that sound for the entire group. Each student will reproduce their sound individually and then the entire group will work together to produce the student version of a forest orchestra.

A very important aspect to discovering the forest is to be flexible and aware of the specific needs of your group. If you see something that is interesting, investigate it. Disregard these plan sheets and discuss the deer you just saw or draw a sketch of the flower you want to research. Most importantly, have fun!

BISON HERD VISITATION

The purpose of this section is to provide teachers with the type of information their students will be receiving when they visit the Bison Herd at the Lederman Education Center at Fermilab in Batavia, Illinois. If a field trip to this facility is not possible, this information can be used as supplemental materials for students.

BISON BASICS

The ancestors of todays bison (Bison bison) are thought to have come to North America via the Bering Land Bridge. They settled in what is now Canada and the United States, with the greatest concentrations living in the western part of our country. They migrated in a wandering mode, as opposed to a pattern, much as they do today. The herds traveled at an average speed of two miles a day. Scattered groups of bison occupied Illinois in herd sizes ranging from 10 to 500. When the French trappers saw the bison, they called them "BOEUFS" (pronounced buhs), because they reminded the Frenchmen of their own cattle at home. In reality, NO buffalo live in North America, except in zoos. Buffalo make their native homes in Asia and Africa.

PHYSICAL CHARACTERISTICS

The bison is the largest land mammal in North America. There is a big difference between the size of a bull and a cow. The bull, usually twice the size of the cow, ranges in weight from 1,800 - 2,000 lbs. A bull can stand as high as 7 feet at the shoulders, whereas a cow may be 4 1/2 feet at the shoulders.

Bison have a "hump" made of muscle and bone. This helps support the animal's huge head. The hair on the bison's head and hump is 2-5 times thicker than on the rest of the body. The head is used for protection and as a weapon. Bison may charge an enemy with a head butt. The 2 inch thick skin, 4-5 inches of fur on the forehead and double layer of bone is needed to protect the animal's brain. There have been accounts of bullets being fired at the forehead of a bison only to ricochet off without injuring the animal. All this helps to give the bison its formidable appearance.

Another form of protection are the horns. These are not shed like a deer sheds its antlers. Bison horns are hollow and can grow to more than 2 feet long. Bison can use the horns to gouge an enemy (such as a hunter on a horse) or to pick up and toss a threatening wolf.

EATING HABITS

Bison thrived on the prairie because of the endless supply of grasses. However, since bison eat in full view of their predators (grizzly bears, wolves, coyotes and mountain lions) they quickly break off the grasses with their teeth and swallow them whole. Bison can do this because they are RUMINANTS . Ruminants have special stomachs of 3 or 4 sections to help them digest the whole pieces of grass by digesting them partially at first. They then bring up the partially digested food as CUD to be chewed, swallowed and digested again. Bison wait until they are in a safe place away from their predators to chew their cud in peace.

WALLOWING

Sometimes bison will fall to their knees, roll onto one side and kick dust over their bodies. This is called wallowing, and is useful in chasing off biting insects. Bison can't roll completely over like a dog because of their humps.

COMMUNICATION

In bison society, there is always a head bull who is allowed to mate freely. This is usually based on strength and size. A bull may challenge another by pawing the ground, snorting, shaking its horns, and roaring. If a head bull is challenged by a new bull, there will be a shoving match and eventual struggle. The wounded bull must relinquish to the stronger bull and leave the stronger bull to his territory. In general, only the fittest survive, so good breeding is essential.

This use of body language can be seen in other aspects of a bison's life. Even though a bison's tail is always in motion, it can also be used as a communication tool. An angry or frightened bison will have a wagging tail, and a relaxed bison will have a tail that's held downward slowly flicking bugs away.

Sounds are also important. It has been said that on a windless day, a bull's roar may be heard over a mile away. Other sounds a bison uses are sneezes and belches, especially when they play. Trapped or cornered bison will squeak or grind their teeth. Cows call their calves with soft grunts.

NATIVE AMERICAN RELATIONSHIP

Native Americans hunted the bison, yet also respected the animal. They only killed what they needed and thought they could use. Native Americans would use the entire animal, wasting nothing. For example, they ate all the meat; its fat became tallow and soap; tendons and muscles were used as thread and bowstrings; buffalo chips were used as fuel and as diaper powder.

SETTLERS

Settlers, on the other hand, killed the herds with no thought as to what they might do with the animal in general. In 1860, there were approximately 50 million bison on the Great Plains. Within 20 years, virtually all were wiped out. Only five hundred remained. The gun and the great masses of people heading west nearly caused the extinction of the bison. As the railroad was cutting across the U.S. bringing settlers to the west, they would stop the trains just to let the passengers shoot point blank at the grazing herds leaving the carcasses to rot. Thousands of bison were killed for their tongues alone which were considered a gourmet delicacy. It wasn't until the founding of national parks, wildlife preserves, and the America Bison Society that the bison were protected.

BISON TODAY

By 1990, there were about 100,000 bison in private herds and on reserves in the United States and Canada.