Prairie Workshop and Field Trip for Grades 3-5

Sampler
Introduction

Welcome to Fermilab's newest prairie program, *The Prairie – Our Heartland, Elementary Prairie Program for the stewards of the next Generation*. This cross-curricular prairie adventure engages students in many facets of the Midwestern prairie and guides them in becoming stewards of this amazing ecosystem. *The Prairie – Our Heartland* is standards-based and grounded in age-appropriate active learning. The goals noted reflect the essence of this exciting multidisciplinary learning opportunity.

Global Goals
Students will:

- Recognize and appreciate the nature, value, and interconnectedness of science as they assume the role of prairie stewards.
- Better comprehend how conservation management issues are identified, strategized, and approached scientifically.
- Better appreciate the wide range of research strategies and/or techniques possible in prairie investigations.
- Describe and/or demonstrate how research findings can be directly applied to prairie conservation (stewardship*).
- Manipulate and analyze authentic data that they and others have collected to answer existing questions and generate new questions.
- Understand the power of communication via reading, writing (including scientific journaling), and oral language.
- Understand how the prairie formed and recognize the impact of humankind in the history of the prairie.

Content Goals
Through science, mathematics, language arts, and social science, students will:

- Understand the relationships and interdependence of prairie organisms within the ecosystem.
- Conceptualize aspects of the prairie using estimation, scale, and appropriate measurement.
- Explore the societal significance of past, present, and future prairie.
- Recognize the role of humans in prairie maintenance and conservation (stewardship*).
- Identify the unique attributes of tallgrass prairie in the U.S. Midwest.

Stewardship Goals
As a result of this prairie program, students will:

- Develop an appreciation of the importance, value, and function of the prairie ecosystem
- Develop an awareness of environmental issues in order to protect the few natural areas that remain.
• Create fact sheets, brochure, slide show, display, and/or other educational tool to increase public awareness of threatened habitats.
• Better understand land management techniques of past and present.
• Develop personal relationships with natural prairie areas.

Core Inquiries of the Stewards of the Prairie
• Unlocking the Secrets of the Organisms: What is a prairie?
• Revealing the Treasures beneath the Soil: How were prairies formed?
• Unlocking the Lessons of the Past: Why do we no longer have vast prairies? (Historical, environmental, societal)
• Revealing the Value of the Prairie: What is the value of the prairie? (Practical uses of plants, medicinal plants, Native American influences, soil replenishment, aesthetics, etc.)
• Unlocking the Mysteries of Prairie Restoration: How can we help restore tallgrass prairie land?

NOTE: “The Illinois Goals use the term “stewardship” rather than “conservation.” Stewardship is the principle theme underlying this program.

The Prairie – Our Heartland Features
Included in The Prairie – Our Heartland are the following components:

• Thematic learning – Prairie Stewardship
• Standards-based activities aligned with NSES and ISBE
• Multidisciplinary focus including science, language arts, mathematics, social science, and fine arts
• Authentic assessment models for each activity
• Companion website http://www-ed.fnal.gov/data/life_sci/poh/ offering:
  - Databases
  - Downloadable activities and assessments
  - Virtual prairie activities
  - Video clips to complement each section
• DVD with all critical components included

Philosophy

The advent of the 21st Century promises an exciting ascent into the future of science at Fermi National Accelerator Laboratory. As Fermilab stands on the brink of great discoveries in physics and establishes answers to some of the most elusive questions in our universe, we pause to look back on a time not so long ago. Rediscovering the majesty of the prairie through observation of Fermilab’s prairie reconstruction is possible through The Prairie – Our Heartland.
The Prairie – Our Heartland provides learners of all ages the opportunity to be scientists. Gathering data and making observations increases students’ knowledge and appreciation of the prairie. Combining science with other disciplines offers an engaging approach, establishing a context for learning that is relevant and exciting.

The hands-on, interactive focus of The Prairie – Our Heartland enlightens a future generation to this fragile, beautiful world. In so doing, we accentuate the student’s responsibility to maintain what remains or is restored of our ancestors’ prairie and become prairie stewards for the next generation.

Teaching Strategies and Tips

Student Research Teams
The Prairie – Our Heartland exemplifies best practice in science education. As is modeled in science laboratories, collaboration is valued. Hands-on, thematic activities comprise the content. Due to the interactive nature of The Prairie – Our Heartland and the vast scope of information covered, cooperative learning strategies are suggested. Distribution of tasks, jig-sawing information, and active student engagement within a team is encouraged.

Questioning Strategies
Strategic questioning promotes thinking and processing of information. Appropriate questions appear throughout this program. Many activities include Student Discussion and/or Reflection pages. These pages are not all intended as individual worksheets. Rather, they are discussion and/or reflection starters. Teachers should examine these question options and determine how and why they are used.

Authentic Assessment
Throughout The Prairie – Our Heartland, authentic assessment strategies are encouraged. Various examples and templates are available for teacher use and/or modification. Through authentic assessment, critical evaluative criteria allow the learner an opportunity to find success at his/her level. Share the assessment tools with students prior to engaging them in the various activities.

Field Trips
Field trips offer an opportunity for first-hand exposure to the prairie ecosystem. Plan a field trip to the Fermilab prairie or another local prairie. Teachers are encouraged to consider the season chosen for prairie study. The fall prairie offers the most varied array of mature plants. Winter trips present opportunities for twig analysis and animal print observations. Spring studies may revolve around woodland wildflowers and prairie emergence. Summer studies reveal prolific blooms and a myriad of insect activity. Consult with the Fermilab Education Office for specific seasonal plan ideas.
Prior to the on-site visit, students experience a variety of *The Prairie – Our Heartland* activities on the school site. Properly preparing students for a prairie field trip is critical to success. Unless a class readily becomes involved and understands the terminology of the prairie, even the best field trip may fall short of expectations.

**The Prairie Learning Curve**

The prospect of teaching prairie study may be intimidating to the uninitiated classroom teacher. It is important to realize that few science teachers are proficient in this area because of the rarity of prairie throughout the world. This is an important reason for establishing *The Prairie – Our Heartland*. The knowledge base you will derive by your preparation, coupled with your enthusiasm for the challenge of learning a new topic, will place you in the upper echelon of teachers in the area of prairie literacy. This background and interest passed on to innumerable students and colleagues foster an attitude of stewardship for the next generation.
The Prairie – Our Heartland
Elementary Prairie Program for the Stewards of the Next Generation

Stewards of the Prairie:
Introducing Concepts of the Prairie

<table>
<thead>
<tr>
<th>Section</th>
<th>Pages</th>
</tr>
</thead>
<tbody>
<tr>
<td>Time Warp on the Prairie</td>
<td>i-iv</td>
</tr>
<tr>
<td>Introduction</td>
<td>v-viii</td>
</tr>
<tr>
<td>History of the Fermilab Prairie</td>
<td>ix-xi</td>
</tr>
<tr>
<td>How Can We Explore a Prairie?</td>
<td>xii</td>
</tr>
<tr>
<td>Tie into Technology</td>
<td>xiii-xiv</td>
</tr>
</tbody>
</table>

Stewards of the Prairie: The Plan

<table>
<thead>
<tr>
<th>Section</th>
<th>Pages</th>
</tr>
</thead>
<tbody>
<tr>
<td>Time Warp on the Prairie (Complete Version)</td>
<td>P-1—P-16</td>
</tr>
<tr>
<td>A Workday in the Prairie</td>
<td>P-17—P-20</td>
</tr>
<tr>
<td>Stewardship</td>
<td>P-21—P-24</td>
</tr>
</tbody>
</table>

Stewards of the Prairie: Unlocking the Secrets of the Organisms

<table>
<thead>
<tr>
<th>Section</th>
<th>Pages</th>
</tr>
</thead>
<tbody>
<tr>
<td>Unlocking the Secrets of the Organisms</td>
<td>1-1—1-2</td>
</tr>
<tr>
<td>How Can We Measure a Prairie?</td>
<td>1-3—1-2</td>
</tr>
<tr>
<td>Home on the Range</td>
<td>1-13—1-28</td>
</tr>
<tr>
<td>Become a Prairie Plant Expert!</td>
<td>1-29—1-48</td>
</tr>
<tr>
<td>Prairie Animals</td>
<td>1-49—1-76</td>
</tr>
<tr>
<td>Prairie Mural</td>
<td>1-77—1-86</td>
</tr>
<tr>
<td>Bison – How Big are these Mammals?</td>
<td>1-87—1-96</td>
</tr>
</tbody>
</table>

Stewards of the Prairie: Revealing the Treasures beneath the Soil

<table>
<thead>
<tr>
<th>Section</th>
<th>Pages</th>
</tr>
</thead>
<tbody>
<tr>
<td>Revealing the Treasures beneath the Soil</td>
<td>2-1—2-4</td>
</tr>
<tr>
<td>Soil is More than Dirt!</td>
<td>2-5—2-32</td>
</tr>
<tr>
<td>Getting to the Root of the Matter</td>
<td>2-33—2-48</td>
</tr>
<tr>
<td>Earthworm Excitement – Soil</td>
<td>2-49—2-74</td>
</tr>
<tr>
<td>Round and Round It Goes – The Nutrient Cycle</td>
<td>2-75—2-86</td>
</tr>
</tbody>
</table>
### Stewards of the Prairie:
#### Unlocking the Lessons of the Past

<table>
<thead>
<tr>
<th>Topic</th>
<th>Pages</th>
</tr>
</thead>
<tbody>
<tr>
<td>Unlocking the Lessons of the Past</td>
<td>3-1—3-2</td>
</tr>
<tr>
<td>Addie Across the Prairie</td>
<td>3-3—3-18</td>
</tr>
<tr>
<td>What’s a Soddy?</td>
<td>3-19—3-28</td>
</tr>
<tr>
<td>Native Americans – Now and Then</td>
<td>3-29—3-48</td>
</tr>
<tr>
<td>Native American Stereotyping</td>
<td>3-49—3-72</td>
</tr>
<tr>
<td>Prairie Food Web/Interdependence</td>
<td>3-73—3-118</td>
</tr>
<tr>
<td>John Deere Internet Scavenger Hunt</td>
<td>3-119—3-130</td>
</tr>
</tbody>
</table>

### Stewards of the Prairie:
#### Revealing the Value of the Prairie

<table>
<thead>
<tr>
<th>Topic</th>
<th>Pages</th>
</tr>
</thead>
<tbody>
<tr>
<td>Revealing the Value of the Prairie</td>
<td>4-1—4-2</td>
</tr>
<tr>
<td>Prairie Concentration</td>
<td>4-3—4-22</td>
</tr>
<tr>
<td>Prairie Plants: Are They Worth Saving?</td>
<td>4-23—4-36</td>
</tr>
<tr>
<td>Prairie Plants of Medicinal Use</td>
<td>4-37—4-56</td>
</tr>
<tr>
<td>Mapping – The Way It Was</td>
<td>4-57—4-66</td>
</tr>
<tr>
<td>My Special Prairie Place</td>
<td>4-67—4-80</td>
</tr>
<tr>
<td>The Path of the Quiet Elk</td>
<td>4-81—4-94</td>
</tr>
<tr>
<td>For Every Wildflower There is a Season</td>
<td>4-95—4-112</td>
</tr>
<tr>
<td>The Palette of the Prairie</td>
<td>4-113—4-126</td>
</tr>
</tbody>
</table>

### Stewards of the Prairie:
#### Unlocking the Mysteries of Prairie Restoration

<table>
<thead>
<tr>
<th>Topic</th>
<th>Pages</th>
</tr>
</thead>
<tbody>
<tr>
<td>Unlocking the Mysteries of Prairie Restoration</td>
<td>5-1—5-2</td>
</tr>
<tr>
<td>Essentials of the Prairie: Bison and Fire</td>
<td>5-3—5-26</td>
</tr>
<tr>
<td>Ashes to Ashes</td>
<td>5-27—5-48</td>
</tr>
<tr>
<td>Prairie Steward Web-Based Projects</td>
<td>5-49—5-56</td>
</tr>
<tr>
<td>Riddle Me This</td>
<td>5-57—5-74</td>
</tr>
<tr>
<td>Seasons and the Moon</td>
<td>5-75—5-100</td>
</tr>
</tbody>
</table>

### Stewards of the Prairie:
#### Resources

<table>
<thead>
<tr>
<th>Topic</th>
<th>Pages</th>
</tr>
</thead>
<tbody>
<tr>
<td>Standards Alignments</td>
<td>R-1—R-6</td>
</tr>
<tr>
<td>• NSES (K-4 and 5-8)</td>
<td></td>
</tr>
<tr>
<td>• ILLINOIS</td>
<td>R-7—R-10</td>
</tr>
<tr>
<td>Glossary – Student</td>
<td>R-11—R-16</td>
</tr>
<tr>
<td>Glossary – Student Booklet (in printable booklet form)</td>
<td>R-17—R-22</td>
</tr>
</tbody>
</table>
Glossary – Teacher  R-23—R-38
Animal Names and Families  R-39—R-40
Prairie Identification Keys  
  • Grasses  R-41—R-44
  • Forbs  R-45—R-48
Herbarium Mount  R-49—R-52
Local Prairies  R-53
Format – Works Cited  R-54
Scientific Ways of Thinking  R-55
Special Education Considerations  R-56—R-58
Prairie Extensions  R-59—R-64
Websites  R-65—R-74
Bibliography  R-75—R-80
Assessments  
  • Rubrics  R-81—R-90
  • Checklists  R-91—R-98
  • Scoring Sheets  R-99—R-100
  • Prairie Rubric  R-101—R-102
Earthworm Excitement – Soil

PURPOSE:
Students utilize and integrate content, scientific inquiry, safety concerns, and science, technology, and society issues in this multidisciplinary activity. Using gummy worms (for practice) and live earthworms, students engage in observation, hypothesizing, data collection, testing, and drawing conclusions about earthworm behavior. Students relate the behavior of earthworms in the prairie soil to the enrichment of the soil and strengthening of the prairie.

STANDARDS:
See Resources, pp. 1-10, for a complete listing of standards.

NSESS K-4:
Science as Inquiry
CONTENT STANDARD A

Life Science
CONTENT STANDARD C

Science and Technology
CONTENT STANDARD E

Science in Personal and Social Perspectives
CONTENT STANDARD F

NSESS 5-8:
Science as Inquiry
CONTENT STANDARD A

Life Science
CONTENT STANDARD C

Science and Technology
CONTENT STANDARD E

ILLINOIS:

Language Arts
3.C.2a
3.C.2b
4.A.2a
4.A.2b
OBJECTIVES:
The students will:
- Observe quantitative and qualitative characteristics of inanimate and living things and distinguish between these characteristics.
- Conduct scientific research on how earthworms react to their environment.
- Relate findings of research to the nature of prairie soil and contribute to prairie stewardship efforts.
- Navigate the Internet using a keyword search to find fascinating information.

MATERIALS:
- One gummy worm per student
- Metric rulers – one per student
- String (5 cm long)
- Balance scales
- Graduated cylinder
- Several flashlights
- Wax paper
- Sandpaper
- White paper
• Standard paper boxes – one per Student Research Team (Use boxes as experimental confinements to control variables.)
• Earthworms – preferably one per student
• Disposable gloves – one pair per student

BACKGROUND:
Earthworms play an important role in the study of prairie soil. In addition to aerating and loosening the soil, they replace soil nutrients. Worms also serve as a food source for many other organisms. As an initial effort to improve soil, earthworms are often introduced to an area. The following activities provide students with a number of opportunities to bring meaning and understanding about dynamics within the soil of the prairie and provide another opportunity to learn about prairie stewardship.

• Worm Family Tree
• Student Family Tree
• Gummy Worm Lab
• Getting to Know Your Worm
• Worm Lab 1
• Worm Lab 2
• Worm Lab 3
• Worm Lab 4
• Worm Research Paper Guidelines

Worm Family Tree and Student Family Tree introduce students to classification of living things. The grade level of the student determines the depth of the explanation. The Family Tree activity brings meaning to the process of classification by asking students to investigate their own family tree.

Gummy Worm Lab stresses the importance of accurate record keeping and explains the nature of qualitative and quantitative characteristics.

Getting To Know Your Worm is an introductory exploration with live earthworms. This gives students an opportunity to become familiar with the external structure of their specimens. For safety reasons, students should wear gloves. The four Worm Labs enable students to investigate how earthworms react to their environment. They allow students to work with accurate record keeping, question and hypothesis formation, interpretation of data, and drawing conclusions. These activities facilitate sharing results by different groups and an understanding of why scientists repeat investigations and communicate with other scientists.

The final aspect of this project, Worm Research Paper, helps integrate research, technology and writing with science. Students improve science literacy
as they search for answers to specific questions online and write a paper reflecting their work.

PROCEDURE:
1. Carefully read the mini-activities and select all or some depending on your class’s needs.
2. Place students in Student Research Teams. (Utilize cooperative learning strategies to determine student placement and their roles within the teams.)
3. Build a prototype of a research confinement using the paper boxes. (Using these confinements, variables such as light, space, etc., can be better controlled.) Allow students to set up their Student Research Team’s experimental box.
4. Allow students to speculate about earthworm preferences. (*Typically, earthworms prefer dark, cool, moist environments.*)
5. Instruct students to note these predictions in their science journal.
6. Proceed with the selected activities, allowing time for reflection and feedback after each mini-activity. Take time to collaborate on data analysis.
7. After the activities are completed, instruct each individual to form a conclusion based on data. Request that Student Research Teams collaborate on a team conclusion. As a class, come to consensus about the behavior of earthworms.
8. Brainstorm about ways this inquiry relates to prairie stewardship.
9. Allow students to design their own hypothetical lab directly relating to prairie soil. If practical, conduct the student-designed lab.

ASSESSMENT:
See Resources.

Option 1
Refer to the Participation Assessment Rubric, pp. R-84, to assess student group participation on the lab tasks.

Option 2
Refer to the Performance Assessment Rubric, pp. R-85, to assess overall group effort.

Option 3
Refer to Laboratory Assessment Rubric, pp. R-86, to assess lab tasks.

Option 4
Refer to Writing Assessment Rubric, pp. R-87, to assess the Worm Research Paper.
WORM FAMILY TREE
Getting to Know Your
*Lumbricus terrestris*
Family Tree

Kingdom

Animalia

Phylum

Annelida

Class

Oligochaeta

Order

Opisthopora

Family

Lumbricidae

Genus

Lumbricus

Species

Terrestris
Gummy Worm Lab

**TASK A: DATA COLLECTION**

**OBSERVATIONS:**
1. How many segments does it have?
   
   *Answers will vary.*

2. How can you tell the front end from the back end?
   
   *Gummy worms have small indentations like eyes in the head region and pointed tails.*

**TASK B: LENGTH**

**OBSERVATIONS:**
1. Which unit (m, cm, or mm) do you feel is the best measurement to use to describe the specimen? Why?
   
   *Centimeter is the best unit to use. The worm is much smaller than a meter, so using this unit would give a very inaccurate measurement. The mm is too specific and would give accuracy beyond what is necessary for this lab.*

2. Does length tell you a quality or a quantity about the specimen?
   
   *Quantity*

**TASK C: CIRCUMFERENCE**

**OBSERVATIONS:**
1. Why is the average circumference a better measurement than taking just one measurement anywhere on the specimen?
   
   *Because the circumference varies slightly at different locations along the length of the gummy worm, the average is a better representation of the circumference of the worm than a single measurement taken at one place.*

2. Instead of a string, what could we use to measure the circumference of an object faster and probably better than a string? (Hint: What do you use to measure your waist size?)
A measuring tape

3. Is circumference a quality or quantity?

Quantity

4. How do your calculations compare with others in the class?

Answers will vary.

TASK D: MASS

OBSERVATIONS:
1. Is mass a quality or a quantity?

Quantity

2. What does the mass of the object actually tell you?

Mass is a measure of the amount of matter in an object.

TASK E: VOLUME BY DISPLACEMENT

OBSERVATIONS:
1. What does the volume of an object tell you about that object?

Volume is the amount of space occupied by a three-dimensional object.

2. How do you find the volume of a regular-shaped object, like a wooden box?

Length x width x height

3. Why do we use the displacement method to find the volume of irregularly/unusually-shaped objects?

Because you cannot measure them accurately

4. What would you do to find the volume of objects, like sugar, which dissolve in water?

You could use the same method or you could use a liquid like alcohol so the sugar would not dissolve.
**TASK F: CONCLUSION**

**OBSERVATIONS:**
1. What does qualitative observation mean? Give an example.
   
   *Qualitative observation is descriptive and can be subjective.*

2. What does quantitative observation mean? Give an example.
   
   *Quantitative observation is measured and is reproducible. It is less subjective than qualitative observation. Length is an example.*

3. Is one of the two kinds of observations more accurate or important to know than the other? Explain.
   
   *Possible answers include: Type of observation used depends on the item being observed and the purpose of the observation. While both are valuable, scientists rely heavily on quantitative observations.*

**TASK G: TASTE TEST**

**OBSERVATIONS:** (If you were allowed to eat your gummy specimen, please answer these questions.)

1. How does it taste?
   
   *Answers will vary.*

2. Is taste a qualitative or quantitative observation?
   
   *Qualitative*

**TASK H: COMPARISONS**

**OBSERVATIONS:**
1. How is your gummy worm like other gummy worms?
   
   *Shape, size, texture, elasticity, and mass will be similar.*

2. How is your gummy worm different from other gummy worms?
   
   *Color and taste may be different.*
3. How are gummy worms like real earthworms?

   *Shape and size are similar; both are smooth and slimy.*

4. How are gummy worms different from real earthworms?

   *Answers may include: color, taste, gummy worms are not alive, earthworm head does not have eye indentations, earthworms feel moister.*

5. If you had a real earthworm to study, would you treat it in the same way as you treated your gummy worm? Why or why not?

   *Answers will vary.*
Getting to Know Your Family Better
Family Tree

Great Grandfather | Great Grandmother | Great Grandfather | Great Grandmother | Great Grandfather | Great Grandmother | Great Grandfather | Great Grandmother

Great Grandfather | Great Grandmother | Great Grandfather | Great Grandmother

Grandfather | Grandmother | Grandfather | Grandmother

Father | You | Mother
Gummy Worm Lab

OBJECTIVES:
Using lab equipment, determine the qualitative and quantitative characteristics of a common object. Quantitative data include numerical measurements (length, weight, volume, etc.). Qualitative data is descriptive and non-numerical (color, texture, smell, behaviors, etc.).

TASK A: DATA COLLECTION

PROCEDURE:
STEP 1: Use the chart below to describe your Gummy worm specimen’s qualitative characteristics.

<table>
<thead>
<tr>
<th>QUALITATIVE CHARACTERISTICS</th>
</tr>
</thead>
<tbody>
<tr>
<td>COLOR</td>
</tr>
</tbody>
</table>

STEP 2: In the space below make an accurate, full-size drawing of your specimen.

OBSERVATIONS:
1. How many segments does it have?

2. How can you tell the front end from the back end?
QUANTITATIVE CHARACTERISTICS

TASK B: LENGTH

PROCEDURE:
Use a metric ruler to carefully measure the length of your specimen. Place your answers in the spaces below.

OBSERVATIONS:
1. Which unit (m, cm, or mm) do you feel is the best measurement to use to describe the specimen? Why?

2. Does length tell you a quality or a quantity about the specimen?

TASK C: CIRCUMFERENCE

PROCEDURE:
STEP 1: Take a small piece of string (2 to 5 cm long) and wrap it once around the thickness of your specimen near the top. Mark the spot where the string end meets the string again. Remove the string from around the specimen and measure the distance to the nearest millimeter and record.

Repeat this measurement two more times, once in the middle and again near the end, and record on the chart.

<table>
<thead>
<tr>
<th>LOCATION</th>
<th>CIRCUMFERENCE</th>
</tr>
</thead>
<tbody>
<tr>
<td>TOP</td>
<td></td>
</tr>
<tr>
<td>MIDDLE</td>
<td></td>
</tr>
<tr>
<td>BOTTOM</td>
<td></td>
</tr>
</tbody>
</table>
STEP 2: Now add the lengths of the top, middle, and bottom measurements together.

TOTAL CIRCUMFERENCE: ____________________

STEP 3: Since you made three measurements, you can find the average circumference by dividing the total you got by 3.

\[
\frac{\text{(total circumference)}}{3} = \text{AVERAGE CIRCUMFERENCE}
\]

OBSERVATIONS:
1. Why is the average circumference a better measurement than taking just one measurement anywhere on the specimen?

2. Instead of a string, what could we use to measure the circumference of an object faster and probably better than a string? (Hint: What do you use to measure your waist size?)

3. Is circumference a quality or quantity?

4. How do your calculations compare with others in the class?
TASK D: MASS

PROCEDURE:
Use one of the balances to accurately measure the mass of your specimen. Place your specimen on the pan and slide the balancing masses over, starting with the heaviest mass first, until the pointer indicates it is balanced. If you move a mass over and it weighs too much, move it one position back and use the next lightest mass to try to balance it. Continue to slide the masses (heaviest to lightest) until it is balanced. To find the mass of the specimen add the indicated weights for each slide (beam) together. Place the answer below.

MASS OF SPECIMEN: ____________ gm

OBSERVATIONS:
1. Is mass a quality or a quantity?

2. What does the mass of the object actually tell you?
(OPTIONAL TASK)
TASK E: VOLUME BY DISPLACEMENT

PROCEDURE:
Place about 20 cubic centimeters of water into a graduated cylinder. Record the exact level on the chart. Now place your specimen into the cylinder so that it is completely submerged (under water). Record the new level of the water to the nearest cubic centimeter on the chart. The difference between the original water level and the new level is the exact volume of your specimen. Record all measurements on the chart.

<table>
<thead>
<tr>
<th>ORIGINAL WATER LEVEL</th>
<th>cm³</th>
</tr>
</thead>
<tbody>
<tr>
<td>WATER LEVEL WITH SUBMERGED SPECIMENT</td>
<td>cm³</td>
</tr>
<tr>
<td>DIFFERENCE BETWEEN THE TWO READINGS (original minus specimen)</td>
<td>Show your MATH!</td>
</tr>
<tr>
<td>VOLUME OF OBJECT</td>
<td>cm³</td>
</tr>
</tbody>
</table>

OBSERVATIONS:
1. What does the volume of an object tell you about that object?

2. How do you find the volume of a regular-shaped object, like a wooden box?

3. Why do we use the displacement method to find the volume of irregularly- /unusually-shaped objects?

4. What would you do to find the volume of objects, like sugar, which dissolve in water?
TASK F: WRITING A CONCLUSION

Use the back of this paper if necessary.

Part 1:
PROCEDURE:
Using the qualitative and quantitative information you have collected about your specimen in the previous tasks, write a detailed description of the specimen, using those characteristics to describe it accurately (at least a one-paragraph description).

Part 2:
PROCEDURE:
Compare your conclusion with the other members of your Student Research Team. How does it compare? As a team, revise your conclusions to create one conclusion for the team.

Part 3:
PROCEDURE:
Compare your conclusion with the other teams within your class. How does it compare? As a class, revise your conclusions to create one conclusion for the class.

OBSERVATIONS:
1. What does qualitative observation mean? Give an example.

2. What does quantitative observation mean? Give an example.

3. Is one of the two kinds of observations more accurate or important to know than the other? Explain.
**TASK G: TASTE TEST**

**PROCEDURE:**
Now that you have completed the lab investigation, you have only one final test to do. You’re normally not allowed to eat anything in a lab; however, with your teacher’s permission, you may eat your specimen.

**OBSERVATIONS:** (If you were allowed to eat your specimen, please answer these questions.)
1. How does it taste?

2. Is taste a qualitative or quantitative observation?

**TASK H: COMPARISONS**

1. How is your gummy worm like other gummy worms?

2. How is your gummy worm different from other gummy worms?

3. How are gummy worms like real earthworms?

4. How are gummy worms different from real earthworms?

5. If you had a real earthworm to study, would you treat it in the same way as you treated your gummy worm? Why or why not?
Getting to Know Your Earthworm
*Lumbricus terrestris* Lab

Now that we have finished working with the gummy worms, it is time to get to know the real *Lumbricus terrestris*. During this lab you will observe and get to know your earthworms. You must follow basic safety rules while working with your worm. Remember, they are living invertebrates. DO NOT mistreat them. DO NOT put your fingers or the worm in your mouth! For safety reasons, you must wear gloves. **Wash your hands** after handling the earthworms.

Make the following observations about your *Lumbricus terrestris*:

- What is the color of your *Lumbricus terrestris*?

- How does the worm move? Describe how it moves.

- Does your *Lumbricus terrestris* have legs? How do you know?

- Does your *Lumbricus terrestris* have eyes? How do you know?

- Does your *Lumbricus terrestris* have ears? How do you know?

- Does your *Lumbricus terrestris* have hair? How do you know?

- Does your *Lumbricus terrestris* have a mouth? How do you know?

- Draw a picture of your *Lumbricus terrestris*. 
Getting to Know Your Earthworm  
*Lumbricus terrestris* Lab #1

**Question:**
Do earthworms prefer rough or smooth surfaces?

**Hypothesis:**
________________________________________________________________
________________________________________________________________
________________________________________________________________

**Procedure:**
Place equal size pieces of sandpaper and plain brown paper side by side. Place one earthworm across both pieces of paper so that the same length of earthworm is on each paper. Make sure the earthworm is facing the same direction each time. Record which type of paper the worm prefers to be on. Make sure you do this three times.

![Image of sandpaper and regular paper with earthworms]

**Controls** = same size of paper, same worm, and worm always facing the same direction.

**Variable** (manipulated) = surface of paper (rough vs smooth).

**Results (data):**

<table>
<thead>
<tr>
<th></th>
<th>sandpaper</th>
<th>regular paper</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>3.</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Conclusion:**
Getting to Know Your Earthworm  
*Lumbricus terrestris* Lab #2

**Question:**  
Do earthworms prefer wax paper or white paper?

**Hypothesis:**  
________________________________________________________________
________________________________________________________________
________________________________________________________________

**Procedure:**  
Place equal size pieces of wax paper (on top of a sheet of white paper) and white copy paper side by side. Place one earthworm across both pieces of paper so that the same length of earthworm is on each paper. Make sure the earthworm is facing the same direction each time. Record which type of paper the worm prefers to be on. Make sure you do this three times.

<table>
<thead>
<tr>
<th></th>
<th>wax</th>
<th>white</th>
</tr>
</thead>
</table>

**Controls** = same size of paper, same worm, worm always facing the same direction.

**Variable** (manipulated) = surface of paper (wax vs. white paper).

**Results (data):**  

<table>
<thead>
<tr>
<th></th>
<th>wax paper</th>
<th>white paper</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>3.</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Conclusion:**
Getting to Know Your Earthworm
*Lumbricus terrestris* Lab #3

**Question:**
Do earthworms prefer wet paper or dry paper?

**Hypothesis:**

**Procedure:** Place equal size pieces of wet paper and dry paper side by side. Place one earthworm across both pieces of paper so that the same length of earthworm is on each paper. Make sure that the earthworm is facing the same direction each time. Record which type of paper the worm prefers to be on. Make sure you do this three times.

<table>
<thead>
<tr>
<th>wet</th>
<th>dry</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Controls** = same size of paper, same worm, worm always facing the same direction.

**Variable** (manipulated) = surface of paper (wet vs. dry paper).

**Results (data):**

<table>
<thead>
<tr>
<th>wet paper</th>
<th>dry paper</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td></td>
</tr>
<tr>
<td>2.</td>
<td></td>
</tr>
<tr>
<td>3.</td>
<td></td>
</tr>
</tbody>
</table>

**Conclusion:**
Getting to Know Your Earthworm
*Lumbricus terrestris* Lab #4

**Question:**
Do earthworms move toward or away from a light?

**Hypothesis:**
________________________________________________________________
________________________________________________________________
________________________________________________________________

**Procedure:**
Place your earthworm on a piece of white paper. Place one earthworm on the piece of paper. Turn on a flashlight and place it in front of the earthworm. The head of the worm must be facing the flashlight. Record whether the earthworm moves toward the light or away from the light. Make sure you do this three times.

![Diagram of earthworm facing flashlight](image)

**Controls** = same size of paper, same worm, worm always facing the same direction, and flashlight in same position.

**Variable** (manipulated) = light from flashlight (moves toward vs moves away).

**Results (data):**

<table>
<thead>
<tr>
<th></th>
<th>toward</th>
<th>away</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2.</td>
<td></td>
<td></td>
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<tr>
<td>3.</td>
<td></td>
<td></td>
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</tbody>
</table>

**Conclusion:**
Getting to Know Your *Lumbricus terrestris* Even Better Internet Research Paper

Now that we have finished working with the gummy worms and the real thing, *Lumbricus terrestris*, it is time to get to know more interesting things about earthworms. You will need to write a one- to two-page paper (minimum) about earthworms. You certainly may include any fascinating facts about earthworms, but you **MUST** include answers to the following questions in your paper:

- How many hearts does an earthworm have?
- What do earthworms eat?
- Do earthworms have lungs?
- Are earthworms cold-blooded or warm-blooded?
- At what temperature do earthworms die?
- Where do earthworms like to live?
- Are earthworms vertebrates or invertebrates?
- What kind of animals eat earthworms (what are their predators)?
- What is the life cycle of an earthworm?
- What is meant by poikilothermic?
- How many earthworms can you find in one acre of soil?
- How do earthworms reproduce?
- In what ways are earthworms good for the environment?
- Why is having segments a good thing for earthworms?
- How many different types of earthworms are there?

You may include accurate pictures or drawings. Do a good job!

Helpful websites:

- [http://www.nsta.org/elementaryschool](http://www.nsta.org/elementaryschool)
- [http://www.animalsoftherainforest.com/earthworm.htm](http://www.animalsoftherainforest.com/earthworm.htm)

You may search for other sites by using “earthworm” as your keyword. **Always** obtain permission from an adult or your teacher before searching on the Internet.

**Have fun!!!**
A Workday in the Prairie

PURPOSE:
To have students gain an understanding of the work involved in restoring and maintaining a prairie in preparation for them becoming stewards and/or prairie volunteers in the future.

STANDARDS:
See Resources, pp. 1-10, for a complete listing of standards.

NSES K-4:

Science as Inquiry
CONTENT STANDARD A

Life Science
CONTENT STANDARD C

Science and Technology
CONTENT STANDARD E

History and Nature of Science
CONTENT STANDARD G

NSES 5-8:

Science as Inquiry
CONTENT STANDARD A

Life Science
CONTENT STANDARD C

Science and Technology
CONTENT STANDARD E

Science in Personal and Social Perspectives
CONTENT STANDARD F

History and Nature of Science
CONTENT STANDARD G
OBJECTIVES:
The students will:

1. Describe different tasks that need to be performed to maintain a prairie habitat.
2. Understand the difference between a professional land management group and prairie volunteers.
3. Understand that by volunteering, they can help now and in the future to save the prairie.
4. Work in cooperative groups to plan for a workday in the prairie.

BACKGROUND:
To restore and maintain a prairie requires the cooperation of many different people. Land managers and professional grounds crew are paid to restore and maintain natural areas. However, there is rarely if ever enough money in the budget to pay for all the work needed to save these ecosystems.

A steward is a volunteer who cares for and protects land that he/she doesn't own. A prairie steward is a caretaker of a natural area who has enough
background on native ecosystems to help plan for work projects on the prairie. Volunteer workers under the direction of a steward are usually dedicated to a specific prairie. Their work on this prairie provides the extra care needed for its survival.

PROCEDURE:
1. Divide the class into four groups.
   Three groups will be made up of a steward or co-stewards and prairie volunteers; the fourth group will be made up of a land management professional(s) and professional grounds crew.
   Land manager job: Makes plan for land use with input from steward. Makes long-range plan for prairie. Trains ground crew. Helps with prairie burns.
   Professional grounds crew: Operates heavy equipment to move earth and remove large brush and trash. Performs the controlled burns.
   Steward job: Helps land managers with long-range prairie restoration plan. Assigns jobs and gathers tools for prairie workday. Often has trained and obtained a herbicide license. If licensed, applies herbicides to invasive plants.
   Volunteers job: Collects and spreads seeds. Removes small brush. Removes trash.
2. The three volunteer groups will be assigned two tasks.
   Task A: Write up a plan for maintaining your imaginary prairie.
   Task B: Plan a workday in your prairie.
3. The professional group will be available to consult with all three volunteer groups on their plans and to perform “work” on the prairies prior to or following the workday.
4. The professional work and prairie workday on these imaginary prairies will be presented to the class as skits.

ASSESSMENT:
The skit can be used for assessment.

Be a literate scientist…
Research the types of plants that would be beneficial to have on a prairie. Research the types of plants that should be removed from a prairie. Write a report that explains why some plants are beneficial and others are not.
Stewardship

What is a prairie steward?

A steward is a volunteer who cares for and protects land that he/she doesn’t own. A prairie steward is a caretaker of a natural area who has enough background on native ecosystems to help plan for work projects on the prairie.

Why did you become a prairie steward?

A desire to help save the prairie ecosystem and do something good for the environment, a desire to learn more about managing the prairie and share what is learned with others, and the enjoyment of working with friends are reasons the stewards volunteer for the job as prairie steward.

What are you expected to know or do as a steward?

Monitoring or keeping track of what plants and how much of each plant are in the prairie is one job of a steward. As a steward, it is important to know both native and non-native plants and how they grow so that you can keep the good stuff and get rid of the bad stuff. As a rule of thumb, plants that green early or stay green late in the growing season are non-native. For example, garlic mustard, a very bad non-native plant, stays green throughout the winter. (There are exceptions to this rule.)

What can a student do to help a prairie steward?

The job of a prairie steward and his or her helpers is hard but rewarding work. Students, as volunteers on workdays, often help collect and spread seeds and pick up trash in the prairie. They can also help by learning about this ecosystem and sharing this information with others.

What do you think is the most important part of your job?

Tagging good plants so that they aren’t removed by mistake and removing non-native plants before they get out of control is very important. Getting others involved in working on the prairie is just as important.

What do you think is the most exciting part of your job?

The most exciting part of a steward’s job is observing a native plant growing in an area for the first time and then spreading in the prairie. Observing the change from an overgrown area to a beautiful ecosystem takes many years but makes all the hard work of a steward worthwhile.
How is the prairie important to us today?

Since the prairie is an important part of the food chain, certain plants and animals depend on it to survive. For example, Burlington Prairie has the largest stable population of purplish-copper butterflies in the state because this butterfly eats from a smartweed plant found in a wet area in this prairie. In the past, Native Americans and pioneers used many prairie plants as medicine. Scientist today continue to study these plants, searching for new medications. The prairie came close to being a lost ecosystem. These plants and animals and the possible discovery of new uses for these plants depend on the survival of this unique prairie ecosystem. By maintaining this ecosystem, we are maintaining open space we all can enjoy.

What is your biggest concern about the prairie?

The survival of the prairie was the shared worry of all the stewards. The construction of homes, businesses, farms and roads near or through the prairies threaten its survival. Also, if people don’t step up and volunteer to be stewards of these prairies in the future, they may be lost.

Thank you to Glenda Peck’s fourth grade class from Alice Gustafson Elementary School in Batavia, who provided the questions.

Thank you to Jon Cooper, co-steward, Fabyan Rock Shelf Prairie; Bob Lootens, co-steward, Fabyan Rock Shelf Prairie; Mary Jo Murphy, steward, Burlington Prairie; and Steve Sentoff, steward, West Chicago Prairie, who provided the answers.
Prairie Stewards

Jon Cooper, Co-Steward
Fabyan Rock Shelf Prairie

Bob Lootens, Co-Steward
Fabyan Rock Shelf Prairie

Steve Sentoff, Steward
West Chicago Prairie

Mary Jo Murphy, Steward
Burlington Prairie