Grade Level:
3rd Grade

Time:
90 minutes

Season:
Fall

Materials:
- ❑ Student science notebooks
- ❑ Pencils
- ❑ Wildflower brochures
- ❑ Rulers
- ❑ Seed posters
- ❑ Hand lenses
- ❑ Seed collecting bags
- ❑ Scotch tape
- ❑ Grocery bags

Skills Used:
Exploring, questioning, collecting data, analyzing data, forming conclusions, critical thinking, restoring habitat, measuring, writing, identifying, sketching, examining, discovering, matching, listening, following directions, choosing, teamwork, organizing, reflecting, writing

Prairie Wetlands Learning Center

Prairie Seed Harvesting

3rd Grade Plant and Animal Behavior Series

Summary

Students participate in a scientific investigation with prairie seeds that is driven by their own inquiry. Students collect seeds outdoors from several plant species and examine them during an indoor lab. They discover the parts as well as adaptations of prairie seeds.

Background

In this lesson, students use the prairie as their outdoor classroom to investigate seeds and help restore the prairie. The KWHL method often used in reading is applied to science, providing structure to their investigation. The specifics of their investigation are driven by the questions they generate. Putting prairie seeds in the hands of students creates an authentic learning opportunity, a chance to apply what they have learned in the traditional school classroom about plant parts and life cycles.

Education is one of two reasons to harvest prairie seeds. The harvested seeds are also used to restore the prairie. Although it was once the most widespread ecosystem in North America, the tallgrass prairie today is in danger of extinction. In Minnesota, for example, less than 0.1% of native prairie remains. One way to help the prairie is to increase the biological diversity of the restored prairie at the Prairie Wetlands Learning Center. Seeds harvested by students from richly producing sites are planted later in less diverse areas. By participating in this field investigation, students are also helping to re-establish part of our natural, national, and agricultural heritage.

More than 500 species of native wildflowers are found on the prairies of northwest Minnesota. More than 150 species of grasses live in the

Minnesota Academic Standards

Subjects Covered: Science, Language Arts

Helps support 14 standards and 14 benchmarks. See section "2019 Minnesota Academic Standards in Science" and "2010 Minnesota Academic Standards in Language Arts."

Objectives:
Students will be better able to...

- Suggest, investigate, and answer questions about prairie plants using appropriate tools
- Name at least one prairie plant species
- Harvest prairie seeds
- Locate the true seed of a prairie plant
- Recognize the basic parts of prairie seeds (seed, seed coat, seed pod, seed head)
- List two adaptations of prairie seeds
- Explain one way prairie restoration happens (seed collection and planting) and why people restore prairie
- Enjoy restoring the prairie!

Background, *continued*

prairie with about 10 species dominating grassland cover. Other categories of prairie plants include shrubs, vines, mosses, algae, ferns and horsetails, and even trees. However, prairie plants mainly include grasses and flowers (forbs).

Prairie seeds are surprisingly tiny and well hidden within protective coverings. People often assume that what they collected from the plants and filled their bags with are the actual seeds. In the grasses, however, seed coverings are papery and best removed by rolling the floret firmly in your palm. A shiny, round, hard seed will eventually appear. Pods, hairs, tufts, and tougher coverings (sometimes thin, sometimes thick) protect various forb seeds. It takes effort and persistence to find what is truly the seed of a prairie grass or forb.

Prairie seeds travel in much the same ways as plants of other ecosystems: mechanically and with the help of gravity, wind, and animals. For example,

- Common milkweed seeds are carried on the wind aided by their fluffy parachutes.
- Relatively heavy false gromwell seeds drop directly below the parent plant.
- Thirteen-lined ground squirrels collect and store grass seeds underground in a food cache.
- Passing animals must bump into goldenrods to mechanically release their seeds which then may float on the wind with parachute plumes.

The only dispersal method not directly used by prairie seeds is water.

Prairie seeds have numerous other interesting adaptations to help them survive and germinate in the extreme conditions of their home or with minimal competition with parent plants.

- Members of the familiar sunflower family have seeds with waxy, corky, husk-like coverings presumably to protect them from drought and mold. These coverings must be removed for germination, often by rodents or songbirds.
- The aerodynamic shape of grass seeds with long awns, along with their relative light weight, controls how far away they can travel in the wind from the parent plant.
- The hard, dense seed coats of false gromwell (marbleseed), New Jersey tea, and narrow-leaved puccoon must be steamed by heat and moisture in prairie fire in order to germinate.

Studying prairie seeds is not only an opportunity to discover more facts about North America's grasslands, our home biome. It is also a chance wonder about the miracle of growth that starts with a tiny seed in the dry, windy, hot-and-cold prairie and culminates in a sea of grass up to 10 feet high, speckled with brilliantly colored blossoms. It is a chance to celebrate beauty and participate in beauty-making as we strive to restore this almost lost landscape.

Teacher Preparation

To maximize outdoor classroom time at the Prairie Wetlands Learning Center, you may:

- Organize your students into small groups at school, each small group led by an adult chaperon, everyone wearing nametags.
- Help your students practice thinking of appropriate questions that can be investigated outdoors. For example, which of these two questions can they best answer today by going outdoors? How many flowers are there in the world? --OR-- How many kinds of flowers are blooming in our school yard right now? Being as specific as possible helps make the questions more realistic. Appropriate questions are key to developing an effective investigation and help develop critical thinking skills.
- Teach the introductory steps in the "Field Investigation Procedure" at school. Upon arrival at the Prairie Wetlands Learning Center, you may provide Prairie Wetlands Learning Center staff with a written list of what students know and wonder for quick review before heading out into the prairie.
- Lead one or more of the suggested extensions before your visit in order to integrate this field investigation into the classroom study of plants, habitat, prairie, life cycles, adaptations or other topics. See section, "Teacher-Led Extensions/Adaptations/Assessment Ideas."

Prairie Wetlands Learning Center Staff Prep

Organize materials in anticipation of questions that may be investigated as listed on page 1. Select appropriate field sites for harvesting seeds.

Field Investigation Procedure

Introducing the Topic

1. Welcome students, teachers, and chaperons to the Prairie Wetlands Learning Center.
2. Distribute clipboards, paper, and pencils to each student or ask them to open their science notebooks.
3. To begin the investigation, start a KWHL chart and ask students what they know about prairie seeds. Give them plenty of time to think and respond, guiding where needed, but not answering for them. At this point, and from their perspective, there is no right or wrong answer in asking them what they know. Even if the information they give is incorrect, resist the temptation to correct them if possible. Doing so will allow for open sharing and for you to gauge where they may need help with this topic during their visit. However, you may prompt students for specifics by asking them such things as, "What do you know about the parts of a seed? The adaptations of prairie seeds? How they travel? What do you know about the life cycle of prairie plant?"
4. Next, ask students what they wonder about prairie seeds. What questions do they have about them? They should think about questions that can be answered by going outside today and exploring. Each question should also be recorded in the column next to what they know. Again, give them ample time to think and respond. Try not to provide them with questions to investigate. Coming up with their own questions will give them more ownership in the investigation. If necessary, prompt them with questions like: "Is there something you would like to find out today about the parts of a prairie seed?

Field Investigation Procedure, *continued*

About prairie seed adaptations?"

5. For the third KWHL column, ask students how we will find the answer to each question. Will we stay on the trails or go off-trail? What kinds of rules or tools will we need to use? Match the tools with the appropriate questions on the chart, creating the third column, "H," how we will find out.
6. Choose four questions for the students to answer, and set up data sheets in quadrants.
7. Give any brief instruction on how to harvest seeds, such as:
   a) Each student, pair, or small group collects one species of seed to start as depicted on their collecting bag.
   b) Be sure to correctly identify the plant you are seeking and place only that species' seed in the bag.
   c) Collect just the seeds, no stems.
   d) Collect only ripe seeds that fall off easily. No green parts.

Exploring Outside

8. Line up in small groups. Remind students that they are scientists conducting a real scientific investigation just like adult scientists do. Scientists are quiet and respectful outdoors. They have a purpose in the field to complete their mission (in this case, collecting seeds).
9. Review rules for the trail. Remember to mention that we will not be picking flowers or breaking plants.
10. Travel to the area you will collect seeds and give space boundaries including if everyone will be staying on the trail or going off trail. In their small groups, students can collect their seeds. Move from group to Group to assist and check that chaperons and students are correctly identifying their plants. Swap bags as needed if species are difficult to find or if bags fill up
11. Provide students with the tools they need to closely examine their seeds including hand lenses, rulers, tweezers, and tape. Chaperons can help to carefully remove *one* seed to tape into each journal, not a pinch of seeds in pods or coverings. If needed, share the parts of prairie seeds and demonstrate techniques helpful in finding the actual seeds such as cracking open pods or peeling back seed coats or outer coverings.
12. Remind students to record their data in the science notebooks. Allow small groups to work together.

Reflecting Together

13. Ask students to find a paper grocery bag with a seeds that matches the ones they collected in their bags. They should place their bag next to it. They can take a minute to casually observe the diversity of seeds collected and the corresponding photos of each species in bloom.
14. As a whole group, discuss the answers to their questions, one question at a time. In their science notebooks, ask them to write one complete and properly punctuated concluding sentence about the investigation. What did they discover about prairie seeds today? Ask students to share any new questions they have about prairie seeds. Are prairie plants important? How?
15. Thank students and chaperons for helping to collect the seeds and restore the prairie. Invite them to come back again to visit.

Weather Alternatives

Field investigations take place rain or shine. Everyone should dress appropriately for the weather. In the event of unsafe weather (lightning, high winds) or pouring rain, everyone must come indoors. Prairie Wetlands Learning Center staff makes every effort to make bus travel worthwhile despite the weather and prepare indoor, age-appropriate plans. Prairie Wetlands Learning Center staff welcomes teacher input into these plans. Some possible alternatives might include:

- Go outside for a very short amount of time, even if only under the deck to conduct the field investigations or make basic observations.
- Prairie Wetlands Learning Center staff provides pre-collected prairie seeds for indoor study and laminated plant specimens from the Growing Native Trunk.
- Tour the Prairie Wetlands Learning Center greenhouse if available to find out how staff and students grow prairie plants and why.
- Demonstrate the length of prairie plant root systems using twine, a measuring tape, and a prairie root depths diagram.
- Draw an example of each life cycle on the white board for them to copy into their science notebooks. Erase the white board and close notebooks. Provide photos of the big bluestem and common milkweed life cycles. Challenge small groups of students to arrange the photos in the correct order and correctly label each stage of the life cycle. (Photos are printed at the end of this lesson.)
- Read a book about plant parts or seeds. Two suggested titles include *A Seed is Sleepy* by Dianna Hutts Aston and Sylvia Long; and *How a Plant Grows* by Bobbie Kalman. Show examples of seeds such as coconut, milkweed pods, pinecones, maple seeds, wild licorice, bur-reed, sunflower. Students may examine and sketch these seeds. Read pages 6-24 and 42-45 of *A Walk in the Prairie* by Rebecca L. Johnson as students listen for and write down facts about prairie plants.

Vocabulary

prairie, life cycle, investigation, data, sentence, forb, adaptation, grass, restore, restoration

Prairie Wetlands Learning Center

Teacher-Led Extensions and Assessments

Try any of these activities to extend your visit.

School Connections

- Take a walk around the block with your class to search for plant seeds. Guide your students in making observations about the seeds and asking questions about them. Some things to notice are colors, sizes, shapes, textures, and the kinds of plants that make them, like grasses, flowers, shrubs, or trees.
- Make a giant prairie seed out of paper mâché with the various parts labeled.
- Study plant parts such as roots, stems, leaves, seeds, flowers. Study the parts of a seed and the parts of a flower. Use coloring sheets, 3-D plastic models, puzzles, or real plants on your school grounds. Or use the plant photos provided at the end of this lesson to sequence the life cycles of prairie forbs and grasses.
- Use art materials to make the life cycle of a plant (such as seed, stems/leaves, and flowers). Or collect weed plants from your school yard and use them to make life cycle diagrams.
- How does a seed come to be? Study the process of pollination, the parts of plant involved in creating seeds, and pollinators who assist.
- Use plastic slide or photo sheets to preserve and display small samples of the prairie seeds collected at the Prairie Wetlands Learning Center. Provide ways that students can share their discoveries with other students at school through poetry, drama, storytelling, artwork, etc.

Home Connections

- Using written material in your students' science notebooks, share their discoveries through your parent newsletter, school newsletter, school district newsletter, or web site.

Cultural Connections

- Research ways people, including Ojibwe and Dakota peoples, use prairie plants for food, medicine, dye, rope, and other purposes. Some examples include use purple coneflower (*Echinacea*), wild bergamot (Monarda) used in tea.

Prairie Wetlands Learning Center Connections

- Borrow the Growing Native Trunk from the Prairie Wetlands Learning Center as a resource to grow native plants in your school yard. Use the laminated plants for classroom study. Call the Prairie Wetlands Learning Center to reserve it, 218-998-4480.
- Read *A Tallgrass Prairie Alphabet* by Claudia McGehee. Make a similar class book based on your visit to the Prairie Wetlands Learning Center and the species collected, using the names of as many plants as possible.

For the Prairie Wetlands Learning Center Educator

Prairie Wetlands Learning Center Theme – the Prairie Pothole Region

Primary Environmental Education Message - The prairie pothole region is valuable and in need of restoration and protection.

Sub-message - Habitat: The prairie pothole region is a unique and rare ecosystem.

Prairie Wetlands Learning Center Environmental Education Objectives:

- Explain the role of the U.S. Fish and Wildlife Service, the National Wildlife Refuge System, the Fergus Falls Wetland Management District, and the Prairie Wetlands Learning Center in conserving our lands and resources. (Wildlife, Habitat, and People)
- Use scientific methodology to explore the environment (ask questions, hypothesize, collect data, analyze data, form conclusions, make recommendations). (Wildlife and Habitat)
- Understand and participate in restoration, enhancement, protection, and management methods of prairie and wetlands. (Habitat and People)

2019 Minnesota Academic Standards in Science

This lesson helps support the following state standards.

Strand 3 Developing possible explanations of phenomena or designing solutions to engineering problems

Substrand 3.1 Developing and using models

Standard 3.1.1 Students will be able to develop, revise, and use models to represent the students' understanding of phenomena or systems as they develop questions, predictions and/or explanations, and communicate ideas to others.

Benchmark 3L.3.1.1.2 Develop multiple models to describe how organisms have unique and diverse life cycles but all have birth, growth, reproduction, and death in common. (P: 2, CC: 4, CI: LS1) *Emphasis is on the pattern of changes organisms go through during their life. Examples of models may include diagrams, drawings, physical models, or computer programs.*

Substrand 3.2 Constructing explanations and designing solutions

Standard 3.2.1 Students will be able to apply scientific principles and empirical evidence (primary or secondary) to explain the causes of phenomena or identify weaknesses in explanations developed by the students or others.

Benchmark 3L.3.2.1.1 Construct an explanation using evidence from various sources for how the variations in characteristics among individuals of the same species may provide advantages in surviving,

Science Standards, *continued*

finding mates, and reproducing. (P: 6, CC: 2. CI: LS4) *Examples of cause and effect relationships may include how individual plants of the same species with different length thorns may be more or less likely to be eaten by predators; or animals that have better camouflage coloration than others of their species may be more likely to survive and therefore more likely to leave offspring.*

Strand 4 Communicating reasons, arguments and ideas to others

Substrand 4.2 Obtaining, evaluating and communicating information

Standard 4.2.1 Students will be able to read and interpret multiple sources to obtain information, evaluate the merit and validity of claims and design solutions, and communicate information, ideas, and evidence in a variety of formats.

Benchmark 3L.4.2.1.1 Obtain information from various types of media to support an argument that plants and animals have internal and external structures that function to support survival, growth, behavior, and reproduction.** (P: 8, CC: 4, CI: LS1) Examples of structures may include thorns, stems, roots, colored petals, heart, stomach, lungs, brain, and skin. Examples of media may include electronic sources.

2010 Minnesota Academic Standards in Language Arts

Strand READING

Substrand Informational Text K-5

Standard 3 Analyze how and why individuals, events, and ideas develop and interact over the course of a text.

Benchmark 3.2.3.3 Describe the relationship between a series of historical events, scientific ideas or concepts, or steps in technical procedures in a text, using language that pertains to time, sequence, and cause/effect.

Standard 5 Analyze the structure of texts, including how specific sentences, paragraphs, and larger portions of the text (e.g., a section, chapter, scene, or stanza) relate to each other and the whole.

Benchmark 3.2.5.5 Use text features and search tools (e.g., key words, sidebars, hyperlinks) to locate information relevant to a given topic efficiently.

Strand WRITING

Substrand Writing K-5

Standard 7 Conduct short as well as more sustained research projects based on focused questions, demonstrating understanding of the subject under investigation.

Benchmark 3.6.7.7 Conduct short research projects that build knowledge about a topic.

Language Arts Standards, *continued*

Strand WRITING

Substrand Writing K-5

Standard 7 Conduct short as well as more sustained research projects based on focused questions, demonstrating understanding of the subject under investigation.

Benchmark 3.6.7.7 Conduct short research projects that build knowledge about a topic.

Standard 10 Write routinely over extended time frames (time for research, reflection, and revision) and shorter time frames (a single sitting or a day or two) for a range of tasks, purposes, and audiences.

Benchmark 3.6.10.10 Write routinely over extended time frames (time for research, reflection, and revision) and shorter time frames (a single sitting or a day or two) for a range of discipline-specific tasks, purposes, and audiences.

Strand SPEAKING, VIEWING, LISTENING AND MEDIA LITERACY

Substrand Speaking, Viewing, Listening and Media Literacy K-5

Standard 1 Prepare for and participate effectively in a range of conversations and collaborations with diverse partners, building on others' ideas and expressing their own clearly and persuasively.

Benchmark 3.8.1.1 Engage effectively in a range of collaborative discussions (one-on-one, in groups, and teacher-led) with diverse partners on grade 3 topics and texts, building on others' ideas and expressing their own clearly.

a. Come to discussions prepared, having read or studied required material; explicitly draw on that preparation and other information known about the topic to explore ideas under discussion.

b. Follow agreed-upon rules for discussions (e.g., gaining the floor in respectful ways, listening to others with care, speaking one at a time about the topics and texts under discussion).

c. Ask questions to check understanding of information presented, stay on topic, and link their comments to the remarks of others.

d. Explain their own ideas and understanding in light of the discussion.

e. Cooperate and compromise as appropriate for productive group discussion.

f. Follow multi-step oral directions.

Standard 3 Evaluate a speaker's point of view, reasoning, and use of evidence and rhetoric.

Benchmark 3.8.3.3 Ask and answer questions about information from a speaker, offering appropriate elaboration and detail.

Standard 6 Adapt speech to a variety of contexts and communicative tasks, demonstrating command of formal English when indicated or appropriate.

Benchmark 3.8.6.6 Speak in complete sentences when appropriate to task and situation in order to provide requested detail or clarification.

Language Arts Standards, *continued*

Strand LANGUAGE

Substrand Language K-5

Standard 3 Apply knowledge of language to understand how language functions in different contexts, to make effective choices for meaning or style, and to comprehend more fully when reading or listening.

Benchmark 3.10.3.3 Use knowledge of language and its conventions when writing, speaking, reading, or listening.

a. Choose words and phrases for effect.
b. Recognize and observe differences between the conventions of spoken and written standard English.

Standard 5 Demonstrate understanding of figurative language, word relationships, and nuances in word meanings.

Benchmark 3.10.5.5 Demonstrate understanding of word relationships and nuances in word meanings to develop word consciousness.

b. Identify real-life connections between words and their use (e.g., describe people who are friendly or helpful).
c. Distinguish shades of meaning among related words that describe states of mind or degrees of certainty (e.g., knew, believed, suspected, heard, wondered).

Standard 6 Acquire and use accurately a range of general academic and domain-specific words and phrases sufficient for reading, writing, speaking, and listening at the college and career readiness level; demonstrate independence in gathering vocabulary knowledge when encountering an unknown term important to the comprehension or expression.

Benchmark 3.10.6.6 Acquire and use accurately grade-appropriate conversational, general academic, and domain-specific words and phrases, including those that signal spatial and temporal relationships

References and Resources

Books and Web Sites for Children

- *A Seed is Sleepy* by Dianna Hutts Aston and Sylvia Long
- *A Tallgrass Prairie Alphabet* by Claudia McGehee
- *A Walk in the Prairie* by Rebecca L. Johnson
- *How a Plant Grows* by Bobbie Kalma
- *How a Seed Grows* by Helene J. Jordan
- *Plant a Pocket of Prairie* by Phyllis Root and Minnesota illustrator Betsy Bowen
- *Plant Secrets* by Emily Goodman
- Biology of Plants on the Missouri Botanical Gardens website

Books and Web Sites for Teachers

- *Minnesota's Natural Heritage, an Ecological Perspective* by John R. Tester
- *Prairie, A Natural History* by Candace Savage
- *Prairie Seedling and Seeding Evaluation Guide* by Paul J. Bockenstedt/Bonestroo, Rosene, Anderlik and Associates
- *Tallgrass Prairie* by John Madson
- *Tallgrass Prairie Wildflowers, a Field Guide* by Doug Ladd
- *Wildflowers of the Tallgrass Prairie, the Upper Midwest* by Sylvan T. Runkel and Dean M. Roosa
- Biology of Plants, How Plants Grow on the Missouri Botanicals Gardens website
- Earth Partnership for Schools K-12 Curriculum Guide on the University of Wisconsin-Madison Arboretum website

Credits

This field investigation was developed and written by Prairie Wetlands Learning Center Staff, U.S. Fish and Wildlife Service. Thanks to Prairie Science Class naturalist Tia Thysell for reviewing this lesson plan. Thanks to the following teachers for reviewing this lesson plan: Stacy Busta, Breckenridge Elementary; Vicki Hanneman, Cleveland Elementary, Fergus Falls; and Deb Strege, licensed teacher, Fergus Falls. Photo credits: Molly Stoddard/USFWS and USFWS.