America's Lost Landscape: The Tallgrass Prairie Activity Guide

University of Northern Iowa. Tallgrass Prairie Center.

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About the Film

*America’s Lost Landscape: The Tallgrass Prairie* tells the rich and complex story of one of the most astonishing alterations of nature in human history. Prior to Euro-American settlement in the 1820s, one of the major landscape features of North America was 240 million acres of tallgrass prairie. But between 1830 and 1900 – in the space of a single lifetime – the tallgrass prairie was steadily transformed to farmland. This drastic change in the landscape also brought about an enormous social change for Native Americans; in an equally short time their cultural imprint was reduced in essence to a handful of place-names appearing on maps.

*America’s Lost Landscape* examines the record of human struggle, triumph, and defeat that prairie history exemplifies, including the history and culture of America’s aboriginal inhabitants. The story of how and why the prairie was changed by Euro-American settlement is thoughtfully nuanced. The film also highlights prairie preservation efforts and explores how the tallgrass prairie ecosystem may serve as a model for a sustainable agriculture of the future.

The extraordinary cinematography of prairie remnants, original score and archival images are all delicately interwoven to create a powerful and moving viewing experience about the natural and cultural history of America.

The Activities in this guide were created by teachers, for teachers to assist you in bringing the story of the prairie to your students.
The Prairie Puzzle

Summary: Scientists use many types of evidence to learn about the tallgrass prairie ecosystem. The most direct way to study the tallgrass prairie is to make observations and measurements of prairie remnants. Historical journals and sketches can supplement direct observation and help scientists and historians build a more complete understanding of the tallgrass prairie system.

Objectives
After completing this activity the students will:
- Assess the extent to which the native tallgrass prairie has been lost.
- Identify different types of evidence used by scientists and historians to understand the prairie ecosystem.

Materials
- One masterpiece puzzle piece of a 1000 piece puzzle representing the Mona Lisa (See Resources)
- Copies of Masterpiece Historical Accounts student copy page.
- Copies of Prairie Historical Accounts student copy page.
- One blank sheet of paper per student.
- Art materials (water colors, pastels, markers, or other drawing/painting items)
- A color copy of the Mona Lisa
- Color copies of various interpretations/spoofs of the Mona Lisa collected from the Internet (optional)
- Student Journals/Paper

Film Segments
Teaching segments 2- The Lost Landscape and its Significance, and Teaching Segment 3- The Prairie Ecosystem

Background
The tallgrass prairie once covered 400,000 square miles of North America, stretching from southern Canada to southern Texas and from parts of Ohio into central Nebraska.

A climate of periodic hot dry summers and cold dry winters, recent (in geologic terms) glaciations, and fire played major roles in developing and maintaining the tallgrass prairie for thousands of generations. But between 1830 and 1900, the tallgrass prairie was almost completely converted into farmland and settlements. Today only about 1/10th of 1% of the tallgrass prairie remains.

By studying prairie remnants (an original prairie that has never been converted to another land use) scientists can learn about the tallgrass prairie ecosystem. Making observations and conducting experiments on prairie remnants, studying prairie soils and reviewing geological evidence is direct observation and measurement. Because there are so few prairie remnants left, scientists must use other evidence to study the prairie. Native Americans have passed down stories of the prairie. Explorers and European settlers wrote accounts of the prairie and made sketches in their journals. These accounts can help scientists better understand what the prairie was like before it was broken up into isolated remnants. These types of records are all primary sources. A primary source is a first hand account.

Scientists can also study prairie reconstructions (a human made prairie). They can analyze historic scientific surveys and journals in the light of new scientific information to develop a better understanding of the prairie ecosystem. These forms of information are indirect evidence. Indirect evidence can play an important role in developing an understanding of an ecosystem that is no longer intact. A secondary...
The Prairie Puzzle

source is a restatement or explanation of a primary source. New interpretations of previous first hand accounts are secondary sources.

In this activity, students will use indirect evidence to supplement direct evidence and attempt to reconstruct a piece of artwork. Then they will compare their experiences reconstructing the artwork to reconstructing a picture of the original extent of the tallgrass prairie.

Procedure

• Engagement
  1. Pass the puzzle piece around the classroom. Announce that the puzzle piece is all that remains of a once famous piece of artwork. After each student has had an opportunity to view the puzzle piece, ask the class to speculate on how the original painting might have looked.
  2. As a class, list on the board what you know about the artwork based on the puzzle piece. Also create a list of information that an artist would need to create a reconstruction of the piece of artwork from which the puzzle piece comes.
  3. Ask the class if it would ever be possible to recreate an exact replica of the original piece of art without more information.

• Exploration
  1. Challenge each student to reconstruct the original painting using various types of art materials available.
  2. While the students are working, announce that new evidence has become available. Several historical accounts of the painting have been discovered. Read the masterpiece historical accounts to the class. Allow the students to change their reconstructions or make up a new reconstruction based on the new information.
  3. Allow time for students to finish their reconstructions.
  4. (Optional: Announce to the class that other artists have also been attempting to recreate this piece of art. Several artists from around the world have sent you copies of their interpretations of the painting. Post several Mona Lisa spoofs along with your student’s artwork.)
  5. Post all of the student’s reconstructions on the wall. Have the students compare each other’s art work. How are the various reconstructions alike? Are there any ideas or features that everyone put into their art? Optional: Have the students organize or classify the reconstructions based on their own criteria.
  6. Ask if anyone in the class knows the name of the masterpiece. Show a picture of the Mona Lisa to the class. Explain that the puzzle piece is one piece of a 1000 piece puzzle of the Mona Lisa painting, perhaps the most famous painting in the world.

• Explanation
  1. As a class, discuss how difficult it was to create the reconstructions of the Mona Lisa. Play Teaching Segment 2 of the Lost Landscape Film. Explain that for scientists, reconstructing an accurate understanding of the tallgrass prairie is like trying to paint the Mona Lisa with only a one/thousandths piece. Only 1/10th of 1 percent of the tallgrass prairie remains.

That is the same as 1 piece of a 1000 piece puzzle. Scientists can visit prairie remnants, but they can’t go back in time and make observations of the prairie when it was an undisturbed ecosystem. Scientists and historians can use the journals and sketches from explorers, settlers and early scientific surveys to supplement what they observe on today’s prairies.

  2. Pass out the Prairie Historical Evidence Student Copy page. Give students enough time to read the page. As a class, watch Segment 3 of the film.
The Prairie Puzzle

**Application**

1. Break the students up into groups and have each group develop a way to illustrate the concept of 1/1000th. They may use analogy, tell a story, draw a picture, or develop a skit. Have each group turn in or share their work.

2. In their small groups or as individuals, have the students make a concept map or list of the things they know about the prairie based on the historical evidence and by watching the video.

3. Then make a list of what more they want to know. Discuss the questions that were listed. Discuss the processes that could be used or the steps needed to answer the student questions (where to find information, resources needed, etc.). Some might be easy to answer by visiting a prairie remnant or researching in books. Other questions (like “How does it feel to look around in all directions and see nothing but grass for miles and miles?” or “What do you think mating prairie chickens sounded like in the springtime?”) are more difficult or impossible to answer because so much of the prairie has been lost.

4. Have each student or group write a brief explanation of the types of evidence scientists could use to further understand the tallgrass prairie. Examples may include:
   - observation (direct)
   - inferences (indirect)
   - photographs
   - journals, scientific surveys, sketches or other historical primary sources
   - artwork
   - scientific papers based on other sources (secondary sources)

5. Watch additional film segments or conduct additional research to discover which of the student’s questions the class can find answers to.

**Assessment**

1. Collect the students’ explanations of 1/1000th or evaluate their presentations as they give them.

2. Collect the students’ concept maps/lists of what they know about the prairie, list of questions they have about the prairie, and their explanation of what evidence can be used to learn more about the prairie.

3. Have the students write a paragraph comparing the loss of prairie to something else that has been lost quickly – loss of rain forests, loss of privacy, etc.

4. Have students present the results of their own prairie research.

**Extensions**

1. Have the student’s research historical journals for information about the prairie and share this information with classmates, or other groups that might be interested (like the local Audubon Chapter.)

2. Have the student’s create their own masterpiece artwork to represent something they know about the prairie.

3. Have students research the Mona Lisa (artist, time period created, inspiration, purpose, value, where currently exhibited, theft of, the “smile”) and write a paper comparing the loss of a cultural treasure to the loss of a natural one.

**Resources**

One puzzle piece may be included with your materials.

Puzzle was obtained from: The Puzzle House
426 Nutting Road
Jaffrey, NH 03452
http://www.puzzlehouse.com/
The Prairie Puzzle

Quote Credits


1: Museum’s Inventory Description:
A Portrait by Leonardo di ser Piero da Vinci, painted circa 1503-1506 on a wood panel;
Height 0.77 m; Width 0.53 m Inventory # 779

2: Personal account by a museum curator:
"The woman is not particularly beautiful, and there is not a lot of color," says Cuzin. "There
is not that much to see, yet this painting is the most famous in the world. The problem is
she has become so famous that we don't really see her anymore. What would be extraordi-
nary would be to see the [painting] for the very first time, as if you had never seen her be-
fore." - Jean-Pierre Cuzin, Curator of Painting at the Louvre

3: Personal Account by a museum visitor:
What color are the eyes? Ironically, even standing in front of the portrait you couldn't tell
what color her eyes were. It's actually quite a small painting. I had her to myself. I did what
anyone would do. I leaned forward, across the guard rope, and peered more closely
through the bullet-proof glass that covers the painting. I guess I peered a bit too much be-
cause all of a sudden the alarms went off. I had crossed the invisible death-ray guarding
her. Within ten seconds I was surrounded by guards... a curator was called. He looked just
like what you would expect a curator in the Lourve to look like. He listened to the guards,
and my host, and looked at me, and smiled. "Good question," he said in excellent English,
"let's look." He reached into his pocket, fiddled with something, and then moved the rope
aside. Cheek by cheek we moved closer to her. No alarm. Finally, perhaps six inches from
the glass, we stopped. We both peered.
"Brown." he said.
"Hazel." I said. – Larry Peery

4: Scientific Description:
Dr. Margaret Livingstone, a Harvard Neuroscientist, has provided a concrete explanation
for popular fascination with the intriguing smile of the figure. She feels that the quality of the
smile is derived from the design of the Human visual system. Livingstone's scientific expla-
nation for the elusive smile is that an individual's center of gaze is focused on subject's
eyes with less accurate peripheral vision on her mouth. This focus picks up shadows from
the cheekbones, which suggests a curvature of a smile, but when the viewer's eyes then
shift to her mouth, the shadows of her mouth elude the viewer. The smile appears present
and then gone because of the visual processing.
1: Historical Account:
Indian agent Joseph Street said it well in 1833 when he described his trip across Iowa: “I had never rode through a country so full of game.” - A Country So Full of Game

2: Historical Account and interpretation by researcher:
William Clark wrote in his journal for July 19 (the day they passed by what is now Lincoln City, Nebraska) that he named an island they passed Butter Island, "as at this place," he said, "we made use of the last of our butter." During the day he left the keelboat and was walking through some woodlands on the shore near here, hunting elk—that's right, elk, in the Midwest—when, he wrote, "I came suddenly into an open and boundless prairie. I say boundless," he continued, "because I could not see the extent of the plain in any direction. This prairie was covered with grass about 18 inches to 2 feet high and contained little of anything else."

This prospect was so sudden and entertaining," Clark noted, "that I forgot the object of my pursuit." Now William Clark was not the kind of man to forget the object of his pursuit, however momentarily. But his first sight of a boundless horizon—this first intimation of the West and what would soon enough become a common sight—literally stopped him in his tracks. It is a remarkable—and I believe poetic—moment. – Clark and Dayton Duncan

3: Researcher Notes:
"It was a flowing emerald in spring and summer when the boundless winds ran across it, a tawny ocean under the winds of autumn, and a stark and painful emptiness when the great long winds drove in from the northwest. It was Beulahland for many; Gehenna for some. It was the tall prairie."—from the prologue Where the Sky Began, John Madson
What is it? Level One

Summary: Scientists communicate through common understanding of words and their meaning. In this activity students will develop their understanding of ecosystems and the tallgrass prairie through the development of individual and common definitions.

Objectives
After completing this activity the students will:
- Identify the prairie as an ecosystem.
- Formulate a basic definition of the prairie.

Materials
- Student Copy Page, one per student
- Students’ science journals or blank paper

Film Segments
Teaching Segment 1-Introduction, Teaching Segment 2- The Lost Landscape and its Significance, and Teaching Segment 3- The Prairie Ecosystem

Background
This is an initial activity for introducing the tallgrass prairie ecosystem. As background, watch the DVD ahead of time, especially if you are not familiar with this ecosystem. An ecosystem is an interrelated group of plants and animals that inhabit a particular region. Factors that contribute to an ecosystem include weather, latitude, species of plants and animals (including humans), and geologic formations. The tallgrass prairie was an extensive ecosystem characterized by vast open expanses of grasses and forbs (flowering broad leafed plants). It was an ecosystem teeming with life, often containing upwards of 200 species of plants and greater than 200 species of animals per acre. The deep root system of the plants built the most fertile thick soils in the world, which later played a part in its demise. The vastness also made it seem like a resource that could not possibly be used up, though it was in less than 2 generations. It is now confined to tiny remnants in old prairie cemeteries, right-of-ways, and on ground that was either too steep or rocky to farm. It is so rare that it is nearly unknown to the populations that inhabit its former domain.

Procedure
- Engagement
  1. Write the words “Tallgrass Prairie” on the board.
  2. Ask the students what these words mean. What do they know about the tallgrass prairie? Where have they heard about the prairie? Has anyone ever been to a tallgrass prairie? What was it like?
  3. Explain that a definition is the statement of the meaning of a word or idea. Ask each student to write a definition of the tallgrass prairie based on their current knowledge.

- Exploration
  1. Give a student copy page to each student. Play segments 1-3 of the film for the class. Ask the students to complete the copy page as they watch the film, or provide time between segments.
  2. Provide an opportunity for students to share their notes and/or drawings for each box on the student copy page.
**What is It? Level One**

- **Explanation**
  1. Have students compare their first definition of the tallgrass prairie to their second. Describe how they are similar and different. What caused the change?
  2. Have students compare their definitions to each other and allow them the opportunity to discuss their reasoning. Discuss the factors which contribute to an ecosystem (weather latitude, species, geological formations). Allow students to modify their definitions based on their conversations with other students.
  3. Select portions of several of the student definitions to develop a class definition that everyone is comfortable with or provide students with the class definition for the tallgrass prairie.

- **Application**
  1. Provide students with information about another ecosystem (i.e. Sahara desert, Everglades, a small pond).
  2. Have students identify the interrelated plants and animals of that ecosystem. Likewise, have students discuss the factors that contribute to this ecosystem such as weather, latitude, species of plants and animals (including humans), and geologic formations.
  3. Provide students the opportunity to compare and contrast the new ecosystem to that of the tallgrass prairie.

**Assessment**
1. Collect the students’ prairie definitions.
   Suggested Definition rubric:
   - The definition includes identifying the prairie as an ecosystem (+3)
   - The definition includes a general description of prairie flora (+1), grasses (+1) & flowering plants (+1)
   - The definition includes where the tallgrass prairie is/was (central or mid-continent N.A., +2)
   - The definition includes an accurate reference to soil (+2)
   - The definition includes a reference to agriculture or transformation of the prairie (+2)
   - The definition does not use an analogy (does not include the prairie is like…) (+2)
   - Total = 14pts
2. Have students journal in their science notebook what they learned about the tallgrass prairie.
3. Collect and assess values to each rectangle of the Student Copy Page.

**Extensions**
1. Have each student write an analogy for the prairie by completing the sentence:
   - The tallgrass prairie is like ___________________ because _____________________.
2. Watch a video about the other ecosystem that students picked to compare to the tallgrass prairie.

**Resources**
<table>
<thead>
<tr>
<th>In this box, draw or describe what the prairie looks like…</th>
<th>In this box, describe how the prairie was created…</th>
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<tr>
<td>In this box, list organisms that live on the prairie…</td>
<td>In this box, describe how you feel about the prairie…</td>
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What is it? Level Two

Summary: Scientists and others communicate through common understanding of words and their meaning. In this activity students will develop their understanding of the tallgrass prairie as an ecosystem through solving and creating riddles.

Objectives
After completing this activity the students will:

- Formulate a description of the tall grass prairie, including location, climatic causes of its establishment, plant and animal life, and its current status.

Materials
- Clue Cards - Set of 10 for each small group
- Introduction Examples
- Small pieces of scrap paper for each group

Film Segments
Teaching Segment 3 -The Prairie Ecosystem

Background
What was the tallgrass prairie? Where was it located? What remains of it? Ecosystem is a word that scientists and others use to describe related biotic (living) and abiotic (non-living) parts that function together as a system. The tallgrass prairie is one of North Americans ecosystems. Other North American ecosystems include the temperate forest, the shortgrass prairie, and the tundra. Abiotic factors that affect all ecosystems include the atmosphere, climate, soil, hydrology (water), and bedrock. The tallgrass prairie formed in the middle of the continent, under the rain shadow of the Rocky Mountains, under conditions of periodic long dry cold winters and long dry hot summers. Periodic fire was also a key factor. Forest ecosystems, where the dominant species is trees, could not develop under these conditions. Instead a complex system of grasses and flowering plants developed.

The biotic elements of all ecosystems can be divided into autotrophs (producers) and heterotrophs (consumers). Grasses (such as Big Bluestem, Indian Grass, and Switch Grass) and flowering plants (pale purple coneflower, blazing star, lead plant, prairie indigo, compass plant, butterfly milkweed) make up the autotrophs of the tallgrass prairie. Bison, elk, rabbits, badgers, skunks, bull snake, ornate box turtle, bobolinks, American kestrel, bumble bees, aphids, earthworms and other animals are the heterotrophs of the tallgrass prairie. In this activity, students will be introduced to the tallgrass prairie by solving a riddle about it.

Procedure
- Engagement
  1. Arrange students into small groups. Distribute two small pieces of paper to each team. Team members should write their names on each piece.
  
  2. Tell the class you are going to play a game. Explain the rules to the students. “The object of the game is to be the first team to correctly guess the answer to the riddle. There are 6-10 clues. One clue card will be given to your group at one-minute intervals. Each group will be allowed only two guesses at the “What is it?” riddle, so it is important that the group carefully consider their answer. When your group thinks they have the answer, write it down on the paper and have one group member present it to me. If your answer is correct, I will write the number of the clue you were last given on your response, but continue to distribute clues to the other groups.”
What is It? Level Two

Practice the game using one or both of the examples below:

Example One: What is it?

Clue 1: They are found in most of Canada, all of the continental US, and northern Mexico, but no where else.

Clue 2: Many people are surprised that they are excellent swimmers.
Clue 3: They live in tall trees near rivers, lakes or coasts.
Clue 4: They eat mostly fish.
Clue 5: They can fly at speeds of up to 35 miles per hour.
Clue 6: The greatest population is in Alaska
Clue 7: They are the top of their food chain.
Clue 8: They were declared an endangered species in 1967.
Clue 9: Adults have a white head and tail.
Clue 10: They are our national bird.

ANSWER: Bald Eagle

Example Two: What is it?

Clue 1: They are mammals.
Clue 2: They have a shaggy brown coat in the winter.
Clue 3: They are the largest terrestrial animal currently living in North America.
Clue 4: They eat grasses and sedges.
Clue 5: They usually travel in herds.
Clue 6: Both males and females have short horns used for defense and to maintain their status in the herd.
Clue 7: Humans, and rarely bears and wolves, are their only predators.
Clue 8: Their grazing habits helped form the local ecosystem.
Clue 9: Kansas, Montana, and North Dakota quarters all feature this animal.
Clue 10: They are a member of the family Bovidae, which also includes cattle and goats.

ANSWER: Buffalo

Exploration
1. Now play “What is it?” using the clue cards from the student copy page. Follow the same procedure as in the engagement activity.
2. After all the teams have made a correct guess or after all of the clues have been read, discuss the process with the students. Which clues helped the most? Which helped the least? What other guesses did the students consider and which clues made them dismiss the wrong guess? What makes a good clue? Read all of the clues again or post the clues on the board/overhead.

Explanation
1. Based on the clues, ask the students to write down the answers to the following questions:
   Where is the prairie located?
   What type of climate is best for prairies?
   What factors help maintain the prairie?
   What plant and animals make their home in the prairie?
   What is the current status of the prairie?

Play Teaching Segment 3, telling students to take notes in any form they choose (concept map, outline, etc.) on the following: location, climate causes, soil, plant and animal life, current status of the tallgrass prairie.

Application
1. Have the students use their notes to create a description of the tallgrass prairie including location, climatic causes of its establishment, plant and animal life, and its current status.
What is It? Level Two

Or (this application may be completed immediately or at the end of a prairie unit)

1. Divide the students into pairs. Have each pair of students select and develop a set of clue cards for one of the plants or animals presented in Teaching Segment 3.
2. Provide the students with time to research their subject.
3. Have the students take turns leading the “What is it?” game.

Assessment
1. Collect and evaluate the notes taken while watching the film segments.
2. Collect and evaluate the completed prairie descriptions.

Extensions
1. Have students create a descriptive pictorial timeline of the tallgrass prairie emphasizing location, climate causes of establishment, plant and animal life, and current status.
2. Have students research and write clues describing other ecosystems.

Resources
<table>
<thead>
<tr>
<th>The Clues</th>
</tr>
</thead>
<tbody>
<tr>
<td>1: Its rich complexity of plant and animal life took millions of years to evolve.</td>
</tr>
<tr>
<td>2: To grow, it requires the right combination of climate and soil and FIRE.</td>
</tr>
<tr>
<td>3: The extremes of weather-periodic cold dry winters and hot dry summers created it.</td>
</tr>
<tr>
<td>4: It once stretched from southern Canada to the Gulf of Mexico, from the western bluffs of the Missouri River to the eastern shores of the Wabash in what is now the state of Indiana.</td>
</tr>
<tr>
<td>5: The people who originally lived there were very diverse.</td>
</tr>
<tr>
<td>6: In 1804, William Clark and Meriwether Lewis saw it for the first time.</td>
</tr>
<tr>
<td>7: For the early settlers who moved there in the 1800’s the work never stopped, from sun up to sun down.</td>
</tr>
<tr>
<td>8: By 1880, the last of the free ranging bison living there had disappeared.</td>
</tr>
<tr>
<td>9: Today, rows of corn and soybeans grow where it was.</td>
</tr>
<tr>
<td>10: Today, less than 1% of it remains.</td>
</tr>
</tbody>
</table>
Level One

Subject Area:
Science, Language Arts

Duration:
Preparation time: 60 minutes
Activity time: Two-three class periods

Setting:
Classroom, outside, or in the cafeteria or gym.

Pre and Post Activities:
This activity can be used before Reconstruction around the country. It can be used before or during Prairie Flows.

Vocabulary:
Producer, consumer, primary consumer, secondary consumer, decomposer, predator, prey

Story of the Prairie Food Web

Summary: Food Chains and Food Webs are of great interest to students. They provide the students with an understanding of the importance of keeping organisms in balance. In this activity, the students will gain an understanding of the Prairie Food Web by actively creating food chains and webs.

Objectives
After completing this activity the students will:
- Demonstrate knowledge of prairie food webs.
- Compare and contrast a food chain from a food web.
- Summarize impacts of disrupting the food web.

Materials
- A section of chain
- Species cards created from the species lists on page 4 and 3 x 5 note cards (one per student)
- Yarn
- Food Web Copy Page (one per student)
- A photograph of a spider web

Film Segments
Teaching Segment 3- The Prairie Ecosystem

Background
A diverse set of organisms inhabits the prairie ecosystem. This lesson will explore the organisms and the feeding relationships among them. Each organism in the ecosystem relies on other organisms to survive. The sun provides all of the energy for prairie wood chains and webs. A food chain is a visual representation of the energy flow from one organism to another in succession. A food web represents interrelationships among many or all organisms in an ecosystem. In the tallgrass prairie, these relationships include plants that depend on insects and other animals to pollinate and disperse seeds, predator-prey relationships such as those between badgers and gophers and coyotes and mice, soil aeration by bison and rodents that encourage healthy plant growth, and so on. If we looked at the ecosystem as a jigsaw puzzle, each component in the ecosystem would be one piece of the puzzle. If one of the pieces is missing, the ecosystem is incomplete and not in balance.

Prior to the activity, prepare a set of species cards for the activity. Select plants and animals from the Species list provided on page 4. You will have to balance the number of producers and consumers, predators and prey so that the students can form food chains of 4 species. With a large group, this will require duplicate predator cards.

Procedure

- Engagement
  1. Show students a section of chain (un-joined with two ends). Ask them to describe the chain. Record their responses on the board. Are there other types of chains? Discuss them.
  2. Discuss what happens when a link of chain is missing or how a weak link impacts the rest of the chain. “You could physically demonstrate this and/or you could make a batch of cookies, but leave out a key ingredient. Allow the students to have a cookie, but do not tell them an ingredient was left out. Their reactions should be evident. Now give them cookies prepared with all of the ingredients and discuss what happened. Allow students to eat the cookies as they watch the film segment.
3. Lead a discussion about connections between living organisms and tell students that they will be exploring natural “chains.”
4. Show film Teaching Segment #3, Prairie Ecosystems. Ask the students to write down a list of connections as they watch the film segment. As a class, discuss the connections described in the film.

• Exploration
  1. Give each student a card with an organism on it. You may use yarn to tie cards around their necks.
  2. Instruct the students to form a group of four organisms (theirs included) that depend on another organism. Examples might include organisms that are being eaten, or eat other organisms. Have the student groups form single file lines (this could be done outside). If required, give the students time to research their animals diet in the library or on the Internet.
  3. Ask the class what they believe they have created? (Answer - food chains). Have each group describe their food chains to the rest of the class. As a class, talk about similarities or any common characteristics between the food chains (i.e. producer at beginning and consumer at end, etc).

• Explanation
  1. Introduce and define the terms; producer, consumer, primary consumer, secondary consumer, decomposer, predator, and prey. Allow students time to figure out which organisms in their food chain are representative of each of these terms.
  2. Hand out and have students fill out the Food Web Copy Page as you complete the remainder of the Explanation phase of the activity.
  3. Ask the students to return to their seats and draw their food chain.
    Examples: Side Oats Grama >> Dickcissel >> American kestrel >> Coyote
               Spiderwort >> Aphid >> Garden Spider >> Meadowlark
               Blazing Star >> Bumble Bee >> Plains spadefoot toad >> Western hognose snake
  4. Using the food chain, have students answer the questions listed below (these are also on the copy page):
    - What type of organism is always first in the chain?
    - Why do you draw your arrows towards the more “complex” organisms?
    - What type of organism is always at the end of the food chain?
  5. Explain what is happening in the food chain (energy is being transferred). We draw the direction in which the energy is flowing on their food chain - arrows should point TOWARD the organism receiving the energy. Ask the students: “Does the food chain accurately represent all of the interactions that take place in an ecosystem? Explain your answer.” Ask the student’s to think of the other food chains that were presented. “Were there other organisms in those chains that could fit in yours?”
  6. Have students (with their cards) rearrange themselves to more accurately show interrelationships among the organisms. Use yarn to join the organisms (this could be done outside).
  7. Explain that they have created a food web. How does it differ from their food chains? What would happen if one organism is removed from the web? Make connections to the missing ingredient in their initial cookie. Instruct the students to explain how the removal of some organisms have more impact on the web than that of others organisms on the back of their Food Web Copy Pages.

• Application
  1. Provide students with a puzzle (preferable one that deals with the prairie) and have them put it together. However, ensure that a piece of the puzzle is missing. For more advanced students, divide the class into groups. Give each group a puzzle. Take a different number of pieces out of each puzzle.
  2. When all of the puzzles have been put together, have students reflect and write about how this would represent a food web that “lost” an organism and how that would affect the food web. If using multiple puzzles ask: Which puzzle would best represent a missing producer? Which would represent a missing predator?
Story of the Prairie Food Web

Assessment
1. Have students write and illustrate a short story about the relationships among organisms on the prairie. Make sure they use the terms discussed in the exploration (producer, consumer, etc.). Ensure they include some disruption in the ecosystem, its impact, and whether or not there is some resolution. Students may work in pairs with one the writer and one the illustrator.

<table>
<thead>
<tr>
<th>CATEGORY</th>
<th>4</th>
<th>3</th>
<th>2</th>
<th>1</th>
<th>0</th>
</tr>
</thead>
<tbody>
<tr>
<td>Requirements</td>
<td>All written requirements (food web vocabulary, type of graphics, etc.) were met.</td>
<td>Almost all (about 90%) written requirements were met.</td>
<td>Most (about 75%) of written requirements were met, but several were not.</td>
<td>Many requirements were not met.</td>
<td>Missing more than 50% of the requirements</td>
</tr>
<tr>
<td>Accuracy of Facts</td>
<td>All facts presented in the story are accurate.</td>
<td>Almost all (about 90%) facts presented in the story are accurate.</td>
<td>Most facts presented in the story are accurate (at least 70%).</td>
<td>There are several factual errors in the story.</td>
<td>Less than 50% accuracy of facts</td>
</tr>
<tr>
<td>Creativity</td>
<td>The story contains many creative details and/or descriptions that contribute to the reader's enjoyment. The author has really used his imagination.</td>
<td>The story contains a few creative details and/or descriptions that contribute to the reader's enjoyment. The author has used his imagination.</td>
<td>The story contains a few creative details and/or descriptions, but they distract from the story. The author has tried to use his imagination.</td>
<td>There is little evidence of creativity in the story. The author does not seem to have used much imagination.</td>
<td>It has been plagiarized, or liberally copied from other sources.</td>
</tr>
<tr>
<td>Focus on Assigned Topic</td>
<td>The entire story is related to the assigned topic and allows the reader to understand much more about the topic.</td>
<td>Most of the story is related to the assigned topic. The story wanders off at one point, but the reader can still learn something about the topic.</td>
<td>Some of the story is related to the assigned topic, but a reader does not learn much about the topic.</td>
<td>No attempt has been made to relate the story to the assigned topic.</td>
<td>The story is totally unrelated to the topic.</td>
</tr>
<tr>
<td>Illustrations</td>
<td>Original illustrations are detailed, attractive, creative and relate to the text on the page.</td>
<td>Original illustrations are somewhat detailed, attractive, and relate to the text on the page.</td>
<td>Original illustrations relate to the text on the page.</td>
<td>Illustrations are limited OR they are not original.</td>
<td>There are no illustrations.</td>
</tr>
</tbody>
</table>

Extensions
1. Research what happens when the prairie is burned and how burning might affect the food web.
2. Describe the difference between the food web of a native prairie and one of a reconstructed prairie.
3. Have the students create a food web that includes themselves and what they are consuming.
Story of the Prairie Food Web

Resources
www.vtaide.com/png/foodchains.htm
www.arcytech.org/java/population/facts_foodchain.html

Prairie Species Lists

**Plants**
- Big Bluestem
- Blazing Star
- Compass Plant
- Cordgrass
- Dropseed
- Indian Grass
- Butterfly Milkweed
- Little Bluestem
- Pale Purple Coneflower
- Purple Prairie Clover
- Rattlesnake Master
- Side Oats Grama
- Spiderwort
- Switchgrass
- Wild Rose
- Yarrow

**Mammals**
- Badger
- Bison
- Black-footed Ferret
- Coyote
- Elk
- Eastern mole
- Franklin’s ground squirrel
- Least shrew
- Plains pocket gopher
- Prairie dog
- Prairie vole
- Red fox
- Spotted skunk
- Thirteen-lined ground squirrel
- White-tailed jackrabbit
- Wolf

**Birds**
- American goldfinch
- American kestrel
- Bobolink
- Burrowing owl
- Dickcissel
- Grasshopper sparrow
- Northern harrier
- Short-eared owl
- Upland sandpiper
- Western meadowlark

**Amphibians**
- Plains spadefoot toad

**Reptiles**
- Bull snake
- Northern prairie skink
- Ornate box turtle
- Prairie rattlesnake
- Western hognose snake

**Invertebrates**
- Aphid
- Earthworm
- Bumblebee
- Honeybee
- Praying mantis
- Garden spider
- Skipper butterflies
- Regal fritillary butterfly

Draw the food chain including your animal in this box:

Answer the questions below:
Looking at the other food chains in the class. What type of organism is at the start of the chain and why are they important?

Explain what is being transferred in the chain and which direction is it going? Using arrows, draw this on your chain above.

Look around the room at other food chains. Is there another organism that could eat or be eaten by your animal? List 2 examples.

Does the food chain accurately represent what happens in nature on the prairie? Explain why or why not?

Using all you know, draw a new representation explaining feeding arrangements on the prairie on the back of this page.
Level One

Subject Area: Science

Duration:
Preparation time: 60-120 minutes
Activity time: Two class periods

Setting: Classroom

Pre and Post Activities: This can be used before Diversity Dilemma.

Vocabulary:
Taxonomy, Scientific Name, Common Name, Classification, Kingdom, Phylum / Division, Class, Order, Family, Genus, Species

It’s All In The Name

Summary: Names are important for communication. What happens when there are four girls in your class with the same first name? How do you tell them apart? When two scientists are discussing a specific plant or animal, it is important for them to know they are both talking about the same thing. Scientists use the process of classification and scientific nomenclature to communicate with each other around the world.

Objectives
After completing this activity the students will:
• Describe how common names are given and may vary from place to place.
• Describe the process of applying the scientific names to organisms.
• Evaluate the concept of scientific naming as a means of worldwide

Materials
• Items to organize (types of candy, pens & pencils, a deck of cards)
• Prairie plant names and pictures student copy pages (1-2 sets)
• 3 x 5 Index cards

Film Segments
Teaching Segment 3- The Prairie Ecosystem

Background
Taxonomy is that area of life science that focuses on classification of organisms. Classifying organisms into groups allows scientists to examine the relationships that exist among them. This provides a worldwide classification system of scientific names for each organism. In the Linnaeus classification system for animals organisms are grouped according to kingdom, phylum, class, order, family, genus, species. For example humans are classified as:

kingdom: Animalia
phylum: Chordata
class: Mamalia
order: Primate
family: Homininidae
genus: Homo
species: sapien

Procedure
• Engagement
  1. Provide students a variety of items and have them organize the items into groups. Ask each student to write down an explanation of how the items were divided into the groups.
  2. As a class discuss why students organized the items as they did.
  3. As a class discuss the idea of classification in science.

• Exploration
  1. Provide students with 3 x 5 cards that have the Common Names of Plants on one card and Pictures of Prairie Plants on a different card.
  2. Ask students to match the common name with the picture. More than one common name is provided for some plants to bring out the necessity for a single universal name.
**It’s All In The Name**

**Explanation**

1. Discuss with each group how and why they assigned the common names and which names caused them difficulty.

2. Show students the correct matches or have them find the correct matches in plant ID guides.

3. Tell the students that taxonomy is the science of naming and show them the Linnaeus classification system.

4. Discuss the importance of having a single name for an organism and why that name should remain constant worldwide.

**Application**

1. Hand out the scientific name 3 x 5 cards. Have students match the scientific names to the common names using a prairie plant guide to aid with the process.

2. Have students determine the taxonomy (from Kingdom to species) of a common prairie plant.

**Key:**

Scientific Name = Two common names

- *Anemone patens* = Pasque flower or Easter plant
- *Comandra umbellate* = Bastard toadflax or star toadflax
- *Besseya bullii* = Kittentails or Bull’s synthris
- *Geum triflorum* = Prairie smoke or old man’s whiskers
- *Lomaticum foeniculaceum* = Biscutroot or carrot leaf
- *Dodecatheon meadia* = shooting star or roosterhead
- *Stipa spartea* = Porcupine grass or needle grass
- *Penstemon grandiflorus* = Large-flowered beardtongue or Canterbury bells
- *Oxytropis lambertii* = Locoweed or crazyweed
- *Cypripedium candidum* = Little white orchid or small white lady slipper
- *Lygodesmia junecea* = Skeleton weed or prairie pink
- *Koeleria cristata* = June grass or crested hair grass
- *Lilium philadelphicum* = Woody lily or orange cup
- *Asclepias tuberosa* = Butterfly milkweed or pleurisy root
- *Rudbeckia serotina* = Black-eyed susan or deer eye
- *Ratibida pinnata* = Yellow coneflower or weary susan
- *Castilleja sessiliflora* = Downy painted cup or Indian paintbrush
- *Spartina pectinata* = Prairie cord grass or rip gut
- *Silphium laciniatum* = Compass plant or turpentine plant
- *Lilium michiganese* = Michigan lily or Turk’s cap
- *Andropogon geradi* = Big bluestem or turkey foot


It’s All In The Name

Assessment
1. Evaluate the proper placement of the common and scientific names on the plant pictures.
2. Evaluate each students’ taxonomy of a common prairie plant.

Extensions
1. Have each student choose a prairie plant and research the history of the common names of the plant.
2. Have each student choose a prairie plant and research the meaning of the scientific name of the plant.
3. Use the cards to play a matching game like you would play “Go Fish.”
4. Research by whom and how the classification system originated in science.
5. Show sections of the video that names the organisms and shows pictures of the prairie plants.
   • As the students view each plant, pause the DVD and ask them to try to determine how the plant was given its common name.
6. Have students select a plant and write the common name of the plant going down the paper. They should then write a word or phrase relating to or describing the plant for each letter of the name.

Resources
Christiansen, Paul and Muller, Mark, An Illustrated Guide to Iowa Prairie Plants, University of Iowa Press, Iowa City, Iowa, 1999.


USDA Plants Database: http://plants.usda.gov/

Lady Bird Johnson Wildflower Center Plants Database: http://www.wildflower.org/plants/

Butler Prairie in Pictures: http://www.butler.edu/herbarium/prairie/picturepage.html

Activities Photos from the film except: Wood Lily, White Lady’s Slipper, Skeleton Weed, Prairie Smoke, Pasque Flower, Large Flowered Beard Tongue, June Grass and Bastard Toadflax courtesy Craig Hemsath.
<table>
<thead>
<tr>
<th>Scientific name</th>
<th>Common name</th>
<th>Additional information</th>
</tr>
</thead>
<tbody>
<tr>
<td>Anemone patens</td>
<td>Pasque flower</td>
<td>Easier plant</td>
</tr>
<tr>
<td>Comandra umbellata</td>
<td>Bastard toadflax</td>
<td></td>
</tr>
<tr>
<td>Star toadflax</td>
<td>Besseya bullii</td>
<td></td>
</tr>
<tr>
<td>Kittentails</td>
<td>Bull’s synthis</td>
<td>X</td>
</tr>
<tr>
<td>Geum triflorum</td>
<td>Prairie smoke</td>
<td>Old man’s whiskers</td>
</tr>
<tr>
<td>Lomatium foeniculaceum</td>
<td>Biscutroot</td>
<td></td>
</tr>
<tr>
<td>Carrot leaf</td>
<td>X</td>
<td><em>Plants are organized: Scientific name, common name, common name, photo</em></td>
</tr>
<tr>
<td>Dodecatheon meadia</td>
<td>Shooting star</td>
<td>Roosterhead</td>
</tr>
<tr>
<td>-------------------</td>
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<tr>
<td><img src="image1" alt="Dodecatheon meadia" /></td>
<td><img src="image2" alt="Shooting star" /></td>
<td><img src="image3" alt="Roosterhead" /></td>
</tr>
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<td>Pasture rose</td>
<td>Rosa carolina</td>
<td>Prairie rose</td>
</tr>
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<td><img src="image5" alt="Rosa carolina" /></td>
<td><img src="image6" alt="Prairie rose" /></td>
</tr>
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<td>Large-flowered beardtongue</td>
<td>Canterbury bells</td>
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<td><img src="image8" alt="Canterbury bells" /></td>
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<td>Oxytropis lambertii</td>
<td>Locoweed</td>
<td>Crazyweed</td>
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<td><img src="image11" alt="Crazyweed" /></td>
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<tr>
<td>X</td>
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<td>Little white orchid</td>
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<td><img src="image14" alt="Little white orchid" /></td>
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<tr>
<td>Small white lady slipper</td>
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<tr>
<td>Lygodesmia juncea</td>
<td>Skeleton weed</td>
<td>Prairie pink</td>
</tr>
<tr>
<td>-------------------</td>
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<tr>
<td>Koeleria cristata</td>
<td>June grass</td>
<td></td>
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<tr>
<td>Crested hair grass</td>
<td>Lilium philadelphicum</td>
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<tr>
<td>Woody lily</td>
<td>Orange cup</td>
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<tr>
<td>Asclepias tuberose</td>
<td>Butterfly milkweed</td>
<td>Pleurisy root</td>
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<tr>
<td>Rudbeckia serotina</td>
<td>Black-eyed susan</td>
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<td>Deer eye</td>
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<tr>
<td>Ratibida pinnata</td>
<td>Yellow coneflower</td>
<td>Weary susan</td>
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<tr>
<td>Castilleja sessiliflora</td>
<td>Downy painted cup</td>
<td></td>
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<tr>
<td>Indian paintbrush</td>
<td>X</td>
<td>Silphium laciniatum</td>
</tr>
<tr>
<td>Compass plant</td>
<td>Turpentine plant</td>
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<tr>
<td>Lillium michiganese</td>
<td>Michigan lily</td>
<td>Turk’s cap</td>
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<tr>
<td>Andropogon geradi</td>
<td>Big bluestem</td>
<td></td>
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<tr>
<td>Turkey Foot</td>
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</tbody>
</table>
Knowing and Naming

Summary: This activity provides the students with an introduction to the identification of prairie plants. It gives them hands-on experiences in the discovery of plant characteristics and the use of field guides and dichotomous keys.

Objectives
After completing this activity the students will:
- Identify specific characteristics of prairie plants used in classification.
- Illustrate a prairie plant and label the primary characteristics of the plant.
- Use the characteristics of plants as a tool in plant identification.

Materials
- Sun print paper or paper for making drawings of their plant
- Plexiglas or plastic pieces the same size as the paper
- Field guides and/or dichotomous keys
- Plant ID sheets

Film Segments
Special Features Section

Background
It is said “naming is not knowing.” When students truly become acquainted with plants, they look for the characteristics that make the plant unique. This process leads to identification. Simply memorizing the names of plants does not lead to long-term learning. Hairy leaf structures vs. smooth leaf structures – differences in flower petal, stamen, pistil arrangement, coloring, etc.

This activity forces the students to take their plants and distill them down to a few features that they can focus on separately. This in turn will help them to make their plants their own, a key to real learning.

The students should then use a field guide or dichotomous key to identify the plants. A field guide contains pictures of the plants with the common name, the scientific name and a descriptions of the plant beneath each picture. They are arranged often by family or color of the flowers. A dichotomous key provides descriptions of the plants providing two choices. When you make the first choice it provides a place in the key where you can make further choices. Once you have fully described the plant by making a series of choices you are given the name of the plant.

It is recommended that you use a field guide for this activity, but provide several different dichotomous keys for the students to explore.

There is a tremendous amount of vocabulary. The students will be able to find the definitions for the words in the vocabulary section in the dichotomous keys and should use only the terms they need for the plants they are using.

Procedure
- Engagement
  1. Take the students outside to a prairie. Ask them to observe, touch, and sketch the plants in their environment. If it is not possible to go outside, bring in plants for students to observe, touch and sketch. You may also show the special features section Selected Prairie Locations, Scene 4 The Nature Conservancy’s Cedar Hill Sand Prairie from the extras part of the film.
Knowing and Naming

• Exploration
  1. Discuss the similarities and differences in the plants. How do the plants look, smell, feel? What do they have in common? What makes each plant distinct?
  2. After examining the plants, have students choose a plant and make a sun print or a detailed drawing of that plant.
  3. The students will position the plants in a way that will highlight what the student feels is a distinguishing visible characteristic of the plant.
  4. Once the prints or drawings are made, post them on a wall or bulletin board. Have the students examine the plant prints and identify which plant goes with what print.
  5. Each student should make a list of characteristics that could be used to help with plant identification. The student’s vocabulary will be built in the next part of the lesson. At this step students should be able to accurately describe and recognize the characteristics in their lists, not necessarily use the scientific term for each characteristic.

• Explanation
  1. The students (as a group) will discuss what characteristics are needed to be able to identify plants.
  2. Compile a class list of characteristics that could be used to help with plant identification.
  3. The students will look through field guides, reference books, and dichotomous keys to compare the list of characteristics the class described with the scientific terms for plant ID characteristics in the books. Ask them if they had some of the same characteristics found in the field guides. Do they need to add any more characteristics to the class list?

• Application
  1. Working in groups of 2 or 3, the students will identify plants unknown to them using their lists of characteristics, the field guides, reference books, and dichotomous keys as resources to identify the plants.
  2. Have each student write a paragraph summarizing the process of plant identification.

Assessment
  1. The students will write a paragraph explaining the process (steps) of plant identification.
  2. The students will be given plants to identify. They will indicate the 2, 3, or more characteristics that allowed them to identify the plants.

Extensions
  1. Create a field guides with sketched plants from the prairie with identification information. The sun prints can be used as the cover for the guide.
  2. Make clay impressions of prairie plants to be used as wall hangings or tiles.
  3. Have the students create their own name for the plants based on the individual distinguishing characteristics they discovered when they were identifying the plants.

Resources
Middle school or high school textbooks for the identification process.


Christiansen, Paul and Muller, Mark, An Illustrated Guide to Iowa Prairie Plants, University of Iowa Press, Iowa City, 1999.

Diversity Dilemma

Summary: In football, if every player brings the same strengths and weaknesses to the team, then the opposing team need only find one successful strategy to win the game. A football team needs players skilled in all positions in order to compete. The team is stronger and more able to adapt to the strategies of other teams when the individual players in each position have varied skill sets. Ecosystems need diversity (many different member species) and variation (differences within individual members of each species) in order to survive environmental changes.

Objectives
After completing this activity the students will:
- Develop a working definition for variation and diversity.
- Distinguish between the concepts of variation and diversity.
- Identify variation and diversity within an ecosystem.

Materials
- Color pictures of large groups of humans with and without and their pets, can substitute having each student bring in a photo of their family and pets and put into a class collage
- A collection of small toy cars or pictures of several cars (1 per pair)

Film Segments
Teaching Segment 2- The Lost Landscape and its Significance, Teaching Segment 3- The Prairie Ecosystem, and Teaching Segment 13- Vision for the Future

Background
Understanding the difference between diversity and variation is paramount to understanding the reasons for preserving the native prairie. For a prairie to survive, it needs to have diversity and variation. Diversity is the distribution and abundance of different species within a given area. For example, a used car dealership that sells all makes and models of cars is more diverse than a dealership that sells only models built by a single manufacturer. If a new safety study were to reveal that cars made by XYZ manufacturer were prone to more fatal accidents than other cars, sales might drop off significantly for all XYZ dealerships, while sales at used car lots would shift from XYZ models to those of other manufacturers. In a natural community a mixed forest containing many species of evergreen and deciduous trees is more diverse than an evergreen forest with only 2 species of trees present. Diversity protects a community from environmental change by increasing the chances that more of the individual species present will be able to adapt to the change, thus preserving the community.

Variation describes the differences between individuals within a population or among populations. Examples of variation include cars of the same make and model but in different colors or with different features. Many cats of the same breed with different coloring (calico, ginger, and tabby) are a second example of variation. Variation protects the individual species by preserving traits that allow the species to survive environmental changes. When all of the species within an ecosystem have high variation, then the entire ecosystem is stronger as well. An ecosystem needs to have many different species which have several variations so that changes in the environment will not wipe out the community.

The definition above is the scientific definition for diversity which is the definition to use for this activity. We often use it interchangeably with the social studies definition which is a single unit made up of many different individuals. An example of this would be a neighborhood having people of many different nationalities and races living in it. By the scientific definition this would be variation and not diversity. It is important for the students to know the difference. As you are developing the work-
Diversity Dilemma

To ensure the students understand the difference and that what we want is the scientific definition.

**Procedure**

**Engagement**
1. Provide students a picture that contains a variety of different people (race, facial features, body types, etc.)
2. Talk about the similarities and differences between the people.
3. Provides students with a picture that contains a variety of people and animals.
4. Talk about the similarities and differences between the organisms.
5. Discuss with students that although the people in the first picture look different they are all of the same species, but they have variations among them. On the other hand, the second picture contains organisms that are diverse because they are not from the same species.

**Exploration**
1. Divide the class into pairs.
2. Now provide each pair with a small toy car or photo of a car (use different types of cars & same type of cars, but different models) and a 3 x 5 card. As you hand out the cars, show the entire class first, then give the car to a group.
3. Ask each pair to make a list of the similarities and differences between the cars. Each pair should describe the characteristics which make their car similar to others and which make it unique on their 3 x 5 card.
4. Bring the class back together and have the students arrange the cards to create a classification of the cars/pictures according to their own standards. Discuss how students organized the information on the cards.
5. Have each pair make a T chart (see below) and label the top with the terms diversity and variation.
6. Briefly discuss the terms and their meaning. How are the terms different?
7. Have students attempt to record the characteristics that belong under diversity and those that belong under variation.

**Explanation**
1. Ask the students to more fully develop definitions of diversity and variation from their T charts. They should include a list of examples for each term.
2. As a class, use the group definitions to develop a working definition for diversity and variation. Guide the students in the right direction by asking for clarification or examples.
3. Discuss the difference between the social and scientific definitions of diversity and clarify as necessary.
4. Students should revisit their cards to see if the lists of characteristics generated need to be changed in their T chart to fit their working definitions.
Diversity Dilemma

• Application
  1. Instruct the students to write a list of examples of variation and diversity found in the tallgrass prairie as they watch a segment of the film. Students should use the working definitions developed as a class to identify their examples of both diversity and variation.
  2. Play Segment 3—The Prairie Ecosystem for the class.
  3. Collect the lists for assessment.

Assessment
1. Review the students’ definitions of diversity and variation and their explanation of each with respect to the film segment. Grade with the following in mind; make sure they understand the meanings of both words and that their examples are appropriate and their written examples distinguish between the two terms.

Extensions
1. Students could research different types of prairie to learn about diversity and variation in different prairies. Or students could research and describe diversity and variation within different ecosystems.
2. Students could research to find the answers to the following questions:
   - Which ecosystem today has the most diversity?
   - Which populations of species have the least variation?
   - What are the causes of loss of diversity and variation in ecosystems?
   - What strategies are being used by humans to assist species with low variation?

Resources
Adaptations of Prairie Plants

Summary: Using the "Lost Landscape" film, physical examples, and research, the students will discover the many adaptations prairie species have developed to survive in the prairie environment.

Objectives
After completing this activity the students will:
- Explain adaptation as the characteristics that allow organisms to be better able to survive in the environment.
- Create a picture of a prairie illustrating that organisms of the prairie are interdependent.

Materials
- Large pieces of paper
- Markers and scissors
- Computers
- Vocabulary Quadrant Copy Page

Film Segments
Teaching segment 3- The Prairie Ecosystem

Background
Prairie organisms have developed a large variety of adaptations for living in the harsh conditions of the prairie. An adaptation is a feature of an individual that improves its chances of survival and reproduction in an existing environment.

Some examples of adaptations in prairie organisms include: Deep roots, seed protection from fire, coloration, hibernation, migration, narrow or broad leaves, hairy leaves, attachment of leaves, and shedding of hair.

All of the organisms (both plant and animal) within the prairie respond and change as they interact with each other and the environment. The organisms of the prairie are part of a unique ecosystem. An ecosystem consists of a diverse set of living organisms all interacting among themselves and within the environment in which they live. Each organism fulfills a niche within the ecosystem. A niche is the organisms 'job' or responsibility within the ecosystem.

Procedure
• Engagement
  1. Handout copies of the Vocabulary Quadrant Copy Page.
  2. Instruct students to complete the copy page as they watch Segment 3 of the video.

• Exploration
  1. Using the Internet, students in pairs will research the conditions of the prairie such as climate and weather, role of fire, soil composition, and plant and animal communities of the prairie. Provide time for students to complete their internet research.
  2. Have students record the information in the vocabulary quadrant.
Adaptations of Prairie Plants

- **Explanation**
  1. Have students compare their research notes with their video notes.
  2. Discuss how the organisms of the prairie have special characteristics that allow them to live on the prairie. Tell students that these characteristics are adaptations. Give them a few examples of the adaptations that exist among organisms of the prairie.
  3. Have students brainstorm a list of characteristics that prairie organisms have that would allow them to survive the prairie ecosystem.

- **Application**
  1. Ask each student to select one example of one prairie adaptation and create an illustration and written explanation of it. Post the illustrations/explanations around the room for everyone to see. Optional: Have each student create one PowerPoint slide with a picture of their organism illustrating its adaptation and their written explanation. Combine the slides into a class presentation and give the presentation to a group of younger students.

**Assessment**
1. Review the completed vocabulary quadrant and organism adaptation illustrations/explanations.

**Extensions**
1. Using what they have learned about the prairie ecosystem and adaptations, place students in groups of four and give each group a picture and description of a specific prairie. Have the student groups design organisms (a plant, a mammal, an insect, and either a bird or reptile) for that prairie. Student’s should describe their new organism’s adaptations. Students should sketch their prairie organisms on large pieces of paper. Have students make a list of the adaptations for each organism in the prairie that their group created and label the adaptations on their posters. Ask the students to be prepared to explain how the adaptations of the organisms better help them survive in a prairie ecosystem. Have students evaluate their pictures using the following questions as guides:
   
   Compare the organisms with each other (i.e. How do the characteristics of plants relate to the mammals and vice versa? How do the characteristics of the birds/reptiles relate to the insects and vice versa?).

   What additional characteristics would allow the organisms in your ecosystem be better able to interact in the prairie ecosystem?

   How are the adaptations of the organisms related?

   Discuss as a class the pictures students drew and their adaptations. Display the posters outside the room for all to see.

2. In groups of four, grow prairie plants and non-prairie plants in 2-liter bottles. Label each plant as “prairie” or “non-prairie” and by species. Examine and record root length, number of leaves, production of flowers, stem length, overall plant height, and plant girth, and production of seeds for each plant. Assist students in creating data graphs which compare their prairie plants growth to the non-prairie plant. Have students make comparisons of prairie plants and non-prairie plants. Have students compare class data and discuss the generalizations that can be made from the data.
Adaptations of Prairie Plants

Resources

USDA Plants Database: http://plants.usda.gov/

Lady Bird Johnson Wildflower Center Plants Database: http://www.wildflower.org/plants/

See sample data table and vocabulary quadrant on the following pages.
- http://www.museum.state.il.us/exhibits/midewin/plantadapt.html

Sample Table for Data Collection

<table>
<thead>
<tr>
<th></th>
<th>Prairie A</th>
<th>Prairie B</th>
<th>Non-Prairie C</th>
<th>Non–Prairie D</th>
</tr>
</thead>
<tbody>
<tr>
<td>Root length</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Number of leaves</td>
<td></td>
<td></td>
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<tr>
<td>Production of flowers</td>
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<tr>
<td>Stem length</td>
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<tr>
<td>Overall length</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Plant girth (diameter of stem)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Production of seeds</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Notes from internet research about conditions of the prairie</td>
<td>Notes from the video about conditions of the prairie</td>
<td></td>
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<tr>
<td>-------------------------------------------------------------</td>
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<tr>
<td>Adaptations of prairie organisms</td>
<td>Sketches of organisms</td>
<td></td>
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</table>
The Tallgrass Prairie Makes Sense

Summary: Students will take a journey to a prairie and will spend individual time observing the prairie environment through their senses.

Objectives
After completing this activity the students will:
- Demonstrate inquiry skills of observation, counting, measuring, and comparing.
- Demonstrate use of appropriate materials and technology to collect and record information.

Materials
- binoculars, magnifying glass, camera, paper, pencil, colored pencils, boots, old clothes, tape recorder, digital or disposable cameras
- additional items the students bring to make observations
- 4-6 bags of small jelly beans in many flavors
- 4-6 balloons
- 4-6 liquid scents (vanilla, mint & cinnamon extract, etc.).
- 5-10 numbered paper bags
- 5-10 objects from the prairie inside (rocks, shells, pine cones, etc.)

Film Segments
Teaching segment 1– Introduction, teaching segment 2—The Lost Landscape and its significance, The Prairie Ecosystem

Background
Use segments 1-3 of the film as a background for this activity.

Procedure
- Engagement
  1. Inform students that they will be visiting a prairie. If you have not already, view a few of the film segments and/or special features to show students the type of environment that they will be visiting.
  2. Encourage them to be prepared and bring equipment to help with "observations."

- Exploration
  1. Prior to class, set up the four stations described below around the classroom.
  2. Divide the class into 4 groups.
  3. Instruct the groups in the rules for each station.
  4. Then have the groups rotate through the stations until all students have had a chance to complete all of the activities.

Activity #1
Prepare the touch bags by placing one prairie item into each numbers paper bag (rocks, grass, flowers, shrubbery, animal bones, etc.). Each student in the group should take turns putting their hand into the bag and feel what is inside. Individually, they need to write down the bag number and what was "observed" inside. Instruct the students to be detailed and vividly describe the object rather than just guess what it is. The group may discuss the experiences and what items they think are in each bag only after the bags have been passed around the group.
The Tallgrass Prairie Makes Sense

Activity #2
The group at this station should divide into pairs. Instruct the students to take turns having one student in the pair be blindfolded or close her eyes and select a jelly bean from the bowl of jelly beans. The other partner will look at the jelly bean and write down a description of it. Then the ‘blind’ student should eat the jelly bean and try to determine what the flavor of the candy is as they eat it. If students cannot determine the specific flavor of the candy at least have them describe it. The students should switch places. After both members of the pair have had a turn, they should discuss the experience and then try another again.

Activity #3
One student in this group is the ‘noise maker’. All other members of the group should close their eyes. The noise maker should create a variety of sounds (i.e. scratching of the chalkboard, clapping hands, a fan, flipping through a book, opening a window). The rest of the group attempts to identify the sounds that were made. The group should take turns being the ‘noise maker’.

Activity #4
Before class, put a few drops of one scent in a balloon. Blow the balloon up slightly and tie it shut. Repeat for the remaining balloons. Students will be able to smell what is inside the balloons because the odor diffuses through the membrane of the balloon. The group should pass the balloons around while attempting to determine what smells are present. The group should discuss the experience after all balloons have been passed to all group members.

5. Discuss how it might be helpful if students isolate a sense to make it more “sensitive.”

• Explanation
  1. As a class discuss the five different senses of the body and how they are used them to make observations of the world.
     • Sight
     • Sound
     • Smell
     • Touch
     • Taste
  2. On the board, compile a list of words used to describe observations made which each sense (red, speckled, bumpy, smooth, harsh, high pitched, sour, sweet, pungent, etc)
  3. The students may have already used counting and measurement while completing the activities in the Exploration phase. If it has not already come up, explain that in addition to using descriptive words, sometimes we use numbers to add detail to a description. This could be counting the number of petals on a flower or measuring the length of a birds beak. Another strategy to use to make observations is to compare one object to another. The strawberry cheese cake jelly bean may have been sweeter than the popcorn flavored one. Discuss the terms counting, measuring, and comparing in relations to making observations.

• Application
  1. Explain to students they will be going to a prairie and after finding a place away from others they are to use their senses (sight, hear, touch, smell) to make observations for 15 minutes. This will be done in isolation and in solitude. Briefly discuss why the sense of taste will not be utilized at the prairie. *Possibly show how to make an organizing chart to record information.
  2. Show the students to the tools that you have collected to assist them with their observations. Allow them to bring additional tools from home.
  3. Take the class on a field trip to a local prairie or prairie restoration.
  4. Instruct the students that they will need to list on a sheet of paper at least four observations for each sense. At least one observation should be made by counting, another by measuring and a third by comparing. Likewise, students need to be very descriptive about their observations. Observations can be recorded in words and sketches.
  5. Assign each student a place (away from other students) to observe from.
  6. Allow time to record observations.
7. When you have returned to the classroom, allow the students time to share their observations. Discuss similarities and differences in the observations. Which observation does the class think was the most detailed?
8. Assign each student to create a product (of the student’s choice) which will best communicate what they have learned about the tallgrass prairie based on their observations.

Assessment
1. Collect and grade the observation notes taken by each student while on the prairie.
2. Collect the final products. Grade the assignment based on its creativity, organization, and content.

Extensions
1. Have students take part in a volunteer project while visiting the prairie (collect seeds, pick up trash, etc.)
2. Allow students the opportunity to taste an assortment of things made from the prairie.
3. Provide a variety of flowers for students to smell. Make connections to what the flowers smell like.

Resources
Micro-Writing: 
Describing Biodiversity

Summary: Transects are used by scientists to collect data about the plant and animal populations in a given area. In this activity students will practice making observations, identifying different plant species and recording data in order to compare the differences in biodiversity between their school yard and a local prairie.

Objectives
After completing this activity the students will:
  • Measure the biodiversity within two 20 x 20 centimeter (400 cm²) transects.
  • Compare and contrast the biodiversity of prairie vs. another land cover type through a written description of their observations.

Materials
  • cardboard or wire frames for transects (1 per group)
  • Transect Datasheet student copy pages (2 per group)
  • clipboard or hard writing surface (1 per group)
  • writing utensils and paper
  • prairie plant and other plant field guides (optional)
  • camera (optional)

Film Segments
Teaching Segment 3- The Prairie Ecosystem

Background
Biodiversity can serve as a measure of how healthy an ecosystem or community is. The more diversity within the community, the more readily the community can survive environmental change. One way scientists measure biodiversity by counting the number of different species and individuals of each species living within the community. It would take too long, cost too much money, and cause too much destruction to count every individual plant in an entire prairie. Instead, scientists collect their data from smaller sample areas called transects. The transects serve as representative samples of the entire area. In this activity, your students will break into groups and each group will collect biodiversity data from one transect within a local prairie and one transect within your school ground. Groups will compare and contrast the data from their own two locations and develop conclusions about the differences in biodiversity between natural areas and cultivated areas. A scientist would combine the results from many transects in order to reduce the chance that the results from one abnormal transect will affect their conclusions.

The teacher can prepare transecting tools before the activity or each group can make a transecting tool. The simplest way to establish the area for a transect is to form a frame out of wire or cardboard. Metal hangers can be bent into a square shaped frame and be used many times. Cardboard is cheaper but may be more difficult for students to use and will require replacing. To use the frame, first select a location. To protect against human bias, scientists generally collect data from several transects all located at specific distances along a transect line (see figure 1). This method helps to insure that the data collected is an accurate representation of the diversity of the entire area. After the location has been selected, the transect frame is placed flat as close to the ground as possible (the vegetation under the frame can hold it up, particularly when cardboard is used). Any plants that have been folded under the transect frame but are growing out of the ground within the transect are gently pulled back into the transect. Lastly, the scientist counts (and generally identifies) how many different species are located in the transect and how much of each species is present. There are two ways to measure how much of a
single species is in the transect. Individual plants can be counted or the percentage of ground covered by that species can be determined. A scientist will often take additional notes (amount of bare ground within the transect, soil type, soil moisture) depending on the purpose of the study.

Identification of prairie plant species, especially grasses, can be difficult. However, this activity does not require students to identify each plant down to the species or even genus level. Students can simply distinguish how many different plants (either by identification or making up their own names for plants that look different) are present. Very young plants are even more difficult to distinguish, so it is suggested that this activity be completed in the late spring or fall when plants are more mature.

The writing portion of this activity can either be of a creative/descriptive nature or technical writing. Students can practice the use of the use of metaphor and simile in a descriptive writing assignment. Metaphor is a figure of speech in which a likeness or analogy is made between one literal object or idea and another. For example: A sea of grasses. A simile is when two unlike things are compared, generally using like or as. For example: The prairie smoke bobbed in the wind like a bobble head on a car dashboard. In creative/descriptive writing the purpose is to instill a feeling in the reader. The purpose of scientific or technical writing is to communicate a complex idea in a simple manner. In technical writing, the author seeks to remove the emotion and convey the facts. Begin by having the students write down their specific aim. What do they wish to communicate to the reader? The teacher may wish to provide the students with a title such as, A technical description of the biodiversity of <name> prairie and <school name> school yard. The technical writer strives to be specific (23 flowering plant species were found in transect two) rather than general (many species were found on the prairie). See the references section of this guide for examples of technical and descriptive writing about the prairie.

Transect data is useful to many types of scientists for many reasons. Some scientists study a single location for many years using the transect data to describe how the area is changing over time. Other scientists collect transect data to keep track of the populations of endangered species. Transecting is useful in a prairie reconstruction to determine how closely the reconstruction resembles similar local native prairies. By completing this activity, your students will be practicing skills of observation and measurement used by scientists.

Procedure

**Engagement**
1. Ask student’s if they know how many species of plants can be found in a native prairie.
2. Play segment 3 of America’s Lost Landscape: The Tallgrass Prairie. Ask the students to keep track of how many different plant species they see during the video.
3. After the video, discuss the results. How do the students think their own school ground would compare in biodiversity to a native or restored prairie?

**Exploration**
1. Arrange a field trip to a local prairie or prairie restoration.
2. Gather the class in one location and demonstrate the use of a transect by lying one transect on the ground in front of the class. Discuss strategies for counting the different types of plants and individuals of each type within the transect with the class. Explain that once the transect is set on the ground, it may not be moved.
3. Divide the students into groups of four. Give each group a transect frame, clipboard, data collection sheet, and (optional) field guides to prairie plants. Assign each group a different location to place their transect.
4. Instruct the students to use the data sheet to record how many plant species are in the transect and how many individuals of each species are present. Have each group complete the Transect Data-sheet, including drawing a sketch of their transect.
Micro-Writing: Describing Biodiversity

5. Provide students with enough time to collect and record data.
6. Return to the school and repeat the data collection process for transects within the school yard.

• **Explanation**
  1. Allow each group to meet and organize their data. Ask them to quantify the difference in biodiversity between the prairie site and the school yard site.
  2. Suggest to the students that they break the plants up into grasses and flowering plants (or maybe more groups) and analyze their data to determine if the same patterns of diversity can be found in all groups.
  3. As a class discuss biodiversity. Ask the students to describe the differences in biodiversity between the two study sites. If the environment were to change in each location, which location would be most likely to already include species adapted to the change? Why?

• **Application**
  1. Working alone or in groups, instruct students to write a descriptive story or technical report about biodiversity and their experiences in the prairie and the school yard. Provide criteria for successful writing.
  2. Time for additional research on biodiversity may be provided.

**Assessment**
1. Collect the students’ lists of biodiversity created while watching the film.
2. Collect the students’ data sheets and site drawings.
3. Collect the students’ stories/reports.

**Extensions**
1. Combine data from all of the students’ transects and write a class report on the biodiversity of the local prairie. Share the report with your County Conservation Board, Parks and Recreation Department, or Soil and Water Conservation District.
2. Collect data from a local native and a local restored prairie. Compare the results. Discuss how a restored prairie and a native prairie are like and how they are different.
3. Collect data from other local land cover types (corn fields, pastures, parking lots, etc). Rank each land cover type by its biodiversity.

**Resources**
See the suggested plant identification guide list.
Transect Datasheet

Date: _____________________  Site Name:________________________________

Group Member Names: ___________________________________________________

Place your transect and record your data in the table below:

<table>
<thead>
<tr>
<th>Plant Name</th>
<th>Number</th>
<th>Percent Cover</th>
</tr>
</thead>
<tbody>
<tr>
<td>Indian Grass</td>
<td>Too many to count</td>
<td>60%</td>
</tr>
<tr>
<td>Blazing Star</td>
<td>### /// = 8 plants</td>
<td>4%</td>
</tr>
</tbody>
</table>

Draw a sketch of your transect as seen from above on the back of this page.
**Bison Chips**

**Summary:** *Bison are very large animals. This activity will build a bison to scale and provide for discussion of bison and their many uses.*

**Objectives**
After completing this activity the students will:
- Build a life-sized 2D representation of a bison.
- Apply length and height to a model.

**Materials**
- 88 squares of paper, 12 in. x 12 in.
- Bison Picture Copy Page
- Tape
- Crayons, markers, and/or colored pencils (mostly brown and black)

**Film Segments**
Teaching segment #3, The Prairie Ecosystem

**Background**
Bison arrived in North America across the Bering Strait during the Pleistocene Epoch. They eventually numbered 20 to 30 million and were found from Alaska to Mexico. They especially thrived on the central plains of North America and Canada. They are often found grazing in or at the fringes of the open prairie. The bison were almost completely eliminated by 1890 by hunters wanting their hides.

Bison have two very distinctive features, their shoulder hump and their large head. Their fur is brown and is longer in the front than in the rear. They have black horns and hooves. They range in mass from 310 to 900 kg (699.6 to 1980 lb.) and in length from 2.1 to 3.8 m (6.89 to 12.46 ft.). They stand about 5 to 6 ft. in height. The females are smaller than the males. They can reach speeds up to 30mph. They have one calf per season who are cared for by the females. The males do not participate in the raising of the young. They can live from 15 to 20 years in the wild (depending on the conditions) and up to 40 years in captivity.

Most bison today are found in parks and preserves, but about 16,000 still roam free in Yellowstone National Park.


Prepare for this activity by labeling each 12 inch quest with coordinates from the picture (A1...H11). Each square in the picture represents one square foot.

**Procedure**
- **Engagement**
  1. Provide the genus species name for a bison and have students attempt to determine what the name represents. *This would be a great opportunity to talk about genus species names (what they mean, how they are given, and what their purpose is).*
  2. Discuss with students the bison they have seen. How big is a bison compared to a student?
  3. Come up with the different names that bison are also called: buffalo, titonka, etc.
Bison Chips

4. Pass out the Bison Picture Copy Page. Have students color the picture to have a chance to more closely observe the patterns.

• Exploration
  1. Hand out the 12 x 12 inch paper squares to the class. Use the coordinates on their large squares to identify the square on the Bison Picture Copy Page it represents.
  2. Have the students draw what is in the coordinates on the Copy Page on their 12 inch paper. Instruct the students to fill the entire 12 inch square with their enlarged drawing. (It might be helpful for students to draw additional coordinates on the copy page square and their 12x12 bison chips. This will help to isolate the section on which to focus.) Be sure to have the students color those sections once they have been drawn!
  3. As student’s complete their 12 inch buffalo chips, hand out the remaining 12 x 12 squares until all of the squares have been drawn.
  4. Once the sections have all been drawn and colored, tape them together on the floor or wall. Have the students stand or lay next to the completed drawing to demonstrate the size of the bison compared to a person.

• Explanation
  1. Problem-solve with students the accuracy and inaccuracy of the completed bison model as compared to the original grid and a real bison. What would have made it easier to do?
  2. Discuss the bison’s size. How did this compare with their original ideas about its size? What other animals are also about the same size as the bison?
  3. Watch a segment of a film which depicts bison in their natural state (Teaching Segment 3, Dances with Wolves, or another film with Bison)

• Application
  1. Instruct the students to research how much space a bison takes up; how big an area it needs to live; how heavy a bison might be; and how much a bison eats. How many students would it take to weigh as much as a bison? The students could work in small groups with each group assigned a different topic.
  2. Direct the student’s to make a poster of their findings and present this information to the class.

Assessment
  1. Check to see if the students identified the correct space as represented by the coordinates they were given and if they were able to reproduce the drawing in the box.
  2. Evaluate the posters the students present to their classmates.

Extensions
  1. Native people were said to have used all the bison. What did this statement mean? Research the uses native people had for the bison.
  2. Visit a farm where bison are raised.
  3. After learning about bison, discuss the accuracy of the film (Dances with Wolves) in how the bison were depicted.
  4. Provide a variety of items that are from a bison (jerky, teeth, hair, clothing made from the hair, horns, casting of footprints, tape recording of sounds from bison). See if students can now determine what each item is. If they already knew before this activity simply allow them the opportunity to view items from bison.
  5. Invite a guest speaker who raises bison. Have questions prepared ahead of time to ask the person.
Bison Chips

students come up with the questions, but provide them general ideas that they can ask questions of (size of area needed, expenses, what do they do with the bison, how did they get started, amount of work involved, food requirements of bison, veterinary care, etc.)

Resources


http://animaldiversity.ummz.umich.edu/site/accounts/information/Bison_bison.html

http://www.kidsplanet.org/factsheets/bison.html

http://www.oaklandzoo.org/atoz/azbison.html
Additional Bison Photos.

Photo by Marcy Seavey

Photo courtesy New Light Media.
Restoration Around the Country

**Summary:** Since the human population keeps increasing, the need for habitat and food are also increasing. This poses a real dilemma for the native environments. In many areas of the country restoration projects are underway to reestablish the environments destroyed by development. This activity will provide the students with an understanding of the need for restoration.

**Objectives**
After completing this activity the students will:
• Compare restoration to reconstruction and explain the difference between the two.
• Identify 5-10 restoration projects and create a written description of one site.
• Prepare a report about one restoration project.

**Materials**
• Video clip of something being restored (optional)
• Paper, scratch paper, and pencil
• Computer with Internet access
• Paper for brochure
• Markers, colored pencils, crayons, scissors

**Film Segments**

**Background**
The tallgrass prairie can be considered an endangered ecosystem. The rich black soil created by the prairie plants has led to its demise. There is only 3% of the original 240 million acres remaining and this 3% is spread over the whole tallgrass prairie region in small remnants. Most of these remnants exist on non-tillable land such as the shallow soils of the Flint Hills of Kansas and the Osage Hills of Oklahoma and the xeric soils of the Sand Hills of Nebraska. The black soil prairies of Iowa, Illinois, Indiana, and Missouri are almost completely gone with only 0.1% remaining.

A large percentage of the remaining prairie has been preserved through the work of private conservation organizations and the state natural resources agencies. These preserves have proven valuable as a resource for understanding a vanishing ecosystem.

Restoration and reconstruction are an important part of the preservation process and had their beginning in the 1930’s with the process escalating in the mid 1960’s. When an ecosystem is on the decline and only found in small remnants, it is often necessary to start from scratch or supplement with seed gathered from the natural areas still remaining. Prairie restoration is the process of recreating a prairie on a site with existing relict plants. Prairie reconstruction consists of starting a prairie from scratch on a site such as a school ground, a city park, in your front yard, or on roadsides.

**Procedure**
• **Engagement**
  1. Use the following questions to start a discussion about restoring things:
     • What do you think a restoration project is?
     • What types of things can you restore?
     • How would you go about restoring something?
Restoration Around the Country

- Why do people restore things?
- Do you know of any restoration projects taking place in your area?

2. Watch a clip or segment from a show that is restoring something (furniture, car, motorcycle, antique, etc.)

Exploration

1. Play DVD segments 11-13 and discuss the need to restore the tallgrass prairie.
2. Have the students do research to find out how many and what type of natural restoration projects are occurring in the country. This field can be made much smaller (country, state, county) depending on what you want to accomplish.
3. Students should make a list of ten restoration projects they find and they should include a brief description for five of them.

Explanation

1. Bring the class together and have the students share their findings.
2. Compile a list of the current projects. This list can be put on the board or on a transparency.
3. Illustrate the percent of prairie remaining:
   - Provide groups of three students with an 8 ½ x 8 ½ inch piece of paper (cut 2 ½ inches off a standard piece of computer paper – use scratch paper as well) and scissors.
   - Have students problem solve by instructing them they need to cut out 100 equal pieces from the piece of paper. Tell students the entire piece of paper must be used.
   - Once students have completed, redirect attention back to you and hold up one piece of paper and ask what percent that piece represents. (Answer - 1%)
   - Have the groups using their pieces of paper, determine what percentage of the tallgrass prairie, which once covered the Midwest, is still there today.
   - Allow students to share their ideas and if no one guesses the right answer tell them that there is only 3% of the original 240 million North American acres still in existence today.
   - Show 3 pieces of paper to represent what is left of the prairie.
   - Have students determine what 3% of 240 million is. (Answer is 7.2 million)
   - Explain to students that this 3 percent is actually found in small remnants over this original 240 million acres. Less than 0.1% of the original prairies can still be found in Iowa, Illinois, Missouri, and Indiana.
   - Have students figure out what 0.1% of 240 million equals. (Answer is 240,000)
   - Have students represent this amount with their pieces of paper. (Answer is to take one piece of paper and cut it into 10 equal pieces and take out 1 slice, that piece represents 0.1% or 1/10% or one tenth of a percent)

Application

1. In pairs have students choose a restoration project to research in greater detail.
2. The project should include the following: location, rationale (why was this restoration needed), coordinators of the project, length of the project, cost of the project, who funded the project, description of the project, and related pictures.
3. This information can be displayed on a poster board, in a brochure, or with a PowerPoint presentation. Provide time to develop the project and schedule class time for each group to present their
Restoration Around the Country

PowerPoint or hold a gallery walk of posters or brochures.

Assessment
1. Each student will list 10 restoration projects and briefly describe five of the projects.
2. Each pair of students will develop and present a poster board, brochure, or PowerPoint about their restoration project.
3. The project will be evaluated using a checklist and evaluating content, organization, and creativity. A sample poster board checklist is provided below.

Sample Poster board Rubric

<table>
<thead>
<tr>
<th>Poster board Requirements</th>
<th>Points Possible</th>
<th>Points Attained</th>
</tr>
</thead>
<tbody>
<tr>
<td>Coordinators of the Project</td>
<td>2</td>
<td></td>
</tr>
<tr>
<td>Rationale for the Project</td>
<td>10</td>
<td></td>
</tr>
<tr>
<td>Description of the Project</td>
<td>10</td>
<td></td>
</tr>
<tr>
<td>Location of the Project</td>
<td>2</td>
<td></td>
</tr>
<tr>
<td>Length of the Project</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>Pictures or Drawings of the Project</td>
<td>5</td>
<td></td>
</tr>
<tr>
<td>Cost of Project</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>Who funded the Project</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>Organization of poster board</td>
<td>5</td>
<td></td>
</tr>
<tr>
<td>Creativity of poster board</td>
<td>5</td>
<td></td>
</tr>
<tr>
<td>TOTAL POINTS ATTAINED</td>
<td>42</td>
<td></td>
</tr>
</tbody>
</table>

Extensions
1. Have students determine how much 240,000 acres would actually cover of Indiana, Iowa, Missouri, and Illinois and how much 2.4 million acres would now cover of the original area once occupied by the tallgrass prairie.
2. Bring in someone from your area to talk about a local restoration project.
3. Have students relate Iowa’s Ecotype Project to restoration projects. Why would it be advantageous to use local ecotype organisms?
4. The Application portion can be modified for younger students by having them prepare a concept map for one of the restoration projects.
5. Go to this site for a build a Prairie Activity. http://www.bellmuseum.org/distancelearning/prairie/

Resources


Restoration Around the Country

http://www.inhf.org/prairiemgmt.htm
A Virtual Prairie Fieldtrip

Summary: There is something about standing in the middle of a prairie, wind bending shoulder high grasses all around that feels different than any other place. Native prairies and reconstructions are so rare that it may not be possible to take your students on a prairie field trip. This activity uses the Selected Prairie Locations Special Feature on the DVD to take your class on a virtual field trip.

Objectives
After completing this activity the students will:
- Integrate prior knowledge about the prairie and sensory responses to the virtual tour to produce a written account of their prairie experiences.

Materials
- Paper and Pencil

Film Segments
Teaching segments 1-14 and the Special Feature “Selected Prairie Locations”

Background
This activity has been designed as a culmination activity for a prairie unit. If the students have not already seen the entire documentary, show the film before beginning the activity. The activity can be used when an actual field trip to a prairie is not possible and/or as a way of assessing the student’s knowledge gain during the prairie unit. The teacher (or the teacher and students) should develop the rubric for the writing assignment prior to beginning the activity. Suggestions for possible rubric criteria are provided in the Assessment section and can be adapted to include the taught concepts. The film itself provides additional background information for this activity.

Procedure
- Engagement
  1. Ask the students to close their eyes and image they are in their favorite place. Except for your questions, the room should be silent. As the students spend 3-5 minutes thinking about their favorite places, ask them some of the following leading questions:
    - What does your favorite place look like?
    - What are the most noticeable colors in your favorite place?
    - What sounds do you hear?
    - What does your favorite place smell like?
    - Is there anyone else with you in your favorite place?
    - What makes this place special to you?

- Exploration
  1. Ask the students to open their eyes and spend another 3-5 minutes writing a paragraph about their favorite place. Ask them to include the details such as sounds and smells.
  2. If any of the students are willing to share their paragraphs, read two or three of them to the class.
  3. Explain that in this activity the students will use their skills of observation and description to write about what they have learned about the tallgrass prairie.
A Virtual Prairie Fieldtrip

• Explanation
  1. As a class, make a list of the major points that students were supposed to have learned about during their past Prairie activities. Write the list on the board and keep this list available during the remainder of the activity.

  2. Tell the students that they are about to watch a new 8 minute segment from the film which will take them on a virtual fieldtrip to prairies across the United States. During this segment the students should take notes about what they see, how they feel, and how the images they see relate to the list of major points.

  3. Play the “Selected Prairie Locations” Special Feature from the DVD. Keep the lights on so that students can take notes as they watch. The Selected Prairie Locations Feature is divided into 19 smaller segments. You may wish to stop between segments to allow students to write. You may wish to use only some of the segments to make the activity fit into the time allotted.

• Application
  1. After the film segment has ended provide additional time (or assign as homework) for students to complete their writing. Explain your expectations for their papers, including that each paper should describe what they heard and felt during their virtual field trip and what they learned during the past Prairie Activities. It may be helpful to allow the students to watch the virtual field trip film a second time.

Assessment
  1. Collect and grade the student writings.

Rubric Suggestions

Thoughtful description of the prairie, including what was seen and heard during the virtual field trip. 10 pts.

An accurate description of an interconnection between prairie species. 5pts.

An accurate reference to the decline of the prairie. 5pts.

An accurate identification of at least 5 prairie plant species observed during the fieldtrip. 1pt. each.

Three comparisons between a native prairie and a reconstructed prairie. 3pt. each.

Correct grammar, spelling and punctuation. 7pts.

Extensions
  1. Have the students write a story about their virtual visit to the prairie.
  2. Using their writing and the information they gathered viewing the film, have the students develop a brochure to advertise a field trip to the prairie.
  3. Using their writings and their knowledge of prairies, have the students develop a guided tour of the Selected Prairie Locations Special Feature by writing the text that a tour guide would read while this feature is playing. The students could be broken into groups and each group assigned one of the 19 chapters from the special feature.
  4. Explore different types of writing by reading poems and literary articles about the prairie.
Prairie Flows

Summary: Planning is important to the success of nearly every project. Flow charts can assist in the planning process by identifying the order of steps that must be taken, the conditions that must be met before moving on to a new stage of the process, and/or what to do when something goes wrong. Students will read a simple flowchart and then create a flow chart for planning or maintaining a prairie restoration or reconstruction.

Objectives
After completing this activity the students will:
- Interpret a simple flowchart.
- Produce a flowchart to describe a part of the prairie reconstruction/restoration process.

Materials
- Sample Flowchart Student Copy Page (1 per student)
- Flow Chart Symbols Copy Page (1 per student or group)
- Paper/pencils or a word processing program
- Resources that include a description of how to restore/reconstruct a prairie

Film Segments
Teaching segment 11 Return of the Prairie (optional) as a reference of current restoration and reconstruction projects and to select a site to contact as a resource for building of flow charts.

Background
Reconstruction is the recreation of a native ecosystem on land that has been completely converted to a new land use. For example, a piece of land that was once prairie may have been converted into cropland and farmed for 3 generations before being converted back into prairie. The term restoration is used when a piece of land that has some remaining prairie features is managed to restore its prairie elements. For example, a railroad ditch contains newer woody plants growing beside many of its original prairie grass and forb species. Initially reconstruction and restoration projects require different approaches.

Reconstruction happens on a site in which no native plants remain. This might be a lawn, former farm field, or other area that is planted in no native prairie vegetation. The first step in the process is to eliminate the non-native vegetation. Usually a herbicide is used to kill off the vegetation. Other times the vegetation is plowed, or covered with a weed barrier to kill it off. After that, native species are introduced and managed to their advantage and the disadvantage of non-natives. This can mean burning to promote the growth of fire resistant native grasses and further disrupt the growth of any remaining invasive species that are not fire resistant. It could also mean mowing at specific times, introducing biological controls, or removing new invasive species by hand.

A restoration happens when an area of vegetation already contains some native species. In order to enhance the natives, different steps can be taken to give advantage to them and take it away from the non-natives. This might include spot spraying, mowing (at different heights and times), burning, and over-seeding. When a reconstruction reaches the point where there are desirable plants present, and there are still non-natives, the techniques for management are the same as those of a restoration project.

Prescribed burning is one of the ways of managing prairies. Prescribed burning is very different from wild fires because the burn is planned very specifically. Wind conditions, humidity, and fuel moisture is monitored. Fire breaks and equipment are
Prairie Flows

use to manage the fire. Prescribed burning is sometimes mistakenly called “controlled burning.” Technically speaking, burns are managed, but not controlled.

A Flow chart is a graphical representation of a process. The different symbols on a flow chart each represent a different part of the process. The terminators (beginning and end) are represented by a capsule shape. Points in the process which require a decision are represented by diamonds. Arrows lead from one step in the process to another. The arrows require labels when a choice must be made. Sometimes a step can not be completed until outside data is provided (symbolized by a parallelogram). See the Sample Flow Chart and Flow Chart Symbols page for additional information about the symbols used and the structure of a flow chart. Flow charts are used in industry, business, anywhere that there is a process that needs to be explained or repeated.

Procedure

- **Engagement**
  1. Ask the students to write down a description of how he/she gets ready for school in the morning. Give the class 5 minutes to complete their descriptions.
  2. Have two or three students read their descriptions. Are there things that every student does while preparing for school? Are there other things that only boys or only girls do? Does each student get ready in exactly the same way every morning?

- **Exploration**
  1. Handout the Sample Flow Chart—Get Ready for School Copy Page to each student or project the Sample Flow Chart to the entire class. As a class, review each step of the flow chart. Draw attention to the way the flow chart provides an explanation of the process of getting ready for school, while allowing for conditions (like a bad hair day or cold weather) to alter what happens.
  2. Draw each of the four basic flow chart symbols on the board. Ask the students to determine the purpose for each symbol. If necessary handout the Flow Chart Symbols Copy Page.
  3. Ask each student to alter the Sample Flow Chart to create a new flow chart that explains how he/she gets ready for school. Provide 5-10 minutes for the students to complete their own flow charts. Collect the samples and review to determine if the students need more assistance learning how to build a flow chart.

- **Explanation**
  1. Review the meaning of each symbol used on the sample flow chart. Introduce the additional symbols on the Flow Chart Symbols Copy Page. As a class discuss how each new symbol is used.
  2. Divide the class into groups. Ask each group to discuss the purpose of a flow chart. Student’s don’t need a flow chart to get ready for school, but when might a flow chart come in handy? Each group should write down their own definition of a flow chart and make a list of processes that would require a flow chart (You may want to provide a couple of examples: a paramedic uses a flow chart to decide how to treat a patient, an auto mechanic uses a flow chart to diagnose a car, a computer manufacturer uses a flow chart to custom build a computer, a conservation manager uses a flow chart to manage a prairie restoration project).
  3. Discuss that different flow charts provide different levels of detail. For example, it would be possible to take the step “Brush Teeth” out of the sample flow chart and develop a new flow chart which just describes how to correctly brush teeth. A consistent flow chart will maintain the same level of detail at each step (rather than gloss over some stages and provide minute details for other stages).
**Prairie Flows**

- **Application**
  1. Divide the class into groups. Assign each group to research a different prairie restoration/reconstruction concept from the list below and develop a flow chart to describe their process.
     a. Reconstructing a 15 acre Prairie that has been converted to Row Crop.
     b. Restoring a 15 acre Prairie that has been grazed for the last 60 years.
     c. Maintaining a 15 acre Prairie.
     d. Managing a prescribed burn on a 15 acre Prairie.
     e. Creating a survey of the plant species present on a 15 acre Prairie.
     f. Monitoring wildlife on a 15 acre Prairie.
  2. Provide each group with a copy of the Flow Chart Symbols Copy Page and time to research the topic. Student’s should begin by identifying the starting condition and ending condition of their process (the start and end terminators for the flow chart).
  3. Student’s may wish to email or write their local County Conservation Board, Natural Resources Conservation Service, State Extension Office or Iowa Department of Natural Resources Office to collect additional information. Provide students with enough time to research and develop their flow charts. At some point the students will discover that any given part of the flow chart could be broken up into smaller parts and developed into a separate chart. It may be necessary to assist students in determining how detailed to be in the development of their charts.
  4. Have the students develop their flow charts on paper or using flow chart software (Microsoft Word, Works, and Publisher all contain Flow Chart Symbols in the AutoShapes Menu, in AppleWorks use the drawing tools.)
  5. When the students have completed their charts, have them present their flow charts to the class or have each group review another group’s chart. If your class is going on to create a prairie reconstruction, use the students’ charts to plan the project.

**Assessment**
1. Collect the student’s “Getting Ready for School” Flow charts and evaluate the structure and proper use of flow chart symbols.
2. Collect the group’s flow chart definitions and lists of real life flow chart uses.
3. Collect the group’s completed prairie flow charts and evaluate for proper use of flow chart symbols, chronology of the steps, understanding of the process they are describing, consistency in the level of detail, and citation of sources.
4. If the student’s reviewed another group’s flow chart, collect the reviews and evaluate for relevant questions and comments.

**Extensions**
1. As a class complete a prairie reconstruction or assist the managers of a local prairie with management using one of the processes developed by your students.
2. Write to natural resource managers. Send them your class flow charts and ask them to send your class copies of any flow charts they use in their own work.

**Resources**
Wake Up to Alarm

- Am I still sleepy?
  - Yes
    - Am I late yet?
      - Yes
      - Hit snooze, sleep 5 more minutes
    - No
      - Shower

- Select clothing for the day
  - Get dressed
  - Eat breakfast
  - Brush hair

- Weather Report And Look outside

- Having a bad hair day?
  - Yes
    - Use blow drier, curling iron and lots of product to correct
  - No

- Is it raining or is the temperature below 60 degrees?
  - Yes
    - Put on coat
    - Use blow drier, curling iron and lots of product to correct
  - No

- Board bus to school
Flow Chart Symbols

Basic Symbols:

- **Terminator**: Start and End of the Process
- **Process Step**: An action is taken
- **Decision**: (or conditional) A Yes/No or True/False Statement must be answered.
- **Data**: Specific information required
- **Arrow**: Illustrates the direction of movement from one step to another.

Additional Symbols:

- **Preparation**: Action that must happen before the step, from another process
  - Gather materials for prescribed burn.
- **Delay**: Illustrate time must pass before next step.
  - Wait for seedlings to grow.
- **Display**: Communicate a result, not necessarily the final outcome.
  - Hand in report on prairie restoration.
- **Manual Operation**: An adjustment/correction that can only be made manually
  - Pick up litter
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