Prairie Seeds and Woodland Wonders

For Students Grades 2–4

Students will learn about **plant structures and the life cycle of flowering plants** through hands-on participation in authentic ecological restoration at the Litzsinger Road Ecology Center (LREC). The Prairie Seeds and Woodland Wonders Field Lab includes lesson plans for your visits to LREC, as well as classroom and schoolyard lessons to help students prepare for their field studies at LREC and to help process their field experiences once they return to the classroom.

The Prairie Seeds and Woodland Wonders Field Lab is intended to span the course of the school year in order to observe plants at all stages of their life cycles. We anticipate that your students will visit LREC once during each season of the school year. Each visit to LREC will include a restoration activity in addition to field investigations. Restoration occurs year-round, with a different suite of activities happening each season.

Outcomes

Students will...

- learn the main structures of plants.
- learn the stages of the life cycle of flowering plants.
- be introduced to the concept of ecological restoration.
- learn to use simple field observation tools.
- learn to collect and interpret data.
- increase their comfort with studying outdoors.
- practice formulating questions.

Table of Contents

Field Lab Overview

This sequence includes classroom preparatory activities, field experiences at Litzsinger Road Ecology Center, and classroom follow-up.

Preparation for Visit 1

In the classroom:
Students will explore various plant parts to find where seeds are produced and to investigate whether the size of a fruit relates to its seed production.

- *Where Do Seeds Come From?*

In the schoolyard:
Students will explore their schoolyard to study the diversity of plants and plant parts.

- *How Does Your Schoolyard Grow?*
- *Schoolyard Seeds*

Visit 1

At Litzsinger Road Ecology Center (recommended time: 2½ hours)
Students will report to Litzsinger staff a sample of their classroom and schoolyard observations. Then students will rotate through the following activities:

- *Seed Scavenger Hunt*: Students will work in teams to explore the site to collect a sample of different kinds of seeds. Students will make observations about the fruits, seeds, and other plant parts; group leaders will record students' observations. Students will take their collected fruits and seeds back to school, where they will make detailed observations that they will record.

- *Seed Collecting*: Students will work in teams to collect seeds for our ongoing ecosystem restoration at the Ecology Center.

- *Seed Cleaning*: Students will help us separate seeds from chaff. Students will make observations about the features of seeds, using words and/or drawings to record their observations.

Field Lab Overview *(continued)*

Preparation for Visit 2

In the classroom:
Students will compare their notes on plant structures. They will learn more about how seeds fit into the life cycle of a plant.

- *Seed Scavenger Hunt*: Students sort their collected fruits and seeds based on various characteristics. Students make detailed observations and record those observations.
- *Inside a Seed*: Students investigate the inside of a seed, discover the tiny plant embryo and observe the food source that nourishes its early growth.
- *Planting Seeds* (Optional): Students plant a variety of seeds in pots or sandwich bags to observe, measure, and compare their growth.

Visit 2

At Litzsinger Road Ecology Center (recommended time: 2½ hours)
Students will investigate plant parts in relation to the life cycle.

- *Seed Sowing*: Students will sow seeds into flats to assist with propagation. Students will record their observations about seed structure.
- *Outdoor Investigation*: Students will explore the Ecology Center to investigate what plants do in the winter and which plant parts will produce new growth in the spring.

Preparation for Visit 3

Students will investigate how flowers fit into the plant life cycle.

In the classroom:

- *Dissect a Flower*: Students examine flowers, identify their parts, and explore how the parts of a flower work together to produce new seeds.

Visit 3

At Litzsinger Road Ecology Center (recommended time: 2½ hours)

- *Planting*. Students will transplant seedlings into the ground to assist with propagation. Students will record their observations about seedling structure.
- *Outdoor investigation*: Students will explore the Ecology Center to investigate what plants do in the spring and to observe the structures that are producing new growth.

Missouri Grade-Level Expectations Addressed

Plants progress through life cycles of seed germination, growth, and development, reproduction, and death. These processes can be recognized, observed, and sequenced. (Grade 3, Standard 3.1.B)

Plants have organs (roots, stems, flowers, and leaves) that function in processes such as reproduction. (Grade 3, Standard 3.1.D)

Organisms may interact with other organisms or with the environment (e.g., pollination, seed dispersal, defensive mechanisms). (Grade 4, Standard 4.1.A)

Different environments (e.g., forest and prairie) support the life of different types of plants. (Grade 4, Standard 4.1.A)

Human activity has had a beneficial or harmful effect on other organisms (e.g., littering, conserving species, restoring habitats). (Grade 4, Standard 4.1.D)

Scientific inquiry includes the ability of students to formulate a testable question and explanation, and to select appropriate investigative methods in order to obtain evidence relevant to the explanation (Standard 7.1.A)

Scientific inquiry relies upon gathering evidence from qualitative and quantitative observations. (Standard 7.1.B)

Evidence is used to formulate explanations. (Standard 7.1.C)

Scientific inquiry includes evaluation of explanations (hypotheses, laws, theories) in light of scientific principles (understandings). (Standard 7.1.D)

The nature of science relies upon communication of results and justification of explanations. (Standard 7.1.E)

Activity 1
Where Do Seeds Come From?

Goal:

Students will recognize different plant parts.

Outcomes:

Students will . . .

- understand that seeds are parts of fruits
- understand that plant parts are diverse in structure
- gain experience taking measurements and recording and interpreting data
- practice observing and investigating in an outdoor setting

Materials:

- 6–8 plastic knives
- 6–8 paper plates
- Safety scissors
- 6–8 strings (2′ long)
- 6–8 rulers
- *Inside a Fruit* Student Worksheets (one per student)
- Several examples of easily obtainable plant parts (for example, produce from a grocery store—see table at right); you will also need 6–8 additional assorted fruits.

Suggested Purchases	
Roots	Beets, carrots, or turnips
Leaves	Spinach, lettuce, or "greens" (collard, mustard, etc.)
Stems	Rhubarb or asparagus
Flowers	Broccoli, cauliflower
Fruits	Oranges, peaches, green beans, eggplant, squash, tomatoes, etc. (anything with seeds)
Seeds	Pumpkin seeds, peas (the round peas, not the pods), etc.

Procedure:

1. Display the samples of plant parts asking students to describe the items. Also ask "Is this part of a plant?"
2. Ask students to name the parts of plants represented by the produce. For example, say, "Plants are made up of different parts, just like we have arms and legs. What are the parts of a plant?" Record the responses. Ask if you have examples of those parts here.
3. Show an example of seeds. Ask "What part of a plant would you look at to find seeds?"
4. Show students only the fruits.
5. Explain that all the items would be called fruits by a plant scientist, because they all contain seeds. Ask:
   - Do all fruits have the same number of seeds?
   - Do bigger fruits have more seeds than smaller fruits?
   - Do bigger fruits have bigger seeds?

   Discuss student's ideas about these questions, and challenge them to use the fruits to discover answers.

6. Demonstrate how to measure the circumference of a fruit by wrapping string around the largest part of the fruit, then measuring its length with a ruler. Give each group of students a different fruit, a string, and a ruler. Have each group measure their fruit, record its circumference on the *Inside a Fruit* student worksheet and make a prediction about the number of seeds they expect to find inside it.

7. Distribute a paper plate and plastic knife to each group. Have students cut their fruit open, make a drawing of the inside of it on the worksheet, and then count the seeds. If a fruit has many seeds, you may wish to give half of them to one team, and half to another.

8. When all have finished, record each team's findings on a class chart:

Fruit	Circumference	Number of Seeds Predicted	Number of Seeds Found

Review the data. Ask:

- Which fruit had the most seeds? The fewest?
- Was it true that larger fruits held more seeds?
- What is the purpose of a fruit? Why do plants produce fruits?
- Why do you think some fruits have so many seeds?
- How is it to the plant's advantage to produce many seeds?

Adapted, in part, from Life Cycles of Plants: Growing Through Changes, *Midwest Public Garden Collaborative, 1997.*

Teacher's Notes:

What's a fruit and what's a vegetable?

Grocery managers usually arrange produce into "fruits" which are sweet flavored, and "vegetables" which tend to be starchy or leafy, such as potatoes or spinach. To a botanist, the traditional "vegetable" aisle is an entire array of plant parts, including carrot roots, parsley leaves, celery leafstalks, and asparagus stems, as well as quite a few fruits. Botanically, a fruit develops from a pollinated flower and holds the ripened seeds of the plant. Pea pods, tomatoes, and green peppers are classified as fruits.

A fruit develops from a pollinated flower.

When a flower is pollinated and fertilized, the ovary of the flower generally ripens into the fruit with its seed(s). As the seeds develop, the ovary swells to protect them. It may become fleshy and juicy like a peach or a pear, or it may become hard and dry, like a milkweed pod or an acorn shell. The seeds of juicy fruits are often dispersed by animals who are enticed to eat the fleshy, flavorful parts and deposit the seeds away from the parent plant. Some dry fruits produce seeds with wings or fluffy plumes that are dispersed by wind.

Student Worksheet
Inside a Fruit

Name_____

Directions: BEFORE you cut your fruit, answer question 1. AFTER you cut it, answer question 2.

1. Our fruit is a _____.

   It measures _____cm around (in circumference).

   We predict we will count _____seeds inside.

2. This is what our fruit looks like on the inside:

   When we counted, it had _____ seeds inside.

Activity 2
Schoolyard Seeds

Goal:

Students will explore their schoolyard to study the diversity of plants (and plant parts).

Materials:

- Colored string, flags, or flagging tape
- Clipboards
- *How Does Your Schoolyard Grow?* and *Schoolyard Seeds* Student Worksheets (one per student)
- Pencils
- Transparent tape

Preparation:

Scout out your schoolyard to find a place with plant diversity that includes trees, shrubs, and non-woody plants. Look for an area where all the students will have space to work. Choose the boundaries of the class study area and divide the whole area into smaller areas for each group. Use colored string, flags, or flagging tape to mark the areas.

Procedure:

1. Divide your students into small groups.
2. Have each student or group of students explore their own study area within the larger study area.
3. Students will explore to answer the following questions:
   - How many different kinds of plants can you find?
   - Can you find different kinds of stems?
   - Leaves?
   - Flowers?
   - Fruits?

   They will record their observations on their *How Does Your Schoolyard Grow?* student worksheet.
4. If students are allowed to collect fruits or seeds from your schoolyard, have the students tape their fruits and/or seeds to the *Schoolyard Seeds* worksheet and record their responses to the questions.

Student Worksheet

Name_____

How Does Your Schoolyard Grow?

Describe or draw the stems, leaves, flowers, and fruits you find in your study area.

Stems
Leaves
Flowers
Fruits

Student Worksheet
Schoolyard Seeds

Name_____

Tape or sketch fruit below.

What do you notice about the plant?

_____

_____

_____

What do you notice about the fruit or seeds?

_____

_____

_____

Record any questions you have about this plant.

_____

_____

_____

Name of plant (if you know) _____

Tape or sketch fruit below.

What do you notice about the plant?

_____

_____

_____

What do you notice about the fruit or seeds?

_____

_____

_____

Record any questions you have about this plant.

_____

_____

_____

Name of plant (if you know) _____

Program Title: Prairie Seeds and Woodland Wonders
Visit 1 of 3

Field Lab Unit Learning Goals

Students will understand that…
- Plants are made up of a variety of parts.
- Plants have life cycles.

Students will help with the ongoing prairie and woodland restoration projects at LREC.

Primary Goals for Visit 1

The primary goals of this visit are to increase students' comfort exploring and observing the natural world, to investigate plant structures and life cycles, and to assist in ecological restoration.

Essential Questions to Investigate at LREC

1. What are the common parts of plants?
2. How do plants grow and reproduce?

Learning Activities

Setting the stage (*relates LREC activities to previous activities and addresses Field Lab Unit Learning Goals; led by teacher and staff*):
Students will report to LREC staff a sample of their classroom and schoolyard observations and what they know about fruits and seeds. The Essential Questions will be introduced. Staff will also discuss ecological restoration.

Small group activities/rotations (*led by staff and volunteers*)
Students will rotate through the following activities:

1. *Seed scavenger hunt*: Students will work in teams to explore the site to collect a sample of different kinds of seeds. Students will make observations about the fruits, seeds, and other plant parts; group leaders will record students' observations (*How Does LREC Grow in the Fall?*). Students will take their collected fruits and seeds back to school, where they will make detailed observations that they will record.
2. *Seed collecting*: Students will work in teams to collect seeds for our ongoing ecological restoration at LREC.
3. *Seed cleaning*: Students will help us separate seeds from chaff. Students will observe the features of seeds, using words and/or drawings to record their observations (*Seed Cleaning*).

Schedule

	Group 1	Group 2	Group 3	Group 4
9:00 – 9:20	Setting the Stage (cabin or deck)			
9:25 – 10:40	Seed hunt and collecting	Seed hunt and collecting	Seed hunt and collecting	Seed hunt and collecting
10:45 – 11:15	Seed cleaning (barn)	Seed cleaning (barn)	Seed cleaning (cabin)	Seed cleaning (cabin)
11:15 – 11:25	Group discussion/assessment (cabin or deck)			
11:25	Prepare to depart			

Group discussion/assessment (*led by teacher and staff*)
Students will share their observations and their answers to the Essential Questions. Teacher introduces activities to follow LREC visit. Staff introduces the activities for the next visit.

Next steps (*led by teacher*)
Suggested follow-up classroom activities:

1. *Seed Scavenger Hunt:* Students sort their collected fruits and seeds based on various characteristics. Students make detailed observations and record those observations (*Seed Scavenger Hunt*).
2. *Inside a Seed:* Students investigate the inside of a seed, discover the tiny plant embryo and observe the food source that nourishes its early growth.
3. *Planting Seeds*: Students plant a variety of seeds in pots or sandwich bags to observe, measure, and compare their growth.

Visit 1 Worksheet

Name_____

How Does LREC Grow in the Fall?

Describe or draw the stems, leaves, flowers, and fruits or seeds you find here.

Stems
Leaves
Flowers
Fruits or Seeds

Visit 1 Worksheet
Seed Cleaning

Name_____

Tape or sketch fruit below.

What do you notice about the fruit?

_____

_____

_____

How many seeds are in one fruit?

_____

What else do you notice about the seeds?

_____

_____

Record any questions you may have about this plant.

_____

_____

Name of plant (if you know) _____

Tape or sketch fruit below.

What do you notice about the fruit?

_____

_____

_____

How many seeds are in one fruit?

_____

What else do you notice about the seeds?

_____

_____

Record any questions you may have about this plant.

_____

_____

Name of plant (if you know) _____

Student Worksheet
Seed Scavenger Hunt

Name_____

Tape or sketch fruit below.

What do you notice about the fruit?

_____

_____

_____

How many seeds are in one fruit?

_____

What else do you notice about the seeds?

_____

_____

Record any questions you may have about this plant.

_____

_____

Name of plant (if you know) _____

Tape or sketch fruit below.

What do you notice about the fruit?

_____

_____

_____

How many seeds are in one fruit?

_____

What else do you notice about the seeds?

_____

_____

Record any questions you may have about this plant.

_____

_____

Name of plant (if you know) _____

Activity 3
Inside a Seed

Goal:

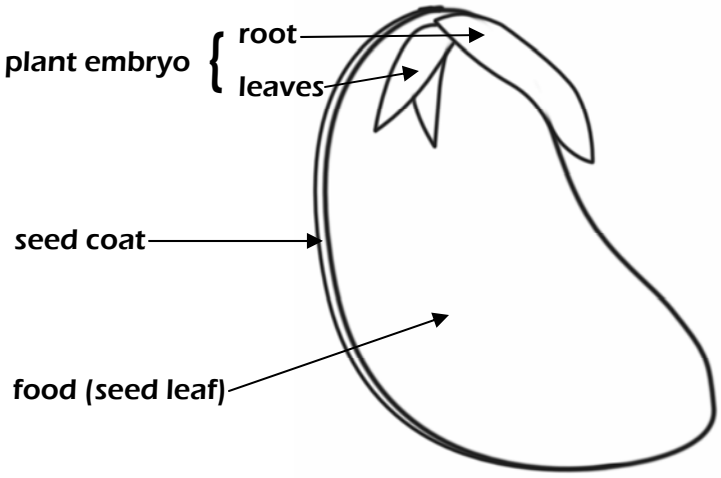
Students investigate the inside of a seed, discover the tiny plant embryo, and observe the food source that nourishes its early growth.

Materials:

- 30 lima beans (soak overnight in water to make dissection easier)
- 15 hand lenses
- *Inside a Lima Bean* transparency

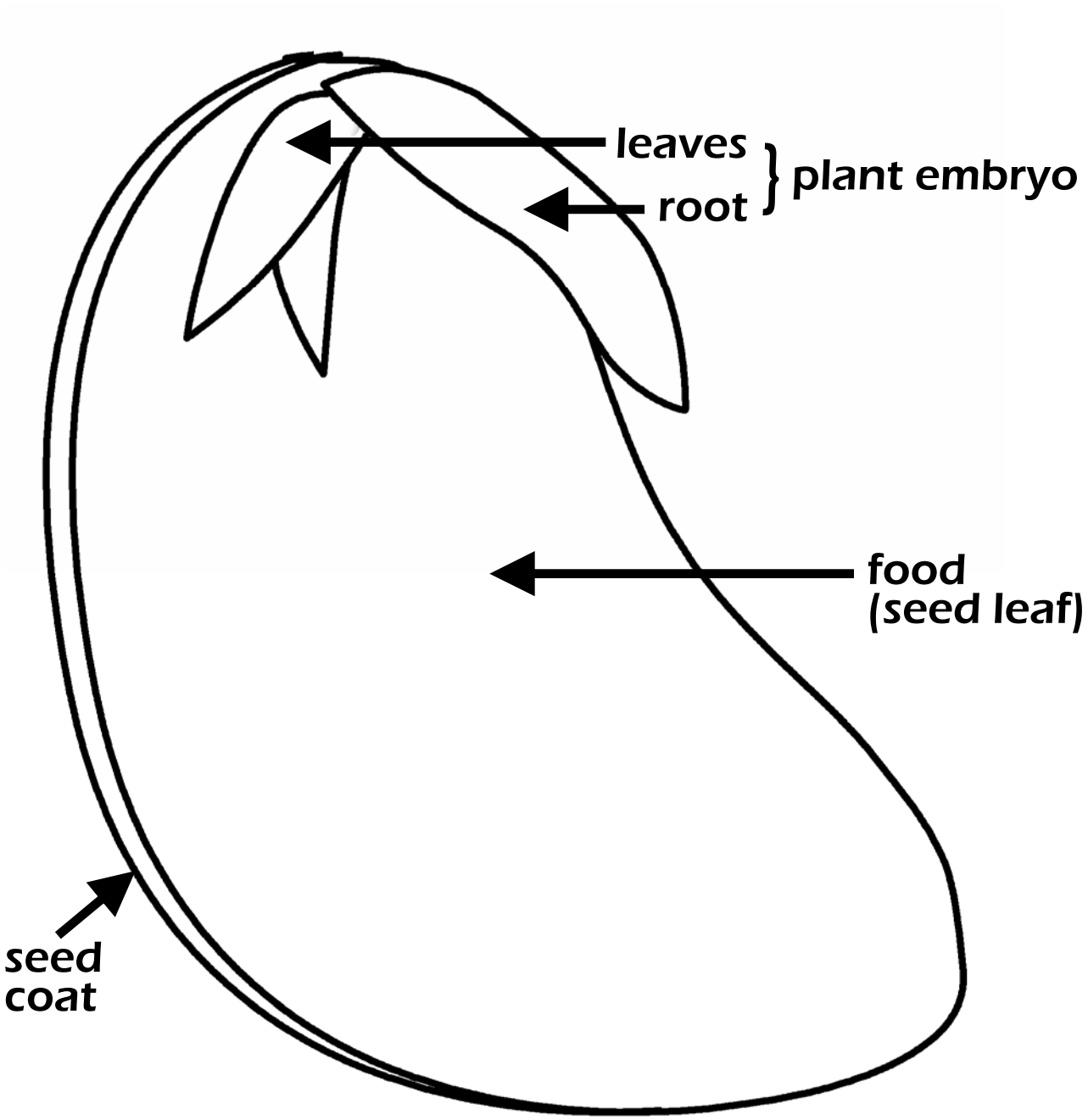
Procedure:

1. Remind students that they have dissected fruits to discover where seeds are produced. Ask students what they think the inside of these seeds might look like. Do they think every kind of seed looks different on the inside or are they alike in some way?
2. Distribute a soaked lima bean to each student. Direct them to carefully peel the outer covering off the seed, and to use their hand lenses to look closely as they separate the seed into two halves. Use a transparency of *Inside a Lima Bean* to help children identify the *seed coat* (the covering that protects the seed, the *embryo* or tiny plant with its pre-formed leaves and root) and the two *seed leaves* or stored food (that nourishes the embryo as it grows to the top of the soil). Although seeds vary, they generally have a seed coat, a plant embryo, and some form of stored food.



Adapted, in part, from Life Cycles of Plants: Growing Through Changes, *Midwest Public Garden Collaborative, 1997.*

Inside a Lima Bean



Program Title: Prairie Seeds and Woodland Wonders
Visit 2 of 3

Field Lab Unit Learning Goals

Students will understand that…
- Plants are made up of a variety of parts.
- Plants have life cycles.

Students will help with the ongoing prairie and woodland restoration projects at LREC.

Primary Goals for Visit 2

The primary goals of this visit are to further investigate plant structures and life cycles and to assist in ecological restoration.

Essential Questions to Investigate at LREC

1. What do plants do in the winter? Are there plants here that are alive?
2. What plant parts will produce new growth in the spring?

Learning Activities

Setting the stage (*relates LREC activities to previous activities and addresses Field Lab Unit Learning Goals; led by teacher and staff*)
Students will report to LREC staff what they know about fruits and seeds and what they did during their previous visit. The Essential Questions will be introduced.

Small group activities/rotations (*led by staff and volunteers*)
Students will rotate through the following activities:

Seed sowing: Students will sow seeds into flats to assist with propagation. Students will record their observations about seed structure.

Outdoor investigation: Students will explore the Ecology Center to answer the Essential Questions listed above.

Schedule

	Group 1	Group 2	Group 3	Group 4
9:00 – 9:15	Setting the Stage (cabin or deck)			
9:15 – 9:45	Seed sowing	Outdoor investigations	Outdoor investigations	Outdoor investigations
9:45 – 10:15	Outdoor investigations	Seed sowing	Outdoor investigations	Outdoor investigations
10:15 – 10:45	Outdoor investigations	Outdoor investigations	Seed sowing	Outdoor investigations
10:45 – 11:15	Outdoor investigations	Outdoor investigations	Outdoor investigations	Seed sowing
11:15 – 11:25	Group discussion/assessment (cabin or deck)			
11:25	Prepare to depart			

Group discussion/assessment (*led by teacher and staff*)
Students will share their observations and their answers to the Essential Questions. Teacher introduces activities to follow LREC visit. Staff introduces the activities for the next visit.

Next steps (*led by teacher*)
Suggested follow-up classroom activities:

Dissect a flower: Students examine flowers, identify their parts, and explore how the parts of a flower work together to produce new seeds.

Review plant parts, especially buds.

Visit 2 Worksheet

Name_____

How Does LREC Grow in the Winter?

Find samples of plants for each of the boxes below to show what plants do during the winter. Write and/or draw what you find.

Stems	**Leaves**
Flowers	**Fruit**
Evidence that plants are alive in the winter.	
Plant part that will produce new growth in the spring.	

Visit 2 Worksheet
Seed Sowing

Name_____

Plant name: _____

Habitat (from reading): _____

Flower color (from reading: _____

Transplant date: _____

Description: _____

_____

_____

_____

_____

_____

Sketch (including measurements):

Activity 4
Dissect a Flower

Goal:

Students examine flowers, identify their parts, and explore how the parts of a flower work together to produce new seeds.

Materials:

- hand lenses
- *Parts of a Flower* transparency
- *Pollination* transparency
- Flowers (one per two or three students) (Note: Flowers with large parts work best, e.g. gladiolus, daffodil, tulip, lily, hibiscus; florists or funeral parlors may donate spent flowers for classroom work.)
- 5–6 rolls clear tape
- *Inside a Flower* student worksheets (one per student)

Procedure:

1. Ask students to describe experiences they have had with flowers. Ask them to share what they know about flowers, and what a flower does for a plant. Why do they think flowers are important for plants?

2. Pass out a flower and a hand lens to each pair of students, and have them use it to closely examine the flower. Direct students to draw the flower on the worksheet *Inside a Flower*.

3. Use the transparency *Parts of a Flower* to discuss the following flower parts and where they are located: **sepal**, **petal**, **stamen** with **pollen**, **pistil** with **ovules**. Direct students to look carefully in their flowers and see whether they can find each of these parts. Remind them that there are many different kinds of flowers that do not look exactly like the diagram, and that a particular kind of flower may not have all these parts. For example, tulips, daffodils, and lilies do not appear to have sepals; their sepals have evolved to look like petals. Other flowers may lack stamens or a pistil.

4. When students have located the stamens and pollen, use the transparency *Pollination* to explain the pollen must be moved from a stamen to the pistil for pollination to occur and the flower to produce seeds. Encourage students to use their fingertip to try to brush pollen onto the tip of the pistils in their flowers.

5. After students have examined their flowers encourage them to carefully take their flowers apart, and to tape down an example of each part under its name on the *Inside a Flower* worksheet. They may also draw a line from the taped part to its location in the picture they drew earlier.

Adapted, in part, from Life Cycles of Plants: Growing Through Changes, *Midwest Public Garden Collaborative, 1997.*

Teacher's Notes:

FYI Flowers and Pollination

Although flowers vary greatly, they have a number of basic parts. The two outer parts, the sepals and the petals, are generally the easiest to find. The sepals are usually green and protect the flower bud before it opens. The petals are often brightly colored to draw attention to the flower. The pistil, the female part of the flower, is usually located in the center. It often has a sticky tip (to trap pollen) and is swollen at the base where the ovules or "eggs" are borne. The stamens, the male part of the flower, are generally found in a ring around the pistil. Each stamen is a tiny stem with a sac of dustlike pollen grains at the top.

Many kinds of flowers have all the parts listed: sepals, petals, stamens and a pistil or pistils. There are a number of other flowers in which one or more of these parts are missing. Some plants produce flowers that either have only male parts (i.e. stamens) or only female parts (i.e. pistils), but not both, in the same flower.

Pollination is the transfer of pollen from the male to the female part of the flower. It is usually necessary in order for seeds to develop. Wind, water, or animals may transfer the pollen. Insects, birds, and bats are the most important animal pollinators. In its search for food, a pollinator may be attracted to a flower by its smell, color, or shape. As the pollinator searches for nectar and/or pollen to eat, the structure of the flower insures that it carries pollen along to the next flower it visits.

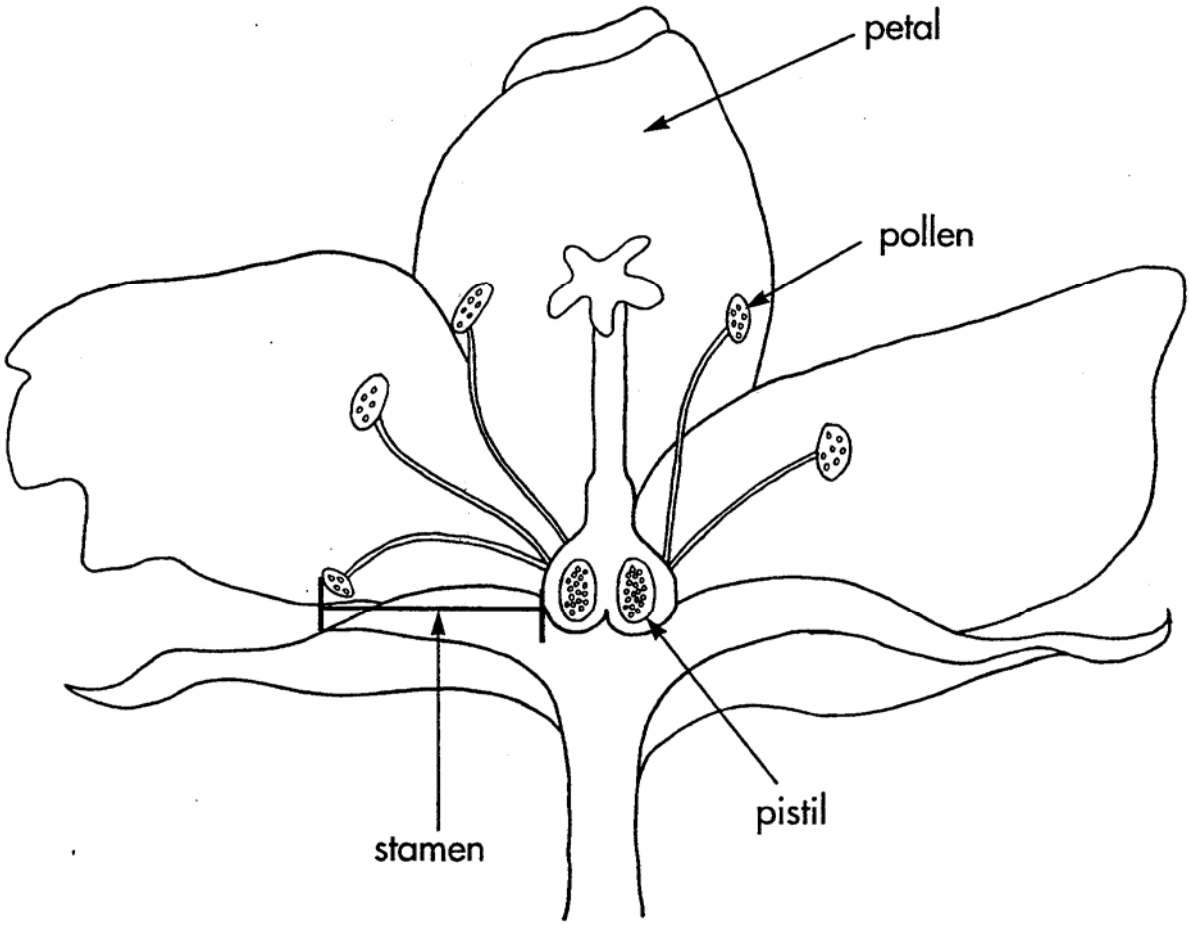
See the following resources for additional information:

From Flower to Fruit, by Anne Ophelia Dowden (Tickner & Fields Books for Young Readers, 1994)

From Flower to Flower: Animals and Pollination, by Patricia Lauber (Crown Publishers, 1986)

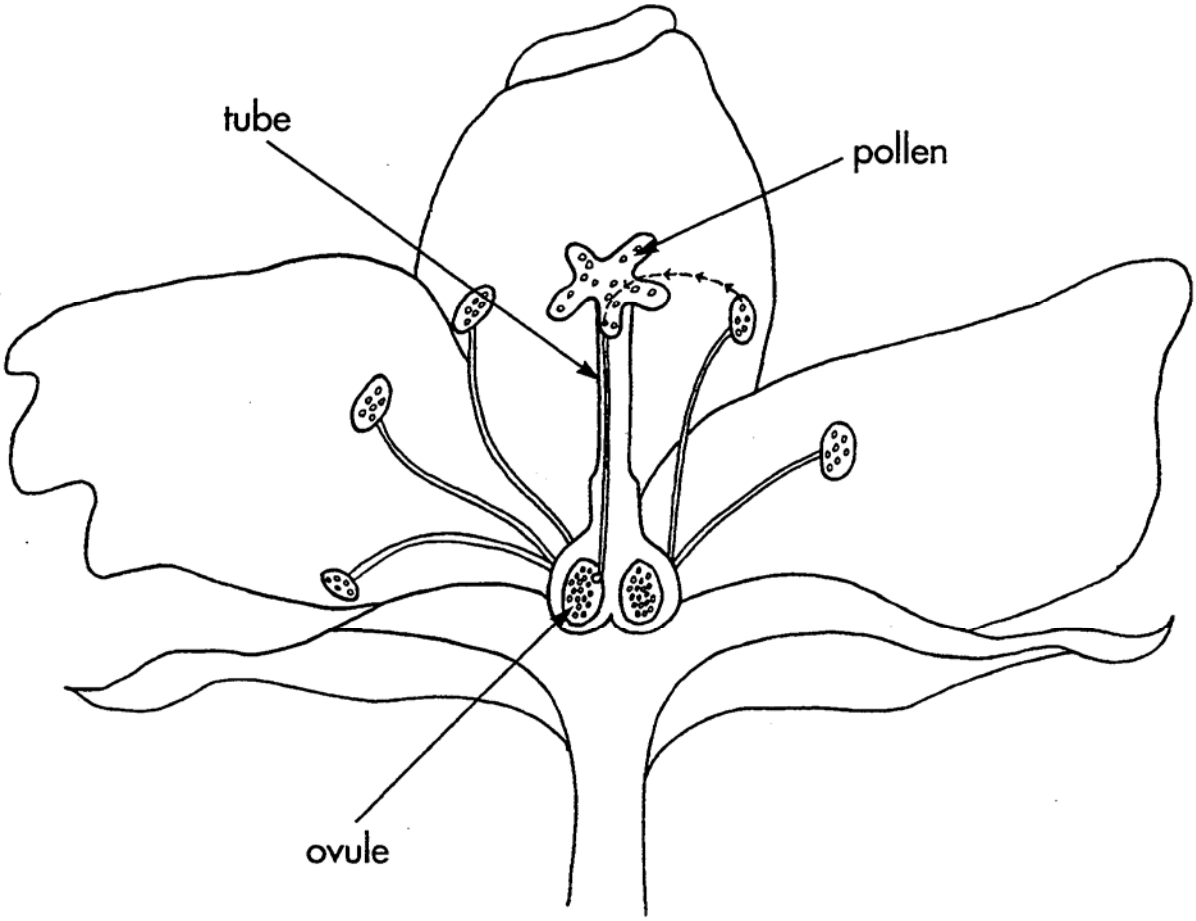
The Young Scientist Investigates Flowers, by Terry Jennings (Children's Press, 1981)

Parts of a Flower



Drawing from Life Cycles of Plants: Growing Through Changes, *Midwest Public Garden Collaborative, 1997.*

Pollination



Drawing from Life Cycles of Plants: Growing Through Changes*, Midwest Public Garden Collaborative, 1997.*

Student Worksheet
Inside a Flower

Name_____

BEFORE you take it apart, draw a picture of your flower. AFTER you take your flower apart, tape an example of each part you find under its name. Then draw a line from the taped part to show its location in your picture.

stamen with pollen

pistil with ovules

sepal

petal

Program Title: Prairie Seeds and Woodland Wonders
Visit 3 of 3

Field Lab Unit Learning Goals

Students will understand that…

- Plants are made up of a variety of parts.
- Plants have life cycles.

Students will help with the ongoing prairie and woodland restoration projects at LREC.

Primary Goals for Visit 3

The primary goals of this visit are to further investigate plant structures and life cycles and to assist in ecological restoration.

Essential Questions to Investigate at LREC

1. What do plants do in the spring?
2. What plant parts are producing new growth?

Learning Activities

Setting the stage (*relates LREC activities to previous activities and addresses Field Lab Unit Learning Goals; led by teacher and staff*)
Students will report to LREC staff what they know about fruits and seeds and what they did during their previous visit. The Essential Questions will be introduced.

Small group activities/rotations (*led by staff and volunteers*)
Students will rotate through the following activities:

1. *Planting*. Students will transplant seedlings into the ground to assist with propagation. Students will record their observations about seedling structure.
2. *Outdoor investigation*. Students will explore the Ecology Center to answer the Essential Questions listed above.

Schedule

	Group 1	Group 2	Group 3	Group 4
9:00 – 9:15	Setting the Stage (cabin or deck)			
9:15 – 9:45	Planting	Outdoor investigations	Outdoor investigations	Outdoor investigations
9:45 – 10:15	Outdoor investigations	Planting	Outdoor investigations	Outdoor investigations
10:15 – 10:45	Outdoor investigations	Outdoor investigations	Planting	Outdoor investigations
10:45 – 11:15	Outdoor investigations	Outdoor investigations	Outdoor investigations	Planting
11:15 – 11:25	Group discussion/assessment (cabin or deck)			
11:25	Prepare to depart			

Group discussion/assessment (*led by teacher and staff*)
Students will share their observations and their answers to the Essential Questions. Teacher introduces activities to follow LREC visit.

Next steps (*led by teacher*)
Suggested follow-up classroom activities:
Review plant parts. Tie together life cycle stages to present a complete picture.

Visit 3 Worksheet

Name_____

How Does LREC Grow in Spring?

Describe or draw the stems, leaves, flowers, fruits, and buds you find here. Record any questions you have on the back of this worksheet.

Stems
Leaves
Flowers
Fruits
Buds

Visit 3 Worksheet
Seedling Transplanting

Name_____

Plant name: _____

Habitat (from reading): _____

Flower color (from reading: _____

Transplant date: _____

Location where transplanted to:_____

Description: _____

_____

_____

_____

_____

_____

Sketch (including measurements):

Glossary

Angiosperm: A plant that produces true flowers and whose seeds are enclosed within fruits. Ferns and pine trees are not angiosperms.

Annual: A plant that is able to complete its life cycle within one growing season.

Biodiversity: All the different kinds (species) of organisms living in an area.

Bud: An immature shoot, protected by tough scales, from which the flower or the stem and leaves may develop.

Chaff: The extra stuff around a seed, like the fruit and stems, which is removed when seeds are cleaned.

Cotyledon: Structure in seeds that either stores or absorbs nutrients.

Dispersal: Movement to a new place. Seeds are dispersed by wind, water, gravity, or animals.

Ecological restoration: The process of putting ecosystems back the way they were before disturbance. Ecological restoration includes returning viable populations of organisms as well as returning ecosystem processes such as fire, pollination, and dispersal.

Ecology: The scientific study of the interactions and relationships among organisms and with their non-living environment.

Ecosystem: An ecological community and its environment interacting and functioning as a unit.

Flower: The reproductive structure of most kinds of plants on earth. (Pine trees and ferns, for example, don't produce flowers.) The male and female structures can be in the same flower or in separate flowers. The male structures produce pollen; the female structures include the ovary, which matures into a fruit and contains ovules that mature into seeds.

Flowering plant: see *Angiosperm*

Fruit: The ripened ovary of a plant and its contents (seeds).

Glossary *(continued)*

Germination: The beginning of growth of a seed. When the seed begins to grow, the seed leaf or leaves (cotyledon(s)) emerge from the seed.

Growth: The expansion of living tissue by an increased number of cells through cell division.

Invasive species: An aggressive, non-native species that takes over the habitat of species formerly growing or living in an area. Invasive species can be plants or animals, causing both ecological and economic damage.

Leaves: The thin organs extending from the stem of a plant; the main site of photosynthesis.

Native species: A species that originated in a particular place; indigenous.

Node: The area of the stem where the leaf or leaves attach.

Perennial: A plant that has the potential to live many years.

Petiole: The stalk that attaches a leaf to the stem; a leaf stalk.

Pollination: The transfer of pollen grains from the male flower structures to the female flower structures.

Prairie: An open community dominated by grasses with very few to no trees.

Reproduction: The production of offspring.

Root: The lower part of a plant, usually underground. Roots anchor the plant and transport water and mineral nutrients from the soil into the plant.

Scarification: Weakening or cutting of the seed coat as a means of increasing the likelihood of germination. Examples of ways seeds are scarified include passing through an animal's gut or abrasion by soil particles. Scarification might be mimicked by soaking seeds in an acidic solution or by rubbing seeds with sand paper.

Glossary *(continued)*

Stratification: Subjecting seeds to sufficiently low temperatures for an extended time period, often weeks, to overcome barriers to germination.

Seed: The discrete body from which a new plant grows. The seed has an outer coat that protects the embryo plant and its food store within. The food may be stored in the cotyledons (seed leaves) in the embryo itself (as in beans) or around the embryo in the endosperm (as in corn kernels).

Stem: The part of the plant that bears leaves, buds, and flowers. The stem forms the central axis and provides mechanical support.

Vegetable: A vegetative (non-reproductive) plant part, such as roots, stems, or leaves.

Web Resources

Litzsinger Road Ecology Center
http://www.litzsinger.org

The Biology of Plants (Missouri Botanical Garden)
http://www.mbgnet.net/bioplants/

Wisconsin Fast Plants®
http://www.fastplants.org

Botanical Society of America
http://www.plantingscience.org

Missouri Department of Conservation
http://www.mdc.mo.gov

Missouri State Parks
http://www.mostateparks.com

St. Louis County Parks
http://www.co.st-louis.mo.us/parks/

Build-a-prairie game (Bell Museum)
http://www.bellmuseum.org/distancelearning/prairie/build/

Appendix 1
Calendar of LREC Restoration Activities

January

- Seed
    - Plan and prepare seed mixes
    - Sow seed mixes in prairie and woodland areas post-burn
    - Stratify seed mixes for spring sowing if burn not anticipated until late in season
    - Sow chaff in burn units
    - Catalog sowing efforts as they are completed
    - Update GIS database with new sowings from the previous season
- Propagation activities
    - Sow seeds into flats for germination
    - Catalog propagation efforts as they are completed
- Planting
    - Order MDC tree seedlings

February

- Seed
    - Sow seed mixes in prairie and woodland areas post-burn
    - Sow chaff in burn units
    - Update GIS database with new plantings and other management changes from the previous season
    - Catalog sowing efforts as they are completed
- Propagation activities
    - Continue sowing seeds into flats for germination
    - Begin transplanting seedlings to pots
    - Catalog propagation efforts as they are completed
- Planting
    - Move trees from nursery to restoration areas

March

- Seed
    - Sow stratified seed mixes in prairie areas post-burn
    - Update GIS database with new plantings and other management changes from the previous season
    - Catalog sowing efforts as they are completed
- Propagation activities
    - Continue transplanting seedlings to pots
    - Catalog propagation efforts as they are completed
- Planting
    - Move trees from nursery to restoration areas

    - Begin planting tree seedlings from MDC
    - Order and plant trees and shrubs

April

- Seed
    - Update GIS database with new plantings and other management changes from the previous season
    - Catalog sowing efforts as they are completed
    - Collect spring ephemeral seed
    - Clean and sow spring ephemeral seeds into bare areas
- Propagation activities
    - Continue transplanting seedlings to pots
    - Catalog propagation efforts as they are completed
    - Begin moving plants outside
    - Begin planting greenhouse plants April 15
- Planting
    - Move trees from nursery to restoration areas
    - Begin planting tree seedlings from MDC
    - Begin planting greenhouse plants April 15
    - Plant shrubs and trees

May

- Seed
    - Collect spring ephemeral seed
    - Clean and sow spring ephemeral seeds into bare areas or flats
    - Catalog collected seeds in database
- Propagation activities
    - Catalog propagation efforts as they are completed
    - Continue planting greenhouse plants
- Planting
    - Finish planting tree seedlings from MDC
    - Continue planting greenhouse plants
    - Finish planting shrubs and trees

June

- Seed
    - Collect seed
    - Dry and clean seed
    - Catalog collected seeds in database
- Propagation activities
    - Catalog propagation efforts as they are completed
    - Finish planting greenhouse plants or give them away
- Planting
    - Finish planting greenhouse plants

July
- Seed
    - Collect seed
    - Dry and clean seed
    - Catalog collected seeds in database

August
- Seed
    - Collect seed
    - Dry and clean seed
    - Catalog collected seeds in database

September
- Seed
    - Collect seed
    - Dry and clean seed
    - Catalog collected seeds in database

October
- Seed
    - Collect seed
    - Dry and clean seed
    - Catalog collected seeds in database

November
- Seed
    - Collect seed
    - Dry and clean seed
    - Catalog collected seeds in database
- Propagation
    - Begin stratification of seeds for propagation

December
- Seed
    - Plan seed mixes for woodland, prairie over-seeding, and new restoration areas
    - Create seed mixes for woodland, prairie over-seeding, and new restoration areas
    - Complete seed cleaning and indexing
- Propagation
    - Complete stratification of seeds for propagation

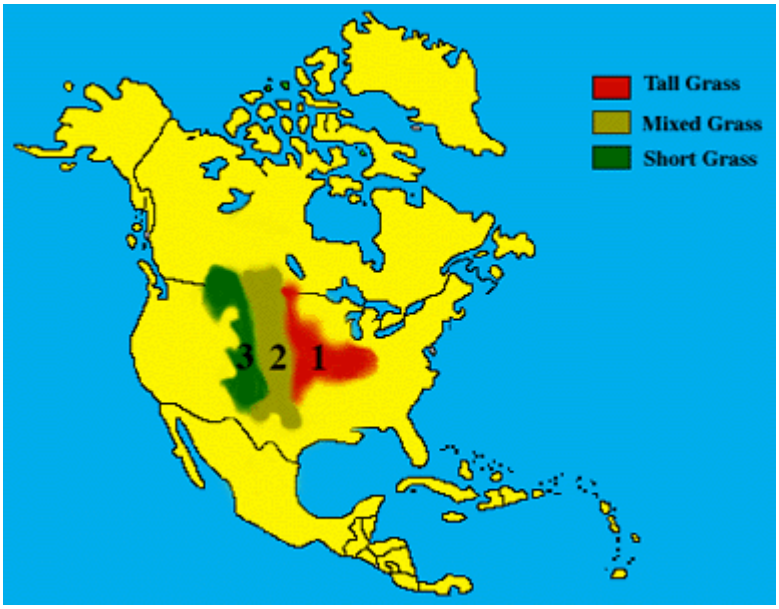
Appendix 2
Missouri Prairies

Introduction—Missouri's prairie legacy

The first Europeans to encounter the vast grasslands of central North America were astounded by their size, productivity, wildlife abundance and striking appearance. These grasslands were unlike anything they had previously encountered. They named these areas prairie, after the French word for a grassy meadow. Prairies are one of the most distinctive aspects of the North American landscape.

Prairies are diverse grasslands with an abundance of wildflowers and few woody plants. Numerous animals are adapted to prairie environments, from bison and prairie-chickens to the small and secretive prairie mole cricket. At least 15 million acres of Missouri, covering more than a third of the state, were prairie at the time of European settlement. Forty percent of St. Louis and portions of Kansas City were prairies covered with grass and wildflowers. These prairies ranged from having sterile, thin acidic soils over sandstone bedrock to rich black soils more than 15 feet deep covered with lush grasses.

Prairies once occupied much of the central part of North America, from the Rocky Mountains eastward to Indiana, with scattered smaller prairies extending into New England and North Carolina. There are three major types of prairie: shortgrass, mixed-grass and tallgrass. These types are largely determined by rainfall. The easternmost and most productive prairie is tallgrass prairie, which is the only type found in Missouri. Tallgrass prairies are characterized by an abundance of prairie grasses capable of growing to three feet or more tall, such as big bluestem, little bluestem, Indian grass and switch grass. In favorable sites, tallgrass prairie grasses can reach twelve feet tall.



More than 800 plant species occur on Missouri's prairies. Many of these plants have deep roots that can penetrate more than fifteen feet under the ground. This deep root system allows the prairie to flourish under the periodic fires, harsh winters, summer droughts and grazing by bison that have characterized the midwestern landscape. Prairie root systems also allow prairies catch and hold water extremely efficiently. The slow percolation of water through the soil accounted for the year-round clear-flowing prairie streams and springs

noted by early settlers.

This same well-developed root system also formed the rich organic soils that led to the downfall of the prairie when, in 1837, John Deere invented the steel moldboard plow that made easier for settlers to break the tough prairie sods. Within a generation, this once vast grassland became the breadbasket of the world.

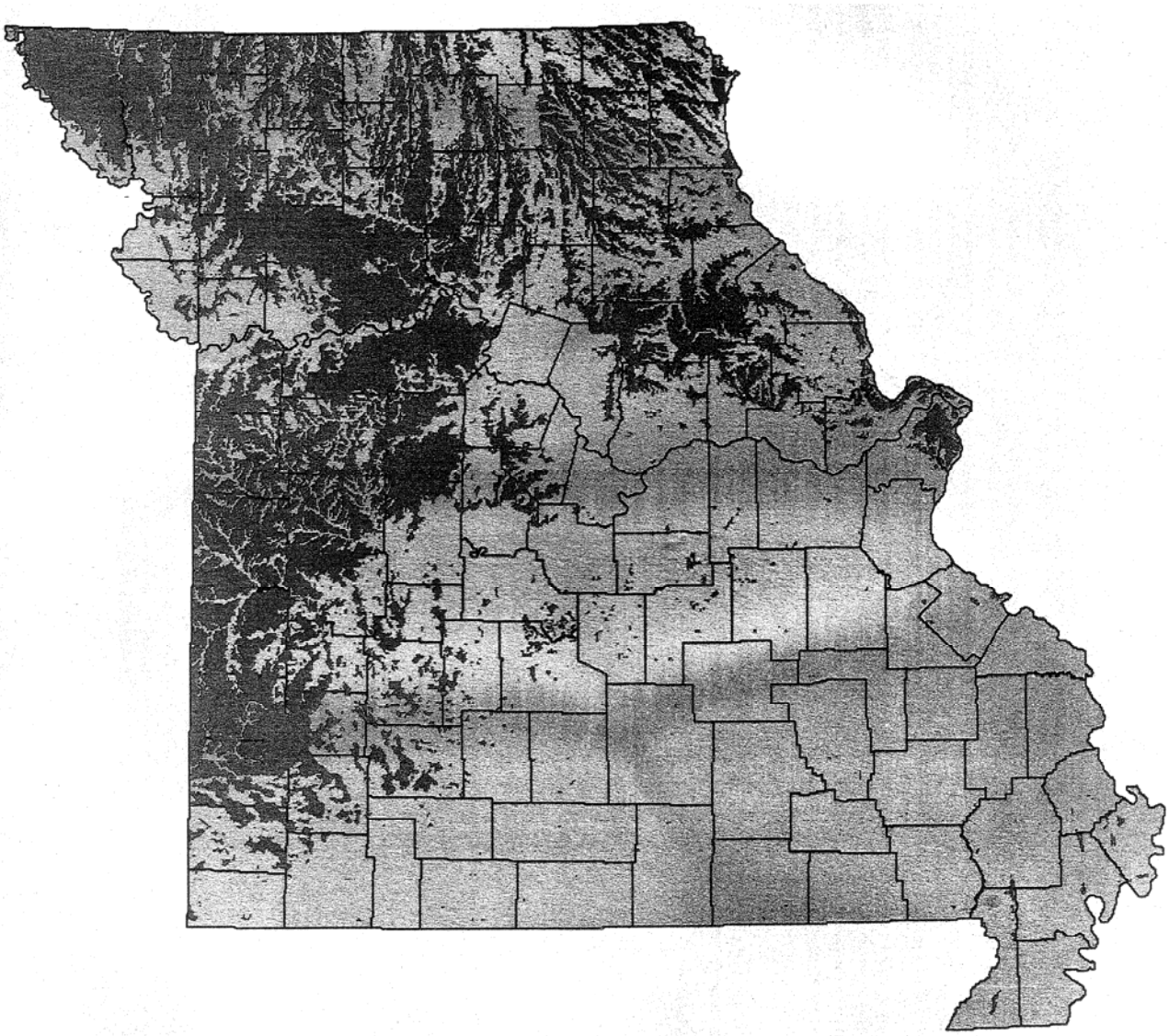
Today, fewer than 90,000 acres of Missouri's original prairie remains. More than 22,000 acres of this prairie is open to the public. Our remaining prairies are the legacy of a few visionary citizens who advocated conservation, practiced sound prairie management on their farms and who contributed to or donated prairie to conservation organizations. Missouri's public prairies are owned and managed by the Missouri Department of Conservation, Missouri Department of Natural Resources, The Nature Conservancy, the Missouri Prairie Foundation, the University of Missouri and the Ozark Regional Land Trust.

Missouri's prairies are home to an array of plants and animals superbly adapted to the stresses of the prairie environment. Our prairies provide a breathtaking window into the past, revealing a glimpse of the landscape and wildlife that shaped our history. An immersion in the prairie world, even for a brief period, can create new insights about our ongoing relationship with the natural environment.

Doug Ladd,
The Nature Conservancy

From Public Prairies of Missouri, *Missouri Department of Conservation*
Graphic from www.mbgnet.net/sets/grasslnd/index.htm

Missouri Presettlement Prairie

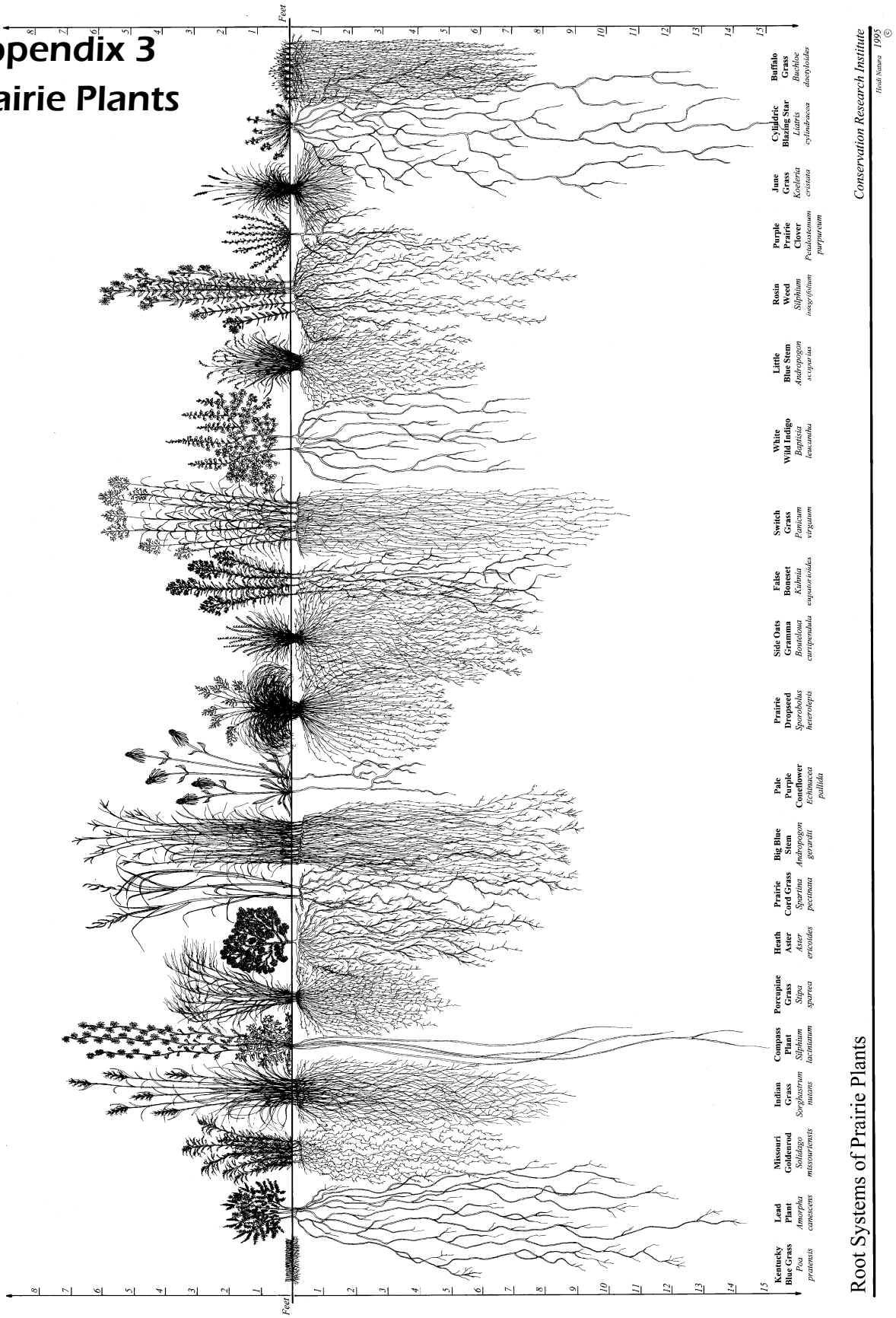


This presettlement prairie map was researched an compiled by Walter A. Schroeder. The identification and demarcation of presettlement prairie are based on the field notes and plats of the U.S. General Land Office survey of Missouri, 1815–1850s, except for the St. Louis region, which is based on the Soulard surveys of 1796–1806.

St. Louis Region Presettlement Prairie

From Presettlement Prairie of Missouri *by Walter A. Schroeder, Missouri Department of Conservation*

Appendix 3
Prairie Plants



Root Systems of Prairie Plants