# The Blackland Prairie


Classroom lessons to accompany field trips
to the Sneed Prairie Restoration

Austin College
Center for Environmental Studies
Sherman, Texas

# Table of Contents

Purpose....1
Field Trip Information....2
Parental Permission for Field Trip....1
Background Information on the Blackland Prairie (for Teachers)....5
References for Further Reading....10
Lesson 1 – Native Americans and the Buffalo....11
Lesson 2 - Changes in the Prairies....13
Lesson 3 - Prairie Jeopardy....15
Appendix A - KWL Chart....17
Appendix B - Web of Knowledge....18
Appendix C - Student Information Packet....20
Appendix D – Cause and Effect Worksheet....24
Appendix E - Prairie Jeopardy Game Board....26
Appendix F - Jeopardy Questions....27
Appendix G - Student Worksheet....29
Grade 4 TEKS Science Objectives Covered in Lessons....30

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# Purpose

The Austin College Center for Environmental Studies has developed a three-part set of opportunities for elementary students to learn about their native Blackland Prairie: a video; classroom lessons; and a field trip program at a prairie restoration site. This document contains the classroom lessons to complement the video, *The Blackland Prairie of Texas*, and the field trip. (A longer set of lessons is also available for teachers who wish to commit a substantial amount of classroom time to study of the Blackland Prairie. If you would like a copy of this more extensive set of lessons, please contact Sarah C. Stevens at sctevens@austincollege.edu).

There are two lessons for use before the field trip and one lesson for use after the field trip. The video can be viewed anytime, but it is intended as an introduction to and overview of the topic. We suggest that you show the class the video before taking the students on a field trip to the prairie restoration.

These lessons introduce students to tallgrass prairie ecology (how prairies function as ecosystems or biomes), the history of land use in the Blackland Prairie region, the consequences of prairie loss, and the potential benefits of prairie restoration. If you have not previously studied these issues, you may be surprised to learn how many benefits can result from prairie restoration.

The lessons are targeted to fourth graders, but they can be modified to accommodate lower or higher grade levels. The lessons are tied to the TEKS grade 4 science objectives. Details on coverage of the various TEKS objectives are described at the end of this document.

The section "Background Information for Teachers" is intended to provide enough information to make teachers comfortable with the material.

Almost all of the resources and information that you will need for these lessons are included here. The one exception is the book, *The Buffalo Hunt*, by Russell Freedman.

Almost all the native prairie of North America has been destroyed, mostly by plowing. However, rather than focusing on who is responsible for the current situation and mistakes that have been made, we hope students will come away with an understanding of the value of the intact prairie biome and enthusiasm for the potential of prairie restoration.

Please contact Sarah C. Stevens if you would like to schedule a field trip to Austin College's Sneed Prairie Restoration (scstevens@austincollege.edu, 903-813-2034). If you have already scheduled a field trip, Ms. Stevens is your primary contact for any issues that arise. If you cannot reach Ms. Stevens, please call Dr. Schulze at 903-813-2284.

We would be grateful if you would alert us to any suggestions for improvements to this document or the field trip.

This project has been made possible by the Meadows Foundation, the Texas Parks and Wildlife Department, the U. S. Environmental Protection Agency, the U. S. Fish and Wildlife Service, and the Priddy Charitable Trust. We are grateful for this support. Thank you for your interest in this project.

# Field Trip Information

**Scheduling:** Field trips are scheduled during both fall and spring semesters. Please call Sarah C. Stevens (813-2034) if you would like to arrange a field trip. Classes typically arrive at 1:00 PM and spend about 1.5 hours at the Sneed property. Longer visits may be possible, depending on tour leader availability.

**Tour Leaders:** Tours of the Sneed Prairie are conducted by specially trained Austin College students. These students are educated in the ecology and history of the Blackland Prairie, and in the techniques of prairie restoration. They have been selected from students who have completed the course *Hands-on Conservation: Restoration of a Native Prairie*. You should not assume, however, that they will know all the names of species you will encounter at the site.

**What to Expect:** Tour leaders will discuss the biology and ecology of the Blackland Prairie, what has happened to the Blackland Prairie over the last 150 years, and the prospects for its restoration. Students will have an opportunity to observe such things as key native grass species, the effect of past overgrazing, the impact of cattle and intentional fires on prairie restoration, properties of local soils, and the consequences of replacing native perennials with non-native annual plants. Students often see a variety of animals as well. As you might expect, the site changes with the seasons so some things are easier to observe or only available during particular seasons. For example, during spring recently burned fields will be apparent but there will not be any tall grass, while during fall grasses will be tall, but fields burned the previous winter will look similar to other fields.

**Site Facilities:** We have basic first aid equipment, drinking water, and restroom facilities at the site, but the water is not transportable during the tours. During hot weather it is helpful if the students bring water that they can carry with them during the field trip.

**Clothing:** We realize that students may not follow instructions about what to wear for field trips, but they should be instructed to wear long pants and regular shoes (not open-toed shoes or sandals). Anyone wearing shorts is likely to get their legs scratched by dry grasses and other plants. Each student should also wear a baseball cap or other hat with a brim. As you know, temperatures vary widely in Texas, especially during spring and fall. Students should be prepared to tolerate uncomfortably warm or cold conditions.

**Safety:** Please explain the following safety precautions to your class before bringing them to the site. (We have worked to minimize potential hazards at the property, but they cannot be entirely eliminated.) Students (and teachers) should follow instructions and watch where they are walking to avoid getting hurt. The main hazards are barbed-wire fences, electric fences, thorns on trees, fire ants, and animal holes that could twist an ankle. Avoid barbed-wire fences and electric fences. Electric fences may or may not be turned on. Their shock is not dangerous, but it hurts. Watch out for fire ants if you stand in one place for a long time. At times it may be necessary to walk in tall grass to make observations, but when feasible it is advisable to stay out of tall grass to minimize the chance of running into ticks or chiggers. We may pass near cattle that are on the other side of an electric fence. Do not attract their attention by calling to them, whistling, waving at them, or disturbing the cattle in any way. The tour leaders will send to the bus any child who tries to attract the attention of cattle, or intentionally irritates cattle. Likewise, anyone who behaves recklessly will be sent back to the bus.

**Directions:** A map will be sent to you when you sign up for the tour. From the intersection of Hwy 82 and Hwy 75 in Sherman travel 9.7 miles west on Hwy 82 to Old Southmayd Road. A westbound sign at the intersection of Hwy 82 and Old Southmayd Road indicates Hagerman National Wildlife Refuge to the north. Turn north on Old Southmayd Road and continue 1.2 miles until reaching the intersection with Keyes Road. Turn west on Keyes Road. The Austin College Sneed property is on the south side of Keyes Road 0.6 miles west of the intersection. There is a large maroon sign. When you reach the site pull up the driveway to the shed, or wait for the field trip leaders to arrive to unlock the gate.

**Inclement weather:** Please call Sarah C. Stevens (903-813-2034) or, if she is not available, Peter Schulze (903-813-2284) if you wish to cancel or postpone a trip. Trips will have to be cancelled or postponed if thunderstorms are in the vicinity or if substantial rain is falling. We will be happy to try to reschedule any postponed field trip.

# Parental Permission for Field Trip
# to Austin College Sneed Prairie Restoration

Your child's class will take a field trip to Austin College's Sneed Prairie Restoration later this semester. The Sneed property is a 100-acre prairie restoration site approximately 10 miles west of Sherman just north of Highway 82. Our trip is scheduled for _____
but will be postponed if the weather is not suitable on that date.

The field trip will provide an opportunity for your child to learn about our region's Blackland Prairie and the process of prairie restoration. The field trip is designed to complement material we have been studying in class, including a video and lesson plans on the same topic. These activities have been made possible by grants to Austin College from a variety of organizations, including The U.S. Environmental Protection Agency, The U. S. Fish and Wildlife Service, Texas Parks and Wildlife, The Meadows Foundation, and The Priddy Charitable Trust.

The field trips have been designed to minimize the potential for injuries. For instance, old barbed wire fences have been removed and the children will be kept on mown paths or other short grass most of the time. Nevertheless, there are some risks that are not entirely avoidable when walking around old farms. Potential hazards include fire ant bites, wasp or bee stings, twisted ankles, bumping into thorns, and snake bites. (Thousands of people have visited the site and no one has been bitten by a snake.)

It is important that students wear appropriate clothing and follow instructions to get the most out of the field trip and avoid injuries. Short pants and sandals or other open toed shoes are unacceptable. Horseplay is also unacceptable. All children should wear long pants, socks, and substantial shoes such as heavy tennis shoes or boots. We also recommend a hat and sunscreen as well as a bottle of water. Water will be provided at the site, but only at the bus parking location, not during the time children are walking around the property. Therefore, it is a good idea to send a bottle of water to school with your child. Please check the forecast as well. Early fall and late spring dates can be hot while late fall and early spring dates can be cold.

My child _____

___ has my permission to participate.

___ may not participate in this activity.

Printed name of parent or guardian _____

Signature of parent or guardian _____

Date _____

I agree to follow instructions and behave responsibly during the field trip.

Student's name (printed) _____

Student's signature _____

Date _____

# Background Information on the Blackland Prairie (for Teachers)

*This information parallels the narration of the video The Blackland Prairie of Texas.*
*The easiest way to become comfortable with this material*
*is to begin by watching the video.*

**Introduction**

Two hundred years ago much of central North America was covered by vast expanses of grasses and wildflowers. This prairie stretched from Texas to Canada and Illinois to Montana. Travelers called it a sea of grass.

The prairie grasses and wildflowers formed the base of a food web that supported a rich variety of majestic animals. In addition to birds, reptiles, and other small creatures, grazers such as elk and pronghorn antelope, and predators like grizzly bears and wolves roamed the prairie biome. The most common large animal living on the prairie was the bison. Some experts think that there were as many as 50 million bison on the Great Plains.

The North American prairie was also home to many Native American peoples, including the Assiniboin, the Blackfeet, the Cheyenne, and in our region, the Wichita and the Comanche.

**The Ecology of Prairies**

To understand the prairie biome it is necessary to understand the roles of the plants, the grazers, the predators, and fire.

The most obvious feature of a prairie is the plants, the grasses and wildflowers. The plants are the base of the food chain: they help build the soil and their roots hold the soil when the rain falls and the wind blows. They capture the sun's energy and feed the grazing animals.

The grasses and wildflowers can be separated into two groups, perennials and annuals. Annuals grow and die in one year, but perennials live for many years. Because they only live for one year, annuals do not have deep roots. But perennials are different, their roots can grow longer and longer year after year. The deep roots of perennial grasses and wildflowers literally held the prairie ecosystem together.

Four perennial grass species dominated much of the Blackland Prairie, switch grass, Indian grass, big bluestem, and little bluestem. These grasses are famous among ranchers because they are such good food for cattle.

Some prairie perennials have root systems that extend ten or more feet below ground. These root systems allow the plants to survive long periods without rain. Their ability to reach water deep in the soil enables the native grasses to grow through the dry summers, which provides a tremendous amount of forage for grazing animals. The perennial plants fed the bison, which in turn fed the wolves and the Native Americans.

Because of the threat of wolves, the bison lived in herds. Nineteenth century travelers frequently reported herds of thousands or tens of thousands of animals. Like fish in schools and birds in flocks, bison stayed in herds because herds made individual bison less vulnerable to predators. But

being in a herd also presented a problem. With so many animals packed into a small area the food was rapidly eaten up.

To find more food the herds were forced to move on, to migrate. As a result, the bison did not stay in any one place for very long. They may have eaten most of the plants' leaves, but the grasses quickly grew back from their deep roots.

Imagine how the situation would have been different if predators had not forced the bison to live in herds. If small groups of bison were spread out all over the place they would not have had to migrate to find new food so they would have grazed in the same area over and over, much as cattle often do today. As we will see later, this subtle difference in behavior makes a tremendous difference to the prairie plants, and therefore to the other organisms of the prairie as well.

Fire was also important to the tallgrass prairie. Without fire, trees invade and their shade kills the grasses and wildflowers. But fires, and trampling by running bison, killed almost all little trees that sprouted on the prairie. Though fire kills little trees, grasses and wildflowers can grow right back after a fire because they have adapted to occasional burning.

In summary, the plants, bison, hunters, and fire each played a crucial role in sustaining the prairie biome. The plants captured the energy of the sun and provided food for the bison and other grazers. The bison fed on the plants and in turn provided food for the predators. Being hunted by those predators forced the bison to live in herds. Because herds could rapidly eat the food in one area, they moved on, giving the plants a chance to grow back. Meanwhile, occasional fires kept trees from invading and shading out the grasses and wildflowers. This was a rich ecosystem. Early Western settlers were attracted by the grass that was such fine food for their cattle.

Over thousands of years the activities of the prairie organisms built some of the richest soil in the world – soil that became deeper and deeper as the years passed. It was the rich soil that attracted farmers to the Great Plains. Farms on the Great Plains grow much of the world's food, but this agriculture has come at a price. Today most of the prairie is gone, and in some areas the soil is worn out as well.

**Destruction of the Blackland Prairie**

Native Americans lived on the Blackland Prairie for thousands of years, but they do not appear to have done any lasting damage to the plants or the soil. They hunted and set fires, but they did not destroy the vegetation. Real damage to the plants and the soil did not begin until new settlers began arriving during the nineteenth century.

The first major impact of settlers was the destruction of the bison. After the Civil War railroads reached the plains, which made it easy to ship heavy bison hides to eastern tanneries. The leather was used in machinery, for book bindings, and for buggy tops. It even became fashionable to panel the walls of homes with bison leather. In only 20 years hunters reduced the tens of millions of bison to only a few hundred animals.

During 1873, one group of sixteen men killed 28,000 bison. The slaughter of the bison destroyed the food supply of the wolves and the Native Americans. The loss of the bison would almost certainly have caused major changes in the vegetation, but within a few decades plows had more impact than the loss of bison ever could.

The soil of the Blackland Prairie was some of the richest soil west of the Mississippi River. At first, the dense root networks of the grasses prevented plows from breaking the soil, but in the late 19th century new plows were developed that could cut through the tough sod. Meanwhile, railroads reached the area, so crops could be easily transported to cities in the east.

The plows and railroads ushered in the cotton industry, and with it the destruction of most of the Blackland Prairie. At first, cotton grew so well that by 1915 almost every available piece of land housed a family farm. For seventy years the Blackland region produced more cotton than anywhere else did in the world. However, growing cotton year after year wore out the soil, and the vast expanses of cotton enabled pests to move from one field to the next. Then came the Depression, the drought of the 1950s, the boll weevil, and competition from cotton grown elsewhere. This combination was too much for most farmers. Many farms were abandoned. Rural populations fell rapidly and many small towns simply disappeared. In only a few decades the Blackland Prairie was almost completely destroyed and its fertile soil was severely degraded.

Despite the damage to the soil the vegetation might have recovered, but in most places it didn't have a chance. Several factors hindered or completely stopped the recovery of native vegetation, especially overgrazing, lack of fire, continued plowing for crop production, and construction of cities, towns, and roads.

The prairie plants were not hurt by the short bouts of grazing by migrating bison herds, but today cattle often have a different effect. Cattle overgraze plants when they are confined to the same field too long or too often. These cattle bite the leaves of the same plants over and over again. Without leaves these plants cannot photosynthesize and they die. This difference between grazers that migrate and grazers that do not makes all the difference for the plants. Plants that get a long enough rest from grazers grow fine, but plants that are grazed day after day die out and are replaced by thorny trees and other plants that cattle do not eat.

Cattle that are kept in a field too long are like a gardener pulling weeds, but in reverse. A gardener pulls the weeds to encourage growth of flowers or vegetables, but cattle keep removing the best foods and thereby encouraging the growth of the plants they don't eat – the plants ranchers call weeds. The native perennial grasses are favorite foods of cattle, so they do not survive in overgrazed pastures.

Meanwhile, lack of fire allows trees to grow and pastures become thickets. Not only is the native prairie lost, but such places are no good for raising cattle either.

Of course, cattle are not always kept in one pasture. Many ranchers work hard to manage their animals in ways that will preserve the native vegetation. But on a trip down almost any country road one can see pastures filled with weeds, thickets of shrubs, and cedar trees – a consequence of overgrazing combined with lack of fire. These changes in the conditions, overgrazing plus a lack of fire, have caused a change in the plants.

In addition to overgrazing and lack of fire, cities cover places that used to be prairies. Every house, parking lot, movie theater, road, and hospital reduces the land available for the native plants and animals.

Together agriculture, overgrazing, fire prevention, and the growth of cities have combined to eliminate virtually all of the Blackland prairie. Today, little more than a century after the beginning of Western settlement, the Blackland Prairie is almost all gone. In fact, experts estimate that more

than 99% of the Blackland Prairie has been destroyed, making it one of the most endangered ecosystems in the United States.

**Consequences of prairie transformation**

The destruction of the native plants has a surprising number of consequences. The most basic one is the loss of habitat for native species, not just plants, but animals and other species as well.

In addition to bison, early Blackland settlers saw black bears, gray wolves, ocelots, pronghorn antelope, prairie chickens, and even jaguars, but all of these animals are gone now. Just imagine -- there used to be jaguars in North Texas. Animals live in particular habitats. When the habitats are lost, the animals disappear with them. When native plants disappear, many native animals are lost as well.

In addition to the disappearance of native species, the shift in the plants also changes what happens to rain when it falls. The deep roots of the native perennial grasses cause water to travel deep into the ground, but the shallow roots of annuals do not.

Meanwhile overgrazing leaves much of the soil surface exposed to the rain. When raindrops hit bare ground they break large soil particles into smaller and smaller pieces, and the small particles wash into the spaces between each other until the soil surface starts to resemble the surface of a brick. The resulting smooth surface causes water to run off rather than sink in.

Because overgrazing causes a replacement of perennials with annuals and leaves bare soil, it reduces the amount of water that sinks into the soil and increases the amount of water that runs off the land.

Running water washes away soil, causes floods, and turns the soil into mud that ends up in reservoirs. The more mud that enters the reservoirs, the faster they fill in and become useless for storing water. The more soil is lost from the land, the more the fertility of the remaining soil is reduced.

The increase in runoff and erosion is obvious from gully walls with exposed roots. Roots do not grow out into the air, they grow in soil. Where roots are now airborne, they were once underground, which demonstrates that such gullies were often formed during the lifetime of the existing trees. Such gullies only formed recently because the heavy runoff only began recently – during the last few decades. The heavy runoff began when the native tallgrass prairie was destroyed.

**Hope for the future of the Blackland - preservation and restoration**

The future of the Blackland Prairie depends upon preservation of the few remaining locations that were never plowed, and the restoration of Blackland vegetation to other sites.

A few Blackland Prairie remnants have been protected in preserves, such as The Nature Conservancy's Clymer Meadow, a 1,200-acre preserve in northwestern Hunt County, Texas.

Preserves provide a place for remaining native populations to hang on. Preserves help scientists and land managers understand the functioning of the prairie ecosystem, and preserves serve as a source of seeds for efforts to restore native species elsewhere.

Only through restoration efforts can the Blackland be brought back to places where it has been destroyed. Successful restoration would not only be good for native species, but would also reestablish the ecological conditions of historic Blackland prairies. If the prairies were restored, cattle would have more and better food, less water would run off, and rather than washing away, the soil would become more and more fertile.

At the Sneed Prairie west of Sherman, Texas, Austin College faculty and students are using prescribed fires, carefully managed grazing, mowing, and seeding to restore the native tallgrass prairie vegetation. Because no one yet knows the best way to restore native vegetation, the Sneed project is set up as an experiment, with different techniques used on different fields. Students then monitor the effects of the management efforts to try to learn what works and what doesn't.

The Sneed Prairie restoration is just one of many places were biologists, students, volunteers, and other interested people are working to restore native prairies in North America. If these restoration efforts are successful, the prairies will thrive and the productivity of the land will recover.

A few decades ago the great conservation biologist Aldo Leopold wrote that we have yet to learn to live on a piece of land without ruining it. He predicted that no one would ever again see a thousand acres of prairie wildflowers tickling the bellies of buffalo. But he also began the first major prairie restoration project. Today lots of damaged land remains, but more and more is being learned about restoration and more and more people – ranchers, conservationists, biologists, retired businessmen, college students, school children, and others - are working to restore pieces of a once thriving ecosystem.

## References for Further Reading

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Packard, S. and C.F. Mutel (editors). 1997. *The Tallgrass Restoration Handbook.* Island Press.

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## Lesson 1 – Native Americans and the Buffalo

Before Field Trip

**The student will be able to** describe the historical condition of the Native cultures and their dependence on buffalo.

**The lesson content is about** the Native Americans' reliance on the buffalo (bison) and thus upon the prairie plants.

**The student will process the content by** working on a KWL chart, listening to you read *The Buffalo Hunt*, and filling in a Web of Knowledge.

**The student will complete this product by** completing the Web of Knowledge.

**I will know how well the student has learned the content, process, or product by** checking the students' webs of knowledge for accuracy and evaluating their comments when completing the KWL chart.

**ACTUAL LESSON:**

**Introduction (15 minutes):** The teacher will introduce the students to the topic of the field trip and associated lessons. The teacher will fill in the first two sections of the KWL chart (see Appendix A) with student ideas.

**Strategies/Activities (1 hour):** The teacher will read to the students *The Buffalo Hunt* by Russell Freedman, encouraging them to listen carefully for answers to their questions and other information related to the KWL chart. The teacher should encourage the students to raise their hands and suggest items for the KWL chart as the teacher reads the story and they hear appropriate material. At the end of the story, the students will be given the Web of Knowledge worksheet to complete (see Appendix B) (This is to be filled out from information the children have learned from the book, based on what existed on the prairie 200 years ago. A sample completed Web is included in Appendix B.) If it is not already completed, the teacher will then complete the last section of the KWL chart using student input.

**Closure (10 minutes):** Assign children to small groups of three or four and have each group generate a list of at least five new ideas or facts that they learned from *The Buffalo Hunt*, and then share their list with the class.

**Materials Required:** *The Buffalo Hunt* by Russell Freedman; KWL chart on overhead, blackboard, or large page; copies of KWL chart and Web of Knowledge sheets for students to use at their desks.

**Classroom Setup:** The teacher can keep the students at their desks or bring them up around the board during the lesson.

**In order to differentiate the lesson to meet the needs of the learners, the teacher should do the following:** The majority of the lesson depends upon group input, so slower students will not be

singled out during those activities. Teachers can rely on other students to clarify issues and make connections. The teacher should walk around to ensure all students are successfully completing the Web of Knowledge activity.

**The following levels of thinking skills (in BOLD) are used in this lesson:**

| | | |
|---|---|---|
| **Knowledge** | **Comprehension** | **Application** |
| **Analysis** | Synthesis | Evaluation |

**Technology Component:** None needed

## Lesson 2 - Changes in the Prairies

Before Field Trip

**The student will be able to** discuss what changes have occurred to the Blackland Prairie region, describe why those changes occurred, and list what problems those changes cause.

**The lesson content is about** causes and effects of prairie destruction.

**The student will process the content by** reading assigned sections of the student packet of information and sharing information with their classmates.

**The student will complete this product by** completing a cause and effect worksheet.

**The teacher will know how well the student has learned the content, process, or product by** listening to the students' discussion of the material and evaluating their answers on the worksheet.

**ACTUAL LESSON:**

**Introduction (10 minutes):** The teacher should begin by describing the lesson's activity - a jigsaw of the information packet (see Appendix C). (The jigsaw procedure is described at the end of this lesson.) Each student should then be assigned to two different groups, an original group and an expert group. There should be four expert groups. Each expert group should have one or more members from each original group. The teacher will then divide the students up into expert groups and assign sections of the information packet.

**Strategies/Activities (45 minutes):** Each student will read his or her assigned section plus the sections that are labeled to be read by all students, and discuss what they have read with the other members of their expert groups (who have read the same material). The students will then return to their original groups and share what they have learned from their sections. The teacher will then lead a discussion of the entire document and help the students synthesize the information. The students will then complete cause and effect worksheet (see Appendix D). The cause and effect worksheet can be completed either by students working individually or in small groups.

**Closure (5 minutes):** The teacher should ask a few review questions about prairie loss and prairie restoration.

**Materials Required:** Copies of Student Information Packet (Appendix C), and copies of Cause/Effect Worksheet (Appendix D) for students.

**Classroom Setup:** Students will be moving around the room, talking within their original groups and their expert groups. The class should be set up to make this grouping as easy as possible, allowing for some distance between group worksites.

**In order to differentiate the lesson to meet the needs of the learners, the teacher should do the following:** This activity depends upon the students' comprehension of the reading. The teacher should circulate during the students reading, checking on student comprehension. The teacher

should group students heterogeneously, making sure that students of all ability levels are included in each group. This type of grouping will benefit the slower students.

**The following levels of thinking skills (in BOLD) are used in this lesson:**

| | | |
|---|---|---|
| **Knowledge** | **Comprehension** | **Application** |
| **Analysis** | **Synthesis** | Evaluation |

**Technology Component:** None needed

***Jigsaw:*** *A jigsaw activity splits students into groups in a manner that encourages discussion among the students and integration by the students. First, have the students count off by 4s. Assign the students to one of these four ORIGINAL groups on the basis of the numbers they counted. Then assign a particular reading (section 1, 2, 3, or 4, Appendix C) to each member of each ORIGINAL group. After the students read their sections assemble EXPERT groups of students that have read the same section (e.g. all of the students who read section 1 form one EXPERT group). Have the members of these EXPERT groups discuss the readings and prepare to summarize the main points of their section with their ORIGINAL groups. When the EXPERT groups have had sufficient time to discuss their readings, have the students return to their ORIGINAL groups and share what they have learned with each other. Note that all students should read the introduction and the 2 final sections of the reading (Appendix C). At the end of the jigsaw, all students should have heard the important facts from all the sections. Lead a discussion of those important facts and their relationships to each other to conclude the jigsaw exercise.*

# Lesson 3 - Prairie Jeopardy

After Field Trip

**The student will be able to** answer questions regarding the features of the native Blackland Prairie ecosystem, problems associated with the destruction of prairies, and restoration strategies.

**The lesson content is about** the change in prairies in the last 200 years, the consequences of their destruction, and the importance of restoration attempts.

**The student will process the content by** playing prairie Jeopardy.

**The student will complete this product by** filling out the student questionnaire after the game.

**The teacher will know how well the student has learned the content, process, or product by** observing them during the course of the game and assessing how much they have learned through the answers they provide.

**ACTUAL LESSON:**

**Introduction (5 minutes):** The teacher should tell the students that they will be playing a game of Jeopardy involving the information they have learned from the video, field trip, and previous lessons. The teacher should then split the students into teams of 3 or 4 students, and each team should select a captain.

**Strategies/Activities (45 minutes):** The teacher should display a Jeopardy game board or draw one on the blackboard for all the students to see (see Appendix E). The teams will take turns selecting questions (see Appendix F) from different categories for different dollar values. Each group will select a category and point value. Correct answers earn the number of dollars associated with the question, but incorrect answers lose the same amount. The captains will state the answer after the team members have conferred and reached a consensus. If a team is stumped by a question, the teacher can ask whether anyone in the class knows the answer. The stumped team is then given the option of receiving help, but they must pay $50 to the team that provides the correct answer. As each question is selected, the teacher should cross off that question. At the end of the game, the team with the most points might be given some reward. The teacher will then give the students the worksheet to complete (see Appendix G).

**Closure (5 minutes):** The students should be asked whether or not they enjoyed the prairie unit, if they would do it again, and what things they might change for the next year (please pass any valuable suggestions along to us).

**Materials Required:** Butcher paper or laminated, reusable posterboard, or blackboard for Jeopardy game board (Appendix E); blackboard for keeping score; Jeopardy questions (Appendix F); copies of student worksheet for students (Appendix G).

**Classroom Setup:** This lesson will require teams of 3 or 4 students, so arrange the classroom in a way that allows teammates to be grouped together and separated from other teams.

**In order to differentiate the lesson to meet the needs of the learners, the teacher should do the following:** The teacher might provide more time for those groups who might need it. Students will be able to rely on their teammates if they are unable to answer a question.

**The following levels of thinking skills (in BOLD) are used in this lesson:**

| | | |
|---|---|---|
| **Knowledge** | **Comprehension** | Application |
| **Analysis** | Synthesis | Evaluation |

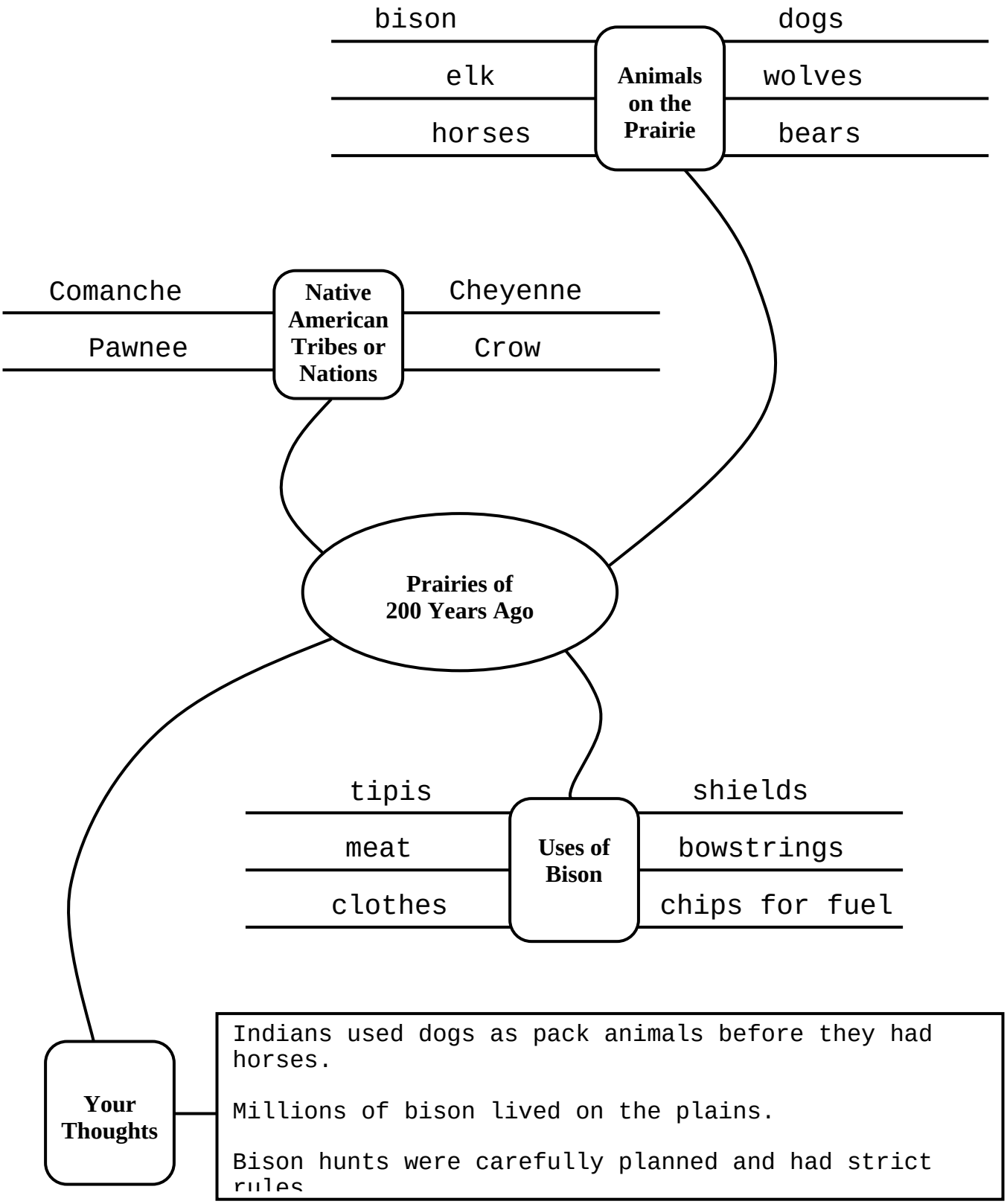
**Technology Component:** None needed

# Appendix A - KWL Chart

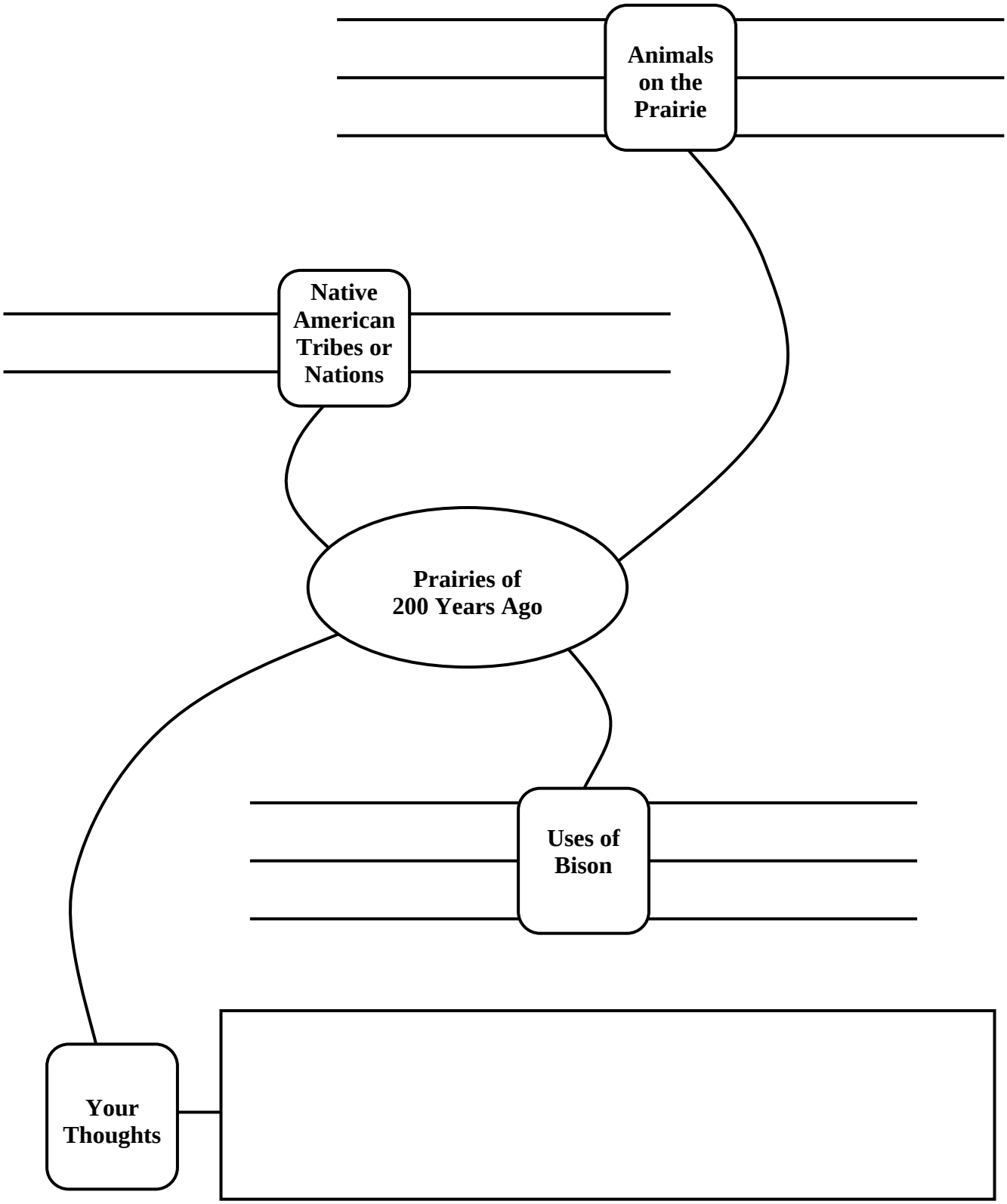
| What We Think We Know About Prairies | What We Want To Know About Prairies | What We Learned About Prairies |
|---|---|---|
| | | |
| | | |
| | | |
| | | |
| | | |
| | | |
| | | |

## Appendix B - Web of Knowledge

SAMPLE



# Web of Knowledge



# Appendix C - Student Information Packet

**Sneed Jigsaw Activity – Destruction and Restoration of the Prairie**

**Introduction (All Students)**

Two hundred years ago, the prairies were almost completely covered by tall grasses and wildflowers; almost no trees grew in this area. Herds of bison, at times numbering in the tens of thousands, roamed the area, eating the lush grasses. At times, prairie fires swept across the land, burning almost everything between the rivers. The grazing bison and prairie fires stimulated the growth of the tall grasses and prevented trees from growing. As you know, numerous Native American peoples had lived on the prairies for hundreds or perhaps thousands of years. When settlers arrived they caused many changes that destroyed the prairies. The settlers were people of European and African ancestry who moved to this area from the eastern United States.

The numbers of bison roaming the prairie astounded the settlers. They began to hunt the bison, slaughtering them almost to the point of extinction. The settlers also began to prevent prairie fires, an important element in maintaining the prairie grasses. The settlers also brought cattle to graze on the land, and most importantly, they plowed up the prairie to plant crops. Though the settlers ruined the prairie, this was not their objective. They probably did not realize how much their actions would affect the environment. People are beginning to realize the importance of prairies, and restoring these lands has become a top priority for many environmental groups.

**Disappearing Bison (SECTION 1)**

When the settlers came to the west, the number of bison on the prairies astounded them. Some herds had tens of thousands of bison. Their herding behavior was a defense against predators. Bison lived in herds for the same reason that many birds live in flocks and fish live in schools. Predators have difficulty attacking animals that are members of herds. But the herds quickly depleted the food where they were, so they had to move on, to migrate across the prairies. Because the bison moved on, the grasses were able to grow back, just as grass can grow back after being mowed. The tall grasses are adapted to being eaten once in a while, and their growth was actually stimulated by the actions of the bison.

The bison attracted hunters since the bison were large and lived in huge herds. The settlers began to hunt these bison in large numbers, shipping their hides back east to sell. More and more hunters flooded the prairies, slaughtering the bison. The millions of bison were reduced to just a few hundred animals at the beginning of the 20th century.

**Prairie Fires Extinguished (SECTION 2)**

Prairie grasses catch fire easily so fires were common when the grasses were abundant. Fires burning in tall dry grass could have flames 50 feet high. When such fires were set by lightning in front of a thunderstorm, the fires could travel almost as fast as the wind. Such fires were so hot that they would burn until they reached a large river that they could not cross. Prairie fires killed young trees, which is the main reason why groves of trees were so rare on prairie land. However, the native tall grasses were adapted to being burned. By burning off old dry leaves and allowing more

sunlight to reach the ground, fires stimulates the growth of important native grasses, and those grasses grow back quickly after a fire.

When the settlers came to the prairies, they began to try to control the prairie fires. They did not want their animals or other possessions to be burned by these raging fires, so they began to fight them. The settlers also began making firebreaks, places that fires could not cross, such as plowed fields and roads. Fires no longer burned huge areas of prairie. Trees became much more common, and grasses began to die off under the shade of the trees.

**Cattle Come to the Prairies (SECTION 3)**

The lush grasses of the prairies were perfect for cattle ranchers. The tall grasses are very nutritious. At first longhorn cattle were allowed to roam the prairie, but eventually barbed wire was invented and people began fencing in areas and preventing cattle from moving at will. The cattle stayed behind their fences in the pastures, and ate the lush native grasses. The ranchers called the native grasses "ice cream" grasses because cattle ate them first. That nickname helps us remember that cattle prefer the native grasses, but it is a little misleading. Just as people like ice cream the cattle like the ice cream grasses, but unlike real ice cream, which is junk food, the ice cream grasses were some of the most nutritious food for the cattle.

The problem is that cattle that are kept within fences search the same area over and over, always choosing what to eat and what not to eat. As a consequence, they tend to "weed" the good grasses from the land, leaving only the plants that they do not like to grow in the place of the ones they like. The plants that they bite over and over die out. This is what is meant by overgrazing. The plants are grazed more than they can stand. If this is allowed to continue, the plants that cattle like to eat get eliminated. Then the pastures become filled with plants that cattle will not eat such as thorny trees, poisonous weeds, non-native plants, and other plants that are not good for cattle. Over a period of time, many pastures became useless for raising cattle. Many of these old pastures have been abandoned. The prairie is gone and the cattle are too.

Today the most thoughtful ranchers work very hard to learn ways to manage their cattle so that the cattle grow but do not destroy their favorite plants. Some ranchers have even found ways to cause cattle to help the native grasses return to fields where they had formerly grown.

**Prairie Agriculture (SECTION 4)**

Early Europeans explorers assumed the prairie lands were as useless as deserts because nothing grew there but grass. It did not take the settlers too long to realize, however, that the prairies were incredibly fertile; the soil was rich in nutrients. The prairie ecosystem had built one of the most fertile soils west of the Mississippi River. At first there were no plows that could cut through the tough root networks of the perennial grasses, but eventually plows that could cut the prairie sod were invented, settlers began to farm the rich prairie soil, and agriculture boomed. However, to farm an area, people have to remove the native vegetation and plow fields, so the farming destroyed the prairie ecosystem.

Farmers plowed the land, clearing the fields of the native tall grasses. They planted their crops, and grew as much as the land could grow. The nutrients of the soil were lost due to erosion that occurred when strong storms dropped heavy rain on bare soil, and when strong winds blew soil away. (During the Dust Bowl, prairie soil landed on ships in the Atlantic Ocean! Today eroding Chinese soil can sometimes be detected on satellite photos – blowing all the way across the Pacific Ocean to North America.) Such erosion did not occur when the native prairie perennials were present. Their thick deep roots held the soil. Rather than eroding away, the prairie soil

accumulated when the prairie ecosystem was intact. Unfortunately, farming not only led to the destruction of the native plants, but also did terrible damage to prairie soil. Eventually many farms were abandoned because the soil fertility was destroyed. Many of these lands were converted to pasture, but most of these pastures have not fared much better. Farmers are aware of the hazards of erosion. Farmers do not wish for their fields to erode. Some farmers work very hard to minimize erosion from occurring on their fields, and others work with agricultural researchers to try to develop farming techniques that prevent erosion.

**Consequence of Prairie Loss (All Students)**

Four major consequences have resulted from the destruction of the prairie and its native tall grasses. First, native species were lost. The tall grasses all but disappeared, as did many of the animals and other organisms that depended upon the grasses.

Second, the loss of prairies also resulted in less forage for cattle. The tall grasses are rare or gone from most ranches. In many cases they have been replaced by non-native grasses or by plants that cattle will not eat. When this situation occurs, it becomes difficult for ranchers to make a profit.

Third, less water is available for plants and streams. Prairies normally held rainwater when it fell. Some experts think the tallgrass prairie on flat ground could hold six inches of water before any ran off. The water that was held slowly percolated into the ground, where it replenished the groundwater and watered the deep roots of the perennial plants. This groundwater was then slowly released to streams, thereby keeping streams flowing most or all of the time. With the prairie plants gone, the rainwater runs off much more rapidly. As a result flash floods are worse, the groundwater is not replenished, and streams get too much water during rains and too little between rains. Because the water runs off the ground rather than soaking in, it is almost as if there is a drought even when it rains. Even though it rains, little rainwater soaks into the soil where it can be used by the plants.

Lastly, the running water also causes soil erosion. The tall grasses have thick deep roots, but many of their replacements are annual grasses with very short roots. The roots of annual grasses are less effective at holding the soil, so when water runs over the ground soil erodes away. As the prairies have disappeared, water has washed the soil into rivers and streams, and then to reservoirs or to the Gulf of Mexico. The soil in reservoirs takes the place of water, reducing the amount of water that the reservoirs can hold. The same material that was valuable as soil becomes a pollutant in reservoirs and in the Gulf of Mexico, where it causes the oxygen in the water to be used up and can leave the water unsuitable for fish. These are gradual processes, but the problem gets worse day after day as long as the problem is allowed to continue, but there is still time to solve the problem here. Archaeologists have determined that many other lands around the world have been ruined by gradual erosion that eventually destroyed the ability of the soil to grow plants.

**Restoration Techniques (All Students)**

People are learning how to restore prairies. The first prairie restoration project was begun in Wisconsin a few decades ago. A lot has been learned from that project and others, but lots more remains to be learned.

At the Sneed property Austin College faculty and students are experimenting with a variety of restoration techniques. These include:

- very carefully managed fires (always with firefighters and a fire engine present)
- controlled grazing by cattle (attempting to imitate some of the beneficial effects of bison)
- mowing (attempting to imitate some of the other beneficial effects of bison), and
- planting seeds of species that are native to the area but have been lost from the site.

Fires are used to kill small trees and enable grasses to flourish. Grasses actually grow better after early spring fires. Fires remove the past year's dead grass leaves and allow more sunlight to reach the ground. This allows the native perennial grasses to start growing earlier in the spring than they would if there had not been a fire. Fire also keeps small trees from surviving and growing on the open fields.

We use electric fences to keep cattle in small areas for short periods of time, then move them to a new field. We are trying to imitate the brief grazing pattern of the bison. However, we cannot keep cattle as closely packed as bison were in a herd, so we are not sure if this procedure will work.

We also mow fields because mowing cuts all of the plants. Grasses grow back from mowing but small trees cannot survive repeated mowing. We do not mow the grass as short as a lawn, but instead mow it down to about a foot tall so it can continue growing easily, and we only mow about once a year. The mowing is intended to be similar to the effect of grazing by a large herd of closely-packed bison.

Because some important native grasses and wildflowers are no longer present at the Sneed property, we purchase seeds and plant them with a special seed "drill." The seed drill, which is towed behind a tractor, plants the seeds among the existing vegetation (without plowing). This allows us to return the seeds without risking the erosion that would occur if we plowed the fields, and without killing any valuable plants that are already present. Schoolchildren who visit the site also have a chance to plant a few seeds and stomp them into the ground. This may not seem like the best procedure, but it is the natural method of seed planting. Seeds fell or blew from the plants and then were trampled by bison. The challenge is for children to stomp as hard as a big bison.

Because we are not sure which techniques will work best, we use these techniques in various combinations and study the results.

These are just a few things that researchers are doing in an effort to restore prairies. As scientists continue to study prairie restoration, new ideas and information will lead to better techniques to restore the prairies.

# Appendix D – Cause and Effect Worksheet

**Directions: List four causes and four effects of prairie destruction. List one fact that you learned about each cause and effect.**

**Cause 1:** _____

**Fact:** _____

**Cause 2:** _____

**Fact:** _____

**Cause 3:** _____

**Fact:** _____

**Cause 4:** _____

**Fact:** _____

**Effect 1:** _____

**Fact:** _____

**Effect 2:** _____

**Fact:** _____

**Effect 3:** _____

**Fact:** _____

**Effect 4:** _____

**Fact:** _____

**Appendix E - Prairie Jeopardy Game Board**

| Prairie Plants | Prairie Grazers | Prairie Restoration | Soil and Water | Potpourri |
|---|---|---|---|---|
| $100 | $100 | $100 | $100 | $100 |
| $200 | $200 | $200 | $200 | $200 |
| $300 | $300 | $300 | $300 | $300 |
| $400 | $400 | $400 | $400 | $400 |
| $500 | $500 | $500 | $500 | $500 |

# Appendix F - Jeopardy Questions

**Prairie Plants**

| | | |
|---|---|---|
| $100 | These types of grasses have very short roots and do not hold soil well. | ANNUALS |
| $200 | Much of the prairie was plowed to grow this plant, which is used for making clothes. | COTTON |
| $300 | This is a category of plants that live for several years. | PERENNIAL |
| $400 | In the past, these types of plants were very rare on the prairie. | TREES |
| $500 | Name three of the four major tallgrasses of the Blackland Prairie. | LITTLE BLUESTEM, BIG BLUESTEM, INDIANGRASS, SWITCHGRASS |

**Prairie Grazers**

| | | |
|---|---|---|
| $100 | Huge bison herds did not overgraze the prairie because they did this. | MIGRATED or MOVED ON |
| $200 | Cattle that are kept in one field for a long time cause their favorite food plants to become this. | OVERGRAZED or LOST FROM THE FIELD |
| $300 | This is the amount of bison that were on the North American prairie 200 years ago. | MILLIONS |
| $400 | Some of the most nutritious foods for cattle are these. | NATIVE or PERENNIAL TALLGRASSES (names of grasses are okay) |
| $500 | Bison lived in herds because they were hunted by these. | WOLVES or NATIVE AMERICANS |

**Prairie Restoration**

| | | |
|---|---|---|
| $100 | This process is very useful in prairie restoration but it is also very dangerous unless it is done by trained professionals. | BURNING |
| $200 | Management of these animals is an important technique in prairie restoration. | CATTLE |
| $300 | Doing this to fields can bring back grass species that are rare or no longer present. | SEEDING |
| $400 | This tool, when towed by a tractor, imitates some of the effects of a migrating bison herd. | MOWER or SHREDDER |
| $500 | Scientists run these things to see which techniques work best to restore prairies. | EXPERIMENTS |

Appendix F - Jeopardy Questions (continued)

**Soil and water**

| | | |
|---|---|---|
| $100 | Because prairie grasses capture and hold rainwater, these are not as severe when prairies are intact. | FLOODS |
| $200 | These structures that hold water for people to use are slowly filling up with mud and sediment. | RESERVOIRS |
| $300 | The rainwater device at the Sneed site showed that lots of runoff can do this to the soil. | ERODE |
| $400 | If rainwater runs off the ground rather than sinking in it does not replenish this. | GROUNDWATER or AQUIFER |
| $500 | When rain falls on bare soil, the raindrops break big particles into small ones that fill these spaces in the soil so that this happens. | WATER CANNOT SINK IN or WATER RUNS OFF |

**Potpourri**

| | | |
|---|---|---|
| $100 | Ranchers used this nickname for the native grasses that are the favorite foods of cattle. | ICE CREAM GRASSES |
| $200 | In the past, the Sneed farm was used to raise or grow many things. Name two of them. | ALFALFA, WHEAT, OATS, DAIRY CATTLE, BEEF CATTLE |
| $300 | Who meant to destroy the Blackland Prairie | NO ONE |
| $400 | This percent of Texas Blackland Prairie remains. | LESS THAN ONE PERCENT |
| $500 | Who can help the Blackland Prairie recover? | ANY OF THE FOLLOWING: RANCHERS, SCIENTISTS, STUDENTS, TEACHERS, OR ANYONE ELSE INTERESTED. |

**FINAL JEOPARDY: Students choose an amount to wager before the teacher reveals this question. Each team writes down its answers before the correct answers are revealed.**

List three benefits of prairie restoration.

1. Conservation of native species.
2. Better food for cattle.
3. Less soil erosion.
4. Replenishment of groundwater.
5. Less mud in reservoirs.
6. Less flash flooding.

# Appendix G - Student Worksheet

| | |
|---|---|
| **Why is there so little prairie land left?** | **Why are prairies important? Think about this and list several benefits of restoring prairies.** |
| **What are some steps we can take to preserve or restore prairies?** | **Why do you think it is important to learn about prairie restoration?** |

# Grade 4 TEKS Science Objectives Covered in Lessons

| | | The student is expected to: |
|---|---|---|
| (4.1) | Scientific processes. The student conducts field and laboratory investigations following home and school safety procedures, and environmentally appropriate and ethical practices. | (A) demonstrate safe practices during field and lab investigations; and<br><br>(B) make wise choices in the use and conservation of resources and the disposal or recycling of materials. |
| (4.2) | (Scientific processes. The student uses scientific inquiry methods during field and laboratory investigations. | (B) collect information by observing and measuring. |
| (4.3) | Scientific processes. The student uses critical thinking and scientific problem solving to make informed decisions. | (D) evaluate the impact of research on scientific thought, society, and the environment. |
| (4.5) | Scientific concepts. The student knows that complex systems may not work if some parts are removed. | (A) identify and describe the roles of some organisms in living systems such as plants in a schoolyard, and parts in nonliving systems such as a light bulb in a circuit; and<br><br>(B) predict and draw conclusions about what happens when part of a system is removed. |
| (4.6) | Scientific concepts. The student knows that change can create recognizable patterns. | (A) identify patterns of change such as in weather, metamorphosis, and objects in the sky. |
| (4.8) | Scientific concepts. The student knows that adaptations may increase the survival of members of a species. | (A) identify characteristics that allow members within a species to survive and reproduce; and<br><br>(B) compare adaptive characteristics of various species; and<br><br>(C) identify the kinds of species that lived in the past and compare them to existing species. |
| (4.10) | Scientific concepts. The student knows that certain past events affect present and future events. | (A) identify and observe effects of events that require time for changes to be noticeable including growth, erosion, dissolving, weathering, and flow. |
| (4.11) | Scientific concepts. The student knows that the natural world includes earth materials and objects in the sky. | (A) test properties of soils, including texture, capacity to retain water, and ability to support life. |