Prairie Workshop and Field Trip for Grades 6-8

Sampler

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Introduction

The original prairie came as a result of a series of glaciers, which slowly crawled across the face of Central North America about 15,000 years ago. Carving through what would one day be called Illinois were four major glaciers (Wisconsinian, Illinoisan, Kansan and Nebraskan). The Illinoisan and Wisconsinian glaciers appeared to have had the greatest effect on our present state contour with their southward movement. The Illinoisan advanced nearly to the present city of Carbondale and was followed by the broad ice sheet of the Wisconsinian.

About 12,000 years ago, average temperatures slowly began to rise, and the glaciers began to melt and recede. As a result of extended periods of warmth, glacial lakes formed, and eventually considerable flooding contributed to the formation of the Illinois River Valley.

During this time, as the climate cooled, vegetation primarily consisted of pine and spruce forests. Eventually, a warming trend inspired the oak and hickory forests. The trend began some 8,300 years ago and allowed for the easterly expansion of the prairie. The prolonged dry, hot xerothermic period to follow provided the climate that was conducive to the emergence of the tallgrass prairie as the predominant vegetation in Illinois.

Currently, the climate in the grassland region of Illinois is punctuated by hot summers and cold winters. Precipitation generally is about forty inches per year in this region. Rainfall is significantly less in the short-grass prairies of the West.

Prairies are unusually well adapted to survive such natural phenomena as extended droughts and wildfire, which would prove devastating to other plant life forms. This resilience is ironic in light of the relative fragility of the prairie at the hands of man.

The true prairie grassland that once blanketed Central North America from Indiana west to Nebraska, south to Texas and north to Saskatchewan and Alberta has been severely impacted by man's progress. Indeed, the vast grassland that once covered 40,000 square miles of Illinois has been dramatically reduced to less than four square miles of virgin prairie. While these grasslands would differ greatly in actual specific flora and fauna, all maintained the characteristic "tall grass" component. One prairie ecosystem slipped almost imperceptibly into another, forming one enormous complex grassland biome.

This biome was, for centuries, home to many tribes of nomadic Indians. While most of these tribes were seasonal residents of the Illinois prairie, they did some cultivation and harvesting of native plants. They learned about the power of the prairie fire and recognized its importance to the ecosystem. The Indians realized that their fire seemed to contribute to the vitality and diversity of the prairie.

As the European settlers entered the scene, the Indians were displaced. Many of the early pioneers feared fire; therefore, many of the accidental fires were extinguished. The dense grassland with its complex root system was a great impediment to the early farmer. In fact, many early pastures and croplands were in open areas of savannah rather than in the grasslands themselves because of the relative ease of planting. Pulling out a stump of a tree was much easier than breaking through the immense biomass of the prairie root system.

Over the centuries, the grassland created some of the richest farmland in the world. This fact alone helps to explain why the tragic loss of virgin prairie was scarcely noticed. As a society, we yielded to “progress” as we cultivated, built towns and established businesses throughout the prairie.

During the late 1950’s, there came a vitalization of ecological studies and a resolve by some to rediscover and recreate that which was lost. In late summer 1959, Floyd Swink, from Morton Arboretum, introduced Robert Betz, Professor of Biology at Northeastern Illinois University, to the prairie. As these men began botanizing together, they dreamed about restoring this nearly destroyed ecosystem.

During the 1960s, Fermilab acquired the site in Batavia, which included 6,000 acres of what had once been prairie. Betz approached Fermilab with his prairie restoration proposal. Prairie restoration plans began in the main ring in 1975 with Dr. Betz, Raymond Schulenberg, former Curator of Plant Collections at Morton Arboretum, and a few dedicated Fermilab employees piloting the project. Supported by founding Fermilab director, Robert R. Wilson, Betz and Fermilab employees established the Prairie Committee in May 1974. Plot I was planted using over 400 pounds of seed collected by 100 volunteers working throughout the area. The 9.6-acre plot yielded, to the untrained observer, only ragweed, but Betz persisted and found tiny prairie plants struggling to survive. The native flora was growing, but at this point was putting nearly all of its energy into the vital root systems necessary for survival. After a few years enough prairie plants existed to allow burning the plot.

Plantings continued over the years with new plots disked, planted and burned on a regular basis. By 1984, over a decade of restoration had taken place when Argonne National Laboratory requested that a group of terrestrial ecologists be permitted to conduct research in the Prairie Restoration Project. This added even more credibility and exposure to the project.

In 1989 Fermilab became the sixth Department of Energy National Environmental Research Park. This site is considered unique because of the wide sampling of native Midwest ecosystem life forms. Also in 1989, the Margaret Pearson Interpretive Trail opened to honor the longtime manager of Public Information Office and original member of the Prairie Committee. Fermilab continues to plant more of the property in prairie, since this is an economical way to maintain large sections of ground.

Teaching Suggestions

Philosophy

The advent of the 21st Century promises an exciting ascent into the future. As Fermilab pursues answers to some of the most elusive questions in our universe, we pause to look back on a time not so very long ago. As settlers ventured into the Midwest during the 1700's and 1800's, vast prairies thrived. Rediscovering the majesty of the prairie through the observation and analysis of Fermilab's prairie reconstruction is made possible through *Particles and Prairies: The Fermilab Prairie.*

The goal of *Particles and Prairies: The Fermilab Prairie* is to provide learners with the opportunity to be scientists. Making observations, gathering and analyzing data, and applying student-created conclusions increase understanding and appreciation of the prairie while providing vital data for further analysis. These data, in turn, help the ongoing prairie restoration project at Fermilab.

The engaging hands-on interactive focus of this instructional unit is designed to enlighten a future generation to this beautiful ecosystem. In so doing, the student's sense of responsibility to maintain what remains, or has been restored, of our forefathers' prairie, is accentuated.

Just as the prairie restoration at Fermilab has evolved over the years, so has the *Particles and Prairies* project. Virtually every component of this initiative is now accessible electronically on the *SIMply Prairie* website at: *http://www-ed.fnal.gov/data/life_sci/prairie/* No longer is a field trip to the Fermilab prairie necessary for a complete learner experience. Participants are encouraged to use local prairies or even create a school site prairie parcel to provide a practical field experience. Data derived may be added to the broad database presented on Fermilab's *SIMply Prairie* website. Comparative analysis of these data is encouraged, thus presenting a real world connection.

Teaching Tips

Cooperative Learning Strategies

Due to the interactive nature of the instructional unit, as well as the vast scope of information covered, we suggest implementation of cooperative learning strategies. Distribution of tasks within the classroom, jigsaw strategies, and utilization of the student as instructor synergistically work to accomplish a great depth of learning within this instructional unit.

Research Components

Particles and Prairies: The Fermilab Prairie program is inquiry-based and infused with a wide variety of opportunities for an engaged-learning experience. It is approachable as a project-based, performance-based, problem-based or field-based experience. In all formats, the quadrat study is critical. Data collected is recorded on an online database and comparative analysis with other prairies is encouraged.

- As a project-based experience, students analyze a prairie via an organism research element and create a classroom field guide of prairie organisms. (See Project-Based Research, p. 76.)
- In a performance-based format, students present a case for developing a school site prairie parcel or preserving an existing prairie to an administrative body. (See Performance-Based Research, p. 90.) This option centers on a problem-based unit with a performance component.
- A problem-based experience places the students in the role of scientists trying to solve a prairie dilemma. In this format, students may actually design and implement a plan to actually create a school site prairie or analyze a data-based, prairie-related trend. (See Problem-Based Research, p. 92.) This option differs from the performance-based experience primarily in terms of the product of learning. A formal performance, such as a debate or forum, is not part of this option.
- Field-based research focuses on data collected for a prairie community over a period of years. (See Field-Based Inquiry, p. 94.) Field-based research differs from laboratory research where variables can be controlled. In the field, the problem becomes "messy." Without the ability to create controls, a variety of factors can contribute to a situation. Designing research questions takes considerable thought. Solving field-based research questions can become true detective stories!

The *SIMply Prairie* and *Smallville Prairie* websites contain information and tools to provide effective project-based, performance-basd, problem-based, and field-based research experiences. These websites are as follows:

SIMply Prairie: *http://www-ed.fnal.gov/data/life_sci/prairie/*
Smallville Prairie: *http://www-ed.fnal.gov/help/prairie/4prairie/*

Visiting a Prairie
Teachers are encouraged to carefully consider the season chosen for prairie study. While abiotic activities and individual investigations of plants and animals may be done effectively at any time, the fall prairie offers the most varied array of mature plants. Immersion of students in the mature prairie during the autumn months allow for a full year of exploration into the factors that contribute to this amazing ecosystem. Winter segments offer twig analysis and animal print observations while spring studies may revolve around prairie emergence. Abiotic factors, including weather, soil and water sampling, and other environmental factors can be initiated throughout the school year.

Prior to an on-site prairie visit, students must master the pre-visit skills, exhibit acute observational skills, and identify the majority of the plants and animals keynoted. A trip to a prairie site may prove unsatisfactory unless a class is able to readily become involved. To help ensure a successful experience, students must understand the terminology and lab techniques presented.

Academic Teaming
The prospect of teaching prairie study may be intimidating to the uninitiated classroom teacher. An intensive, weeklong teacher training program is designed to put teachers at ease using interactive, engaging strategies to build confidence and knowledge. For this reason, teams of teachers are encouraged to participate in the *Particles and Prairies* professional development class offered at Fermilab.

Because of the rarity of prairie throughout the world, relatively few individuals are exposed, in depth, to this ecosystem. The knowledge base derived through preparation for this instructional unit, coupled with enthusiasm for the challenge of learning a new topic, places *Particles and Prairies* participants in the upper echelon of teachers in the area of prairie literacy. This background and interest are passed on to innumerable students and colleagues. Ultimately, this serves to make our world a better place. Is this not one of the goals of science?

Because of the time involved, the science teacher may not be able to do all the activities and labs included in the program. For this reason, implementation of these materials through the interdisciplinary team is recommended. Related activities are noted on the Interdisciplinary Team Grid with appropriate suggestions for specific area involvement. On an abbreviated scale, a mini-interdisciplinary experience focusing on monarch butterflies has been developed. The Monarch Butterfly Unit, included as a post-visit activity, will provide a one- to three-day cross-curricular activity to give grade level teams an opportunity to attempt a teamed approach for a shorter period prior to the more complex prairie unit.

Unit Sequence

All labs and activities included in *Particles and Prairies* are designed to prepare students for a successful field trip to Fermilab's restored prairie (or other prairie) and transfer this learning to other aspects of the educational experience. Because of the complex nature of the varied components of the prairie, considerable hands-on, interactive experience is necessary for students to build background. Components of learning are strategically positioned within the experience to help ensure achievement.

The learning experiences are separated into three general sections: Pre-Visit, On-Site Prairie Experience, and Post-Visit. The pre-visit activities are primarily skill builders and prairie introduction. The On-Site section includes field activities completed on either the Fermilab or another prairie. The Post-Visit segment incorporates analysis and reflection.

NOTE: The pre-quadrat study field experiences and activities highlighted as critical must be performed prior to the Fermilab site visit to help ensure a successful experience. As previously noted, data gathered by students is used in the construction of an on-site database. Pre-visit activities conducted on the school site preceding the field trip prepare students for related activities requiring similar skills during their prairie trip. Sequencing, observation skills, and ability to follow directions are required key skills.

Assessment

No traditional tests are provided with *Particles and Prairies: The Fermilab Prairie.* Authentic assessment is advised. Student journals and portfolios are recommended. Team efforts should result in individual accountability. No student should be allowed a "free ride."

In the Resource section, an assortment of assessment rubrics is provided. Appropriate assessment of student progress is a key to student achievement. The *Particles and Prairies* program emphasizes authentic assessment.

Four types of rubrics are suggested. Teachers are encouraged to manipulate the criteria to best fit their unique classroom situation.

1. Investigation (measuring day-to-day activity responses)
2. Participation (considering scientific attitudes or habits of the mind, as well as cooperative team behaviors. See "Scientific Attitudes" in Resources.)
3. Performance (appropriate for research-based classroom events such as town meeting forums, debates, and open-ended questions wherein the student creates a product that is shared with the community within and beyond the classroom)
4. Journal (Consider sending the journal home with this rubric for parent comment. This is a powerful communication strategy!)

The teacher is encouraged to use these models to assess student achievement. The teacher is further encouraged to modify these rubrics to meet the unique conditions and priorities of individual classrooms and students.

Particles and Prairies – Alignment, Stages D-H

Illinois Science and Selected Mathematics Content Standards

Note: * Dependent on student-directed exploration

Discipline	Language Arts					Mathematics					Science		
GOAL	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**13**
Pre-Visit Activities													
Candle Eating			**B** **C**										**A**
Peanut Search			**A** **C**				**C**			**A** **B**	**A**		
Sustained Writing			**C**										
Calico Beans			**B** **C**							**A** **B**			
What is a Prairie?			**B** **C**										**A** **B***
Science Journal			**A** **B**							**A** **B**	**A** **B**		
Research Components	**B** **C**		**A** **B** **C**				**A*** **C***			**A*** **B***	**A** **B**	**B**	**A*** **B***
Estimating Percentages	**C**		**A** **B** **C**				**A** **C**			**A** **B**	**A** **B**		
Quadrat Study: School Lawn	**C**		**A** **B** **C**				**A** **C**			**A** **B**	**A** **B**		
Measure Up	**C**						**A**			**A** **B**	**A**		

Discipline	**Language Arts**					**Mathematics**					**Science**		
GOAL	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**13**
Fermilab Prairie: Past, Present, Future	**C**		**A B C**									**B**	**A B***
Sightless Drawing							**A* C***						**A**
Peanut Butter and Jelly Sandwich			**B C**				**C**						
The Key to the Keys	**C**		**B C**								**A B**	**A B**	
Adaptations			**B C**								**A**	**A B**	
Everyone's Important												**B**	**A**
On-Site Activities													
Abiotic Study	**C**		**B C**				**A C**			**A B**	**A**	**B**	**A**
Airborne and Crawling Prairie Insects			**C**				**C**				**A**	**A B**	
A Microhabitat: Life in a Log			**A B C**				**A C**			**A B**	**A**	**A B**	
Quadrat Study: Reconstructed Prairie	**C**		**A B C**				**A C**			**A B**	**A B**	**A B**	**A**
A Twig Tale											A	**A** B	
Water: Aquatic Diversity and Water Quality	**B C**	**B**	**A B C**				**A C**			**A B**	**A**	**A B**	**A**
Post-Visit Activities													
Herbarium Specimen Collection												**A** B	

Discipline	**Language Arts**					**Mathematics**					**Science**		
GOAL	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**13**
Prairie Plantings											**B**	**A** **B**	**B**
Seed Dispersal												**A** **B**	
Baked Potato Invertebrate Trap											**A**	**A** **B**	
Thinking Environmentally											**B**	**B**	**A** **B**
Pollinators and Consumers – CSI Prairie	**C**		**B** **C**							**A** **B**	**A**	**A** **B**	
Resources													
Sampling Terrestrial Invertebrates			**C**				**A** **C**			**A** **B**	**A**	**A** **B**	
Soil Structure	**B** **C**		**C**	**B**	**A** **B** **C**					**A**	**A**	**E**	
Fire Ecology	**B** **C**	**B**										**A** **B**	**B**
Monarch Unit	**B** **C**											**A** **B**	**A** **B**

Particles and Prairies Teacher's Guide

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Post-Visit Activities

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Sample Activity

Quadrat Study: Reconstructed Prairie

PURPOSE:
Evaluate a restored prairie plot and compare the data to Fermilab student data collected since 1992.

OBJECTIVES:
The student will:

- Investigate species diversity and importance value of prairie plants on a designated plot.
- Compare these data to prairie quadrat data collected since 1992.
- Interpret these data to draw conclusions about the progress of a prairie restoration.
- Write a concise summary of these findings.
- Apply these findings to other comparable restoration sites noted on the *SIMply Prairie* website.

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 1200 acres of prairie have been planted on the Fermilab site with plans for more in the future. This reconstruction process has been in progress for over thirty years. As prairie plants have been added, careful notice has been taken as to their progress and the succession of these plants.

One of the goals of the quadrat study is to determine the importance value of any given species. Importance value is calculated by considering the relative dominance + relative frequency + relative density. (See Table 1.) Importance value is of interest because it is not simply asking which plant is present in the greatest number. It involves much more criteria. For example, what if one plant is much larger than another plant or one plant is common only in one location? The importance value gives a more accurate picture of which plants are having the greatest impact.

Species diversity refers to how many different species of prairie plants are present. In a true prairie, we find hundreds of different species. Restored prairies will not approach this number. In time, maintenance methods and natural succession may increase the species diversity of prairie plants and decrease the diversity of weeds. A common indicator of the maturity and health of a prairie is its species diversity.

Please remind students that the prairie is precious. They should be careful not pick any plants.

Common terms encountered in quadrat sampling include:

TABLE 1

Value	Definition
Dominance	Total percent cover of a species / Total area sampled
Frequency	Total # quadrats in which a species occurs / Total # quadrats
Density	Total # plants of a certain species / Total area sampled
Relative Dominance	100 x Dom. of a species / Sum of the Dom. of all species
Relative Frequency	100 x Freq. of a particular species / Sum of the Freq. of all species
Relative Density	100 x Density of a particular species / Sum of the Densities of all species
Importance Value	Relative Dominance + Relative Frequency + Relative Density

MATERIALS per group:

- Meter square quadrat
- Meter sticks (at least 2)
- Small metric ruler
- Flora Field Guide
- Data sheets
- Access to *SIMply Prairie* website: http://www-ed.fnal.gov/data/life_sci/prairie/

RESPONSIBILITIES
Docent:

- Provide quadrat forms.
- Provide meter sticks.
- Provide field guides.
- Facilitate activity on field trip.

Teacher:

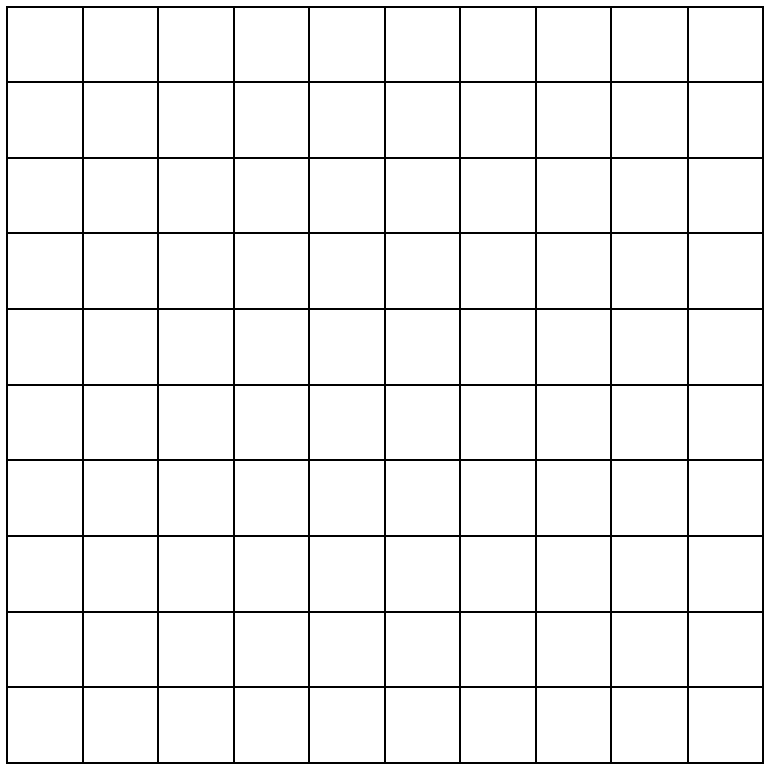
- Appropriate preparation
- Provide data sheets for each research group, pp. 181-182.
- Help students stay on task.
- Debrief after trip.

PROCEDURE:

1. Complete “Estimating Percentages” and “Lawn Quadrat Study.”
2. Access the *SIMply Prairie* website and review data resources.
3. Familiarize students with the quadrat procedures found at: *http://www-ed.fnal.gov/ntep/f98/projects/fnal/student/data.shtml*
4. Students will work in groups of three or four. Prior to the lab, establish student roles. Assign one student as recorder, one as counter, and commission everyone to a collective effort to identify plants.
5. Proceed to a prairie site. Use a “random site generator” (hurled Frisbee, hat, etc.) to identify student quadrats. (Fermilab docents will help set up the quadrats if done there.)
6. Using the grid form use meter sticks and the following data pages, students will map the location of the plants in their quadrat, drawing grasses first.
7. Once the grasses have been represented, students will use the meter sticks to get the exact location of each forb.
8. After the grid is complete the 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 representative 1% section of your quadrat and multiply by the appropriate number of similarly covered sections.
9. Determine the percent cover for each species.
10. Enter the data into the computer (*http://www-ed.fnal.gov/ntep/f98/projects/fnal/student/data.shtml*). Then go to ENTER DATA. (The computer will use the class data and calculate the importance value and species diversity for each.)
11. Back in the classroom, debrief using the data summary.

Quadrat Study: Reconstructed Prairie

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



Please do not remove meter sticks and quadrat marker until your docent has checked your work and initialed here. ________

QUADRAT STUDY: RECONSTRUCTED PRAIRIE

	Quadrat Number Assigned by Computer						
	School		**Date**		**Teacher**	**Recorder's Name**	
Key	**Prairie Plants**	Number	%	Key	**Weeds**	Number	%
	Prairie Grasses				**Weedy Forbs**		
	Big Bluestem			1	Black Raspberry		
	Indian Grass			12	Clovers (ground)		
	Switch Grass			11	Common Milkweed		
				7	Common Ragweed		
	Prairie Forbs			6	Curled Dock		
B	Black-eyed Susan			2	Daisy Fleabane		
C	Compass Plant			28	Dandelion		
M	Mountain Mint			27	Drummonds Aster		
N	New England Aster			31	Evening Primrose		
D	Prairie Dock			9	Ground Cherry		
R	Rattlesnake Master			19	Hairy Aster		
W	Rosinweed			18	Hairy Vetch		
A	Saw-toothed Sunflower			30	Heal-all		
S	Stiff Goldenrod			4	Sweet Clovers (tall)		
Ђ	Tall Boneset			10	Tall Goldenrod		
T	Tall Coreopsis			13	Thistle		
E	Wild Bergamot			3	Wild Carrot		
Y	Yellow Coneflower			5	Yarrow		
	Uncommon Grasses/Forbs						
L	Blazing Star				**Unlisted Weeds**		
K	Culver's Root			34	Unlisted Grasslike		
Z	Cup Plant			33	Unlisted Oval leaf		
G	Gray Goldenrod			32	Unlisted Round leaf		
	Little Bluestem			35	Unlisted Triangular/pointed leaf		
O	Nodding Wild Onion						
P	Pale Purple Coneflower						
	Prairie Cord Grass						
U	Purple Prairie Clover						
F	Showy Tick Trefoil						
V	White Prairie Clover						
X	White Wild Indigo						
Q	Wild Quinine						
	# of Types of Prairie Plants Found				# of Types of Weedy Forbs and Unlisted Weeds Found		

Name: ________________________

Student-Collected Data Summary

Importance Value

1. Which grass has the highest importance value? ___________
2. Which forb (showy flowering plant) has the highest importance value? ___________
3. Which weed has the highest importance value? ___________
4. Which plant overall has the highest importance value? ___________
5. How does your sample compare to the class average data? Explain the discrepancies.

Species Diversity

6. For long-term analysis of this area, it is good to analyze the species diversity. (How many different plants are there per meter square?) Complete the diversity data collection record:

   Diversity of prairie plants ___________
   Diversity of weedy plants ___________
   Diversity of prairie plants last year ___________
   Diversity of weedy plants last year ___________

7. Explain any patterns and/or changes in the diversity values.

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

Group Data – Plant Numbers

9. Calculating importance value requires records of the numbers of plants within species. Enter your numbers below:

   Total number of different prairie plants found ______
   Total number of different weedy plants found ______

Name: ______________________________

Student Reflection: Quadrat Study – Reconstructed Prairie

Classroom Data – Comparative Analysis

1. How does data from your research team's sample compare to the class average data? Explain the discrepancies.

2. Obtain the class's average data for importance value and species diversity collected to other sites on the *SIMply Prairie* website. Are the same plants on both lists? If any changes have taken place, please list them.

3. If data has been collected at Fermilab, compare your class data with the data from 1992. What has stayed the same? What has changed? Why do you believe this is so?

4. Why are the "plant numbers" important?

5. Apply your class's findings to other restoration sites noted on the *SIMply Prairie* website.

Be a literate scientist…
Expand on the last reflection question. Design a plan to use these data to help promote prairie restoration in other areas. Summarize your plan in several paragraphs.

Teacher Page

Student Reflection Suggested Responses: Quadrat Study – Reconstructed Prairie

1. How does data from your research team's sample compare to the class average data? Explain the discrepancies.

   Responses will vary. Expect an appropriately constructed comparison. Encourage a data table similar to the sample provided. It is best to allow students to construct a table of their own design.

Research Team Data	Classroom Data	Comparison
Importance Values		
Species Diversity		
Plant Numbers		

2. Obtain the class's average data for importance value and species diversity collected to other sites on the *SIMply Prairie* website. Are the same plants on both lists? If any changes have taken place, please list them.

   Responses will vary. Expect an appropriately constructed comparison as indicated in the previous question.

3. If data has been collected at Fermilab, compare your class data with the data from 1992. What has stayed the same? What has changed? Why do you believe this is so?

   Responses will vary. Expect an appropriately constructed comparison as indicated in the previous question. It is anticipated that the Fermilab student prairie has more prairie plants (greater diversity) and fewer weedy species.

4. Why are the "plant numbers" important?

   Importance value and other values are determined using plant numbers.

5. Apply your class's findings to other restoration sites noted on the *SIMply Prairie* website. How might these data encourage the restoration of more prairie plots?

   Responses will vary. Expect thoughtfully constructed ideas.

Be a literate scientist…
Expand on the last reflection question. Design a plan to use these data to help promote prairie restoration in other areas. Summarize your plan in several paragraphs.

Expect a degree of sophistication as determined by the teacher and communicated to the student prior to assigning this task.