General Background on the Blackland Prairie for Teachers

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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 the native Blackland Prairie of North and Central Texas: a video, classroom lessons, and a field trip program at a prairie restoration site. This document complements both the video *The Blackland Prairie: Past, Present and Future* and the field trip. We suggest that you show the class the video before taking the students on a field trip to the prairie restoration.

If you lack a copy of the video, please contact Dr. Peter Schulze at pschulze@austincollege.edu.

The field trips are targeted for fourth graders, but the lessons can be modified to accommodate lower or higher grade levels.

"General Background on the Blackland Prairie for Teachers" is intended to provide enough information to make teachers comfortable with the material.

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 Dr. Peter Schulze if you would like to schedule a field trip to Austin College's Sneed Prairie Restoration (pshulze@austincollege.edu, 903-813-2284).

Teachers with any questions should not hesitate to contact Dr. Schulze. We wish to make this material as useful and user friendly as possible, and would be pleased to hear of any questions or suggestions for improvements.

Thank you for your interest in this project.

General Background on the Blackland Prairie for Teachers

This information parallels the narration of the video, The Blackland Prairie: Past, Present, and Future. 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 others smaller creatures, grazers such as elk and pronghorns, 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 important 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, and 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 grass species dominated much of the Blackland Prairie: switchgrass, Indiangrass, 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 the ground. These root systems allow the plants to survive long periods without rain. Their ability to reach water deep in the soil enabled the native grasses to grow through the dry summers and provided a great food supply for the millions of bison and other 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 them 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 any little trees that sprouted on the prairie. Though fire kills little trees, grasses and wildflowers can grow right back after a fire.

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 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 don't appear to have done any lasting damage to the plants or the soil. They hunted and set fires, but they didn't destroy the vegetation. Real damage to the plants and the soil did not begin until new settlers began arriving during the 19th century.

The first major impact of settlers was the destruction of the bison. After the Civil War the railroads reached the plains, which made it easy to ship heavy bison hides to eastern tanneries. The leather was used in machinery, for bookbinding's 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 16 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, though, 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 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 ruined.

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 often overgraze the 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 don't 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. Scenes like these are common all over the North Texas area – pastures that have become so filled with trees that in many cases little grass remains. Not only is the native prairie lost, but such places are not 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 a 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 the entire 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, pronghorns, 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 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 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 up, and the restoration of Blackland vegetation on 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.

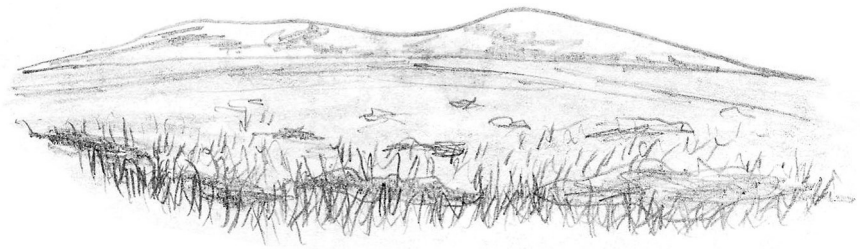
Preserves provide a place for remaining native populations to hang on. Preserves help scientists and land managers understand the functioning of the prairie ecosystem, and preserves serve as a source of seeds for efforts to restore native species elsewhere.

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.



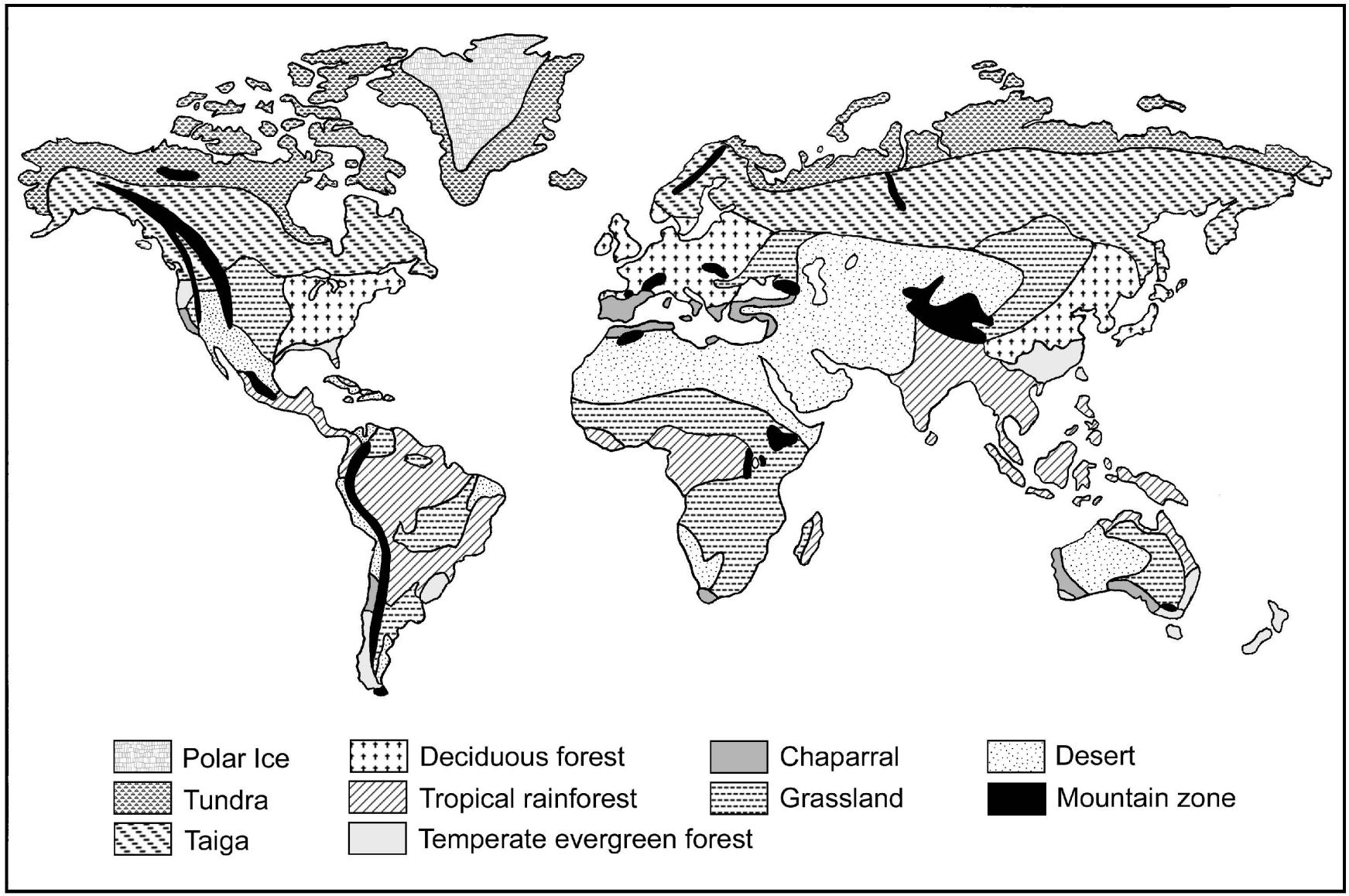


Figure 1. Biomes of the World

Adapted from Biology, Raven, Peter H., and Johnson, George B., 2002 (6th Edition), with permission by McGraw-Hill, publisher

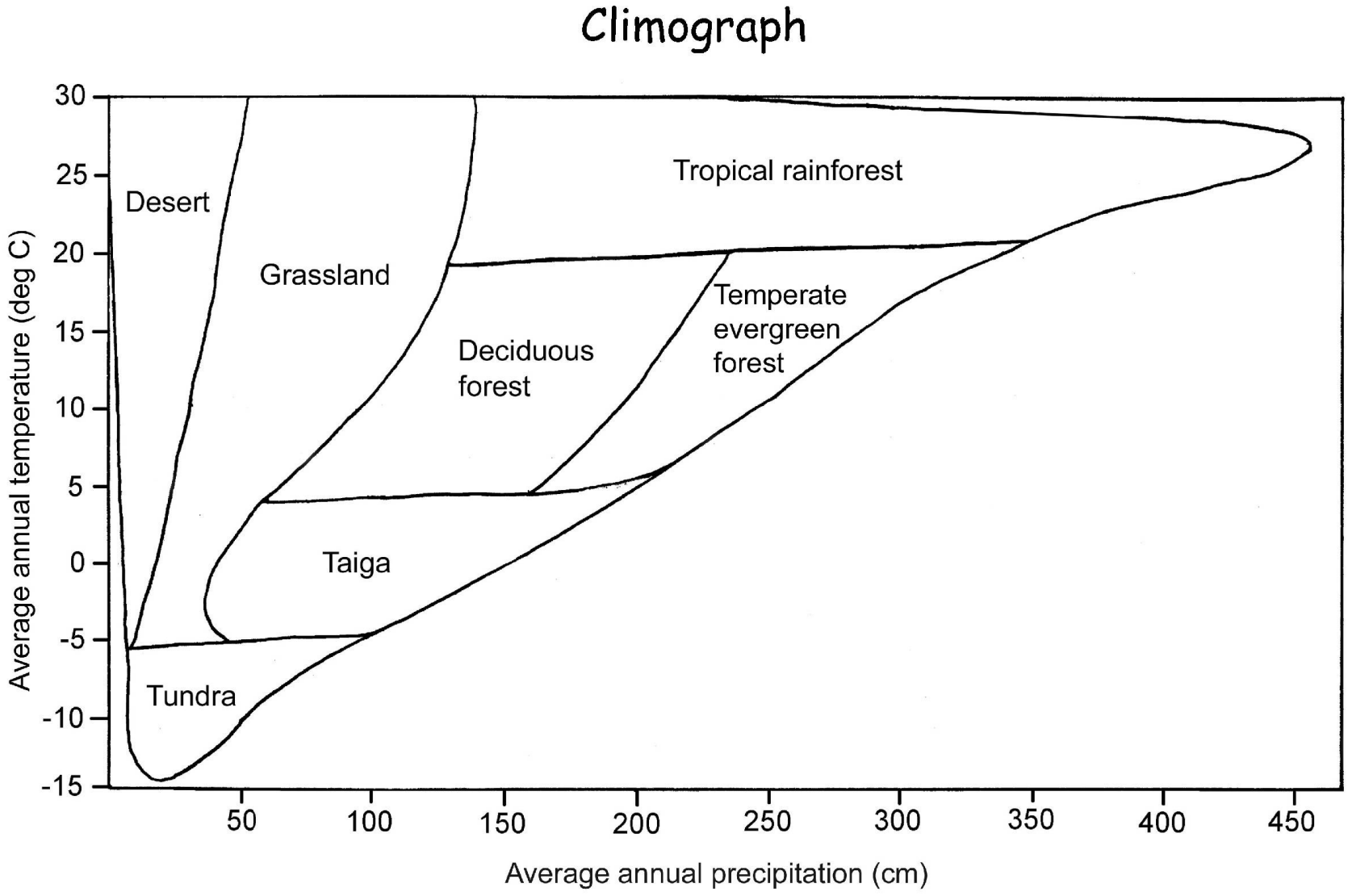


Figure 2. Climograph

Adapted from Biology, Raven, Peter H., and Johnson, George B., 2002 (6th Edition), with permission by McGraw-Hill, publisher

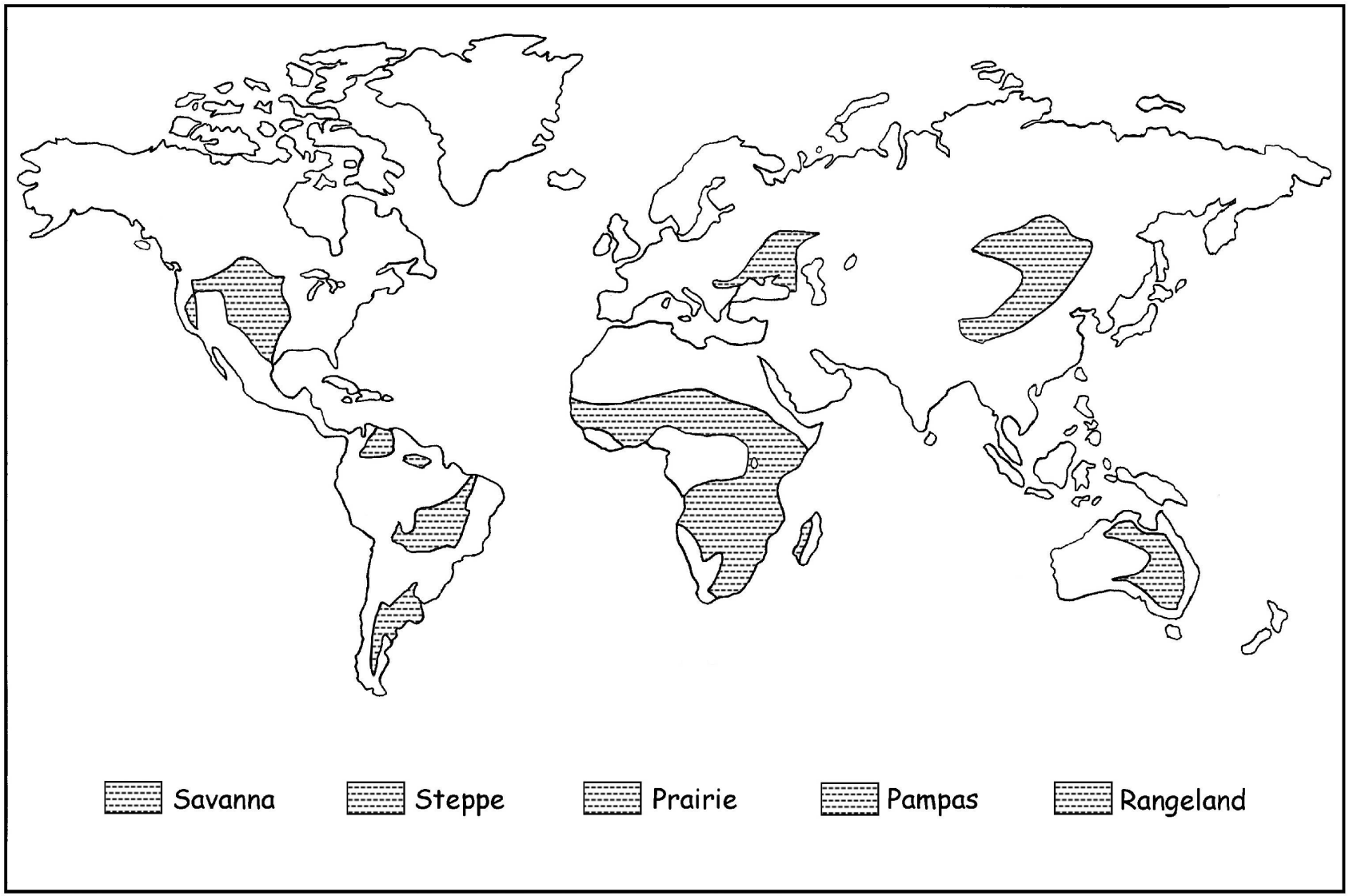


Figure 3. Grasslands of the World

Adapted from Biology, Raven, Peter H., and Johnson, George B., 2002 (6th Edition), with permission by McGraw-Hill, publisher

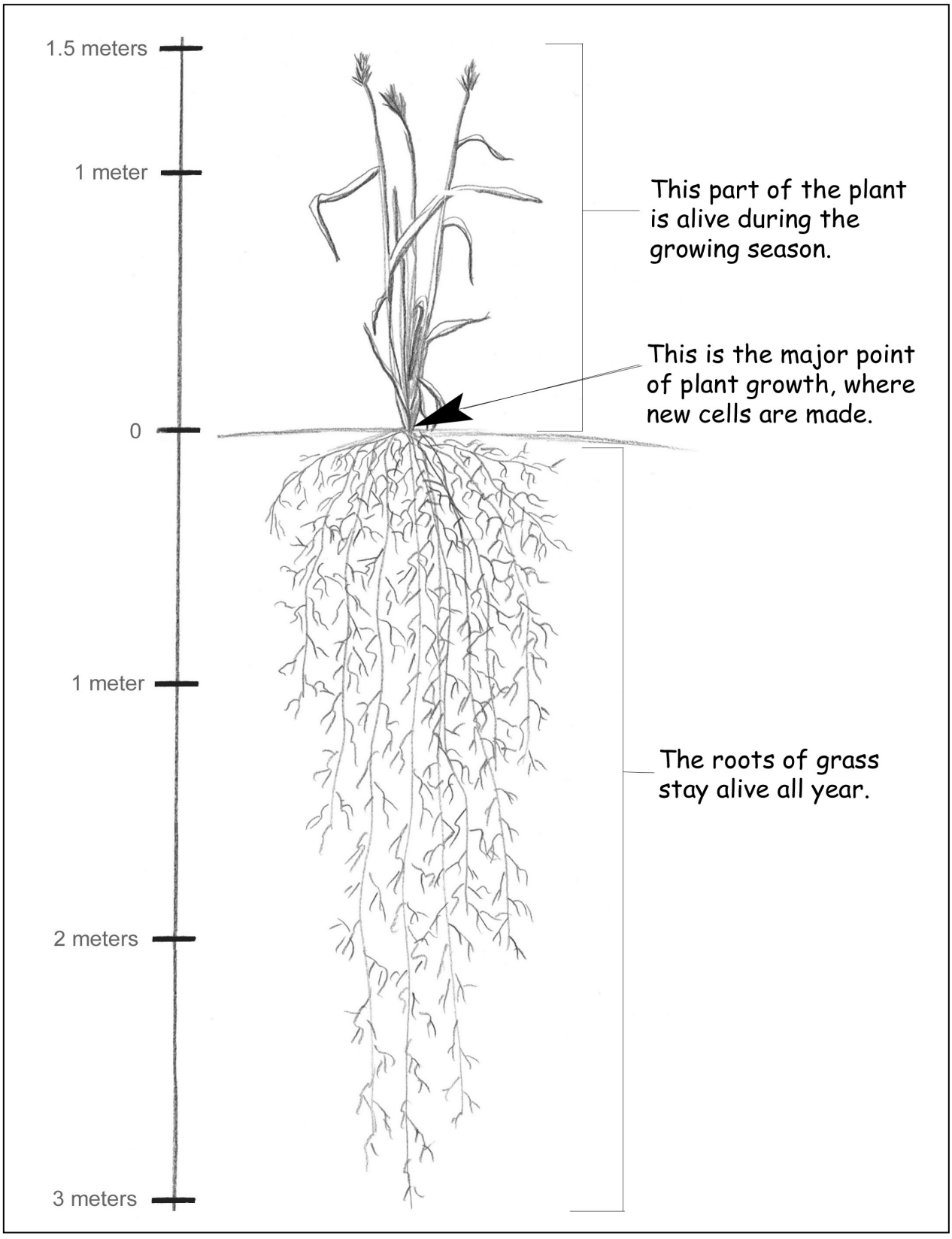


Figure 4. Native Grass Roots

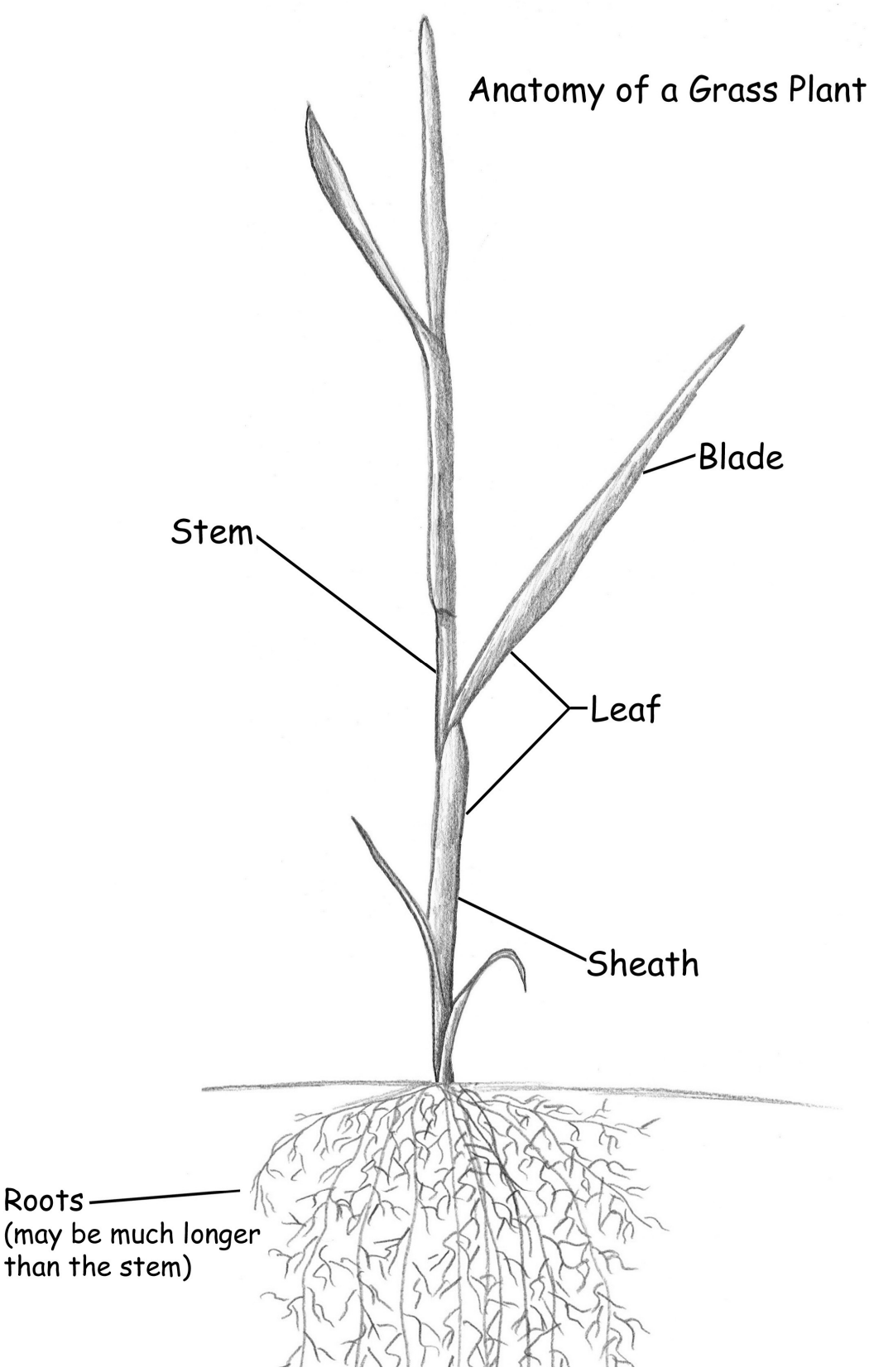


Figure 5. Anatomy of a Grass Plant

Prairie Topics

FIRES

Fires are natural features of grasslands. Blackland Prairie fires had flames raging more than fifty feet into the air, and they traveled as quickly as the wind, perhaps as fast as fifty miles per hour! Prairie fires are thought to have burned until they reached a large river. Prairie fires killed young trees, which is the primary reason why groves of trees were so rare on the Blackland Prairie. Unlike trees, the native perennial tall grasses are well adapted to being burned. Fire can even stimulate the growth of these native grasses, which grow back quickly from their roots following a fire.

When settlers came to the prairies, plowed fields and roads began to stop the spread of prairie fires.-In the past only large rivers could stop major prairie fires. With the arrival of settlers, fires no longer burned huge areas of prairie. Trees became more common, and the shade they created began to kill the native prairie grasses and wildflowers. This process continues to this day in many of the areas of the former Blackland Prairie (such as Grayson County, TX).

Biologists now use intentional fires to simulate the natural prairie fires of the past. These burns are carefully planned but can still be dangerous. At the Austin College Sneed Prairie, the people managing the fires are highly trained, use specialized fire control equipment, and always have actual-firemen and a fire truck standing by just in case a fire escapes from the intended area.

EROSION

Erosion is the process by which the surface of the earth is worn away by the action of water or wind. Erosion can be slow or fast, depending upon the force and the type of material upon which it is acting. As soil erodes away the land becomes less fertile. In addition, soil that is a resource when it is in place becomes a water or air pollutant when it erodes away. The Dust Bowl in the 1930s was an extreme case of wind-driven erosion. Muddy streams that occur with every substantial rainstorm in our area are examples of water-driven erosion. Destruction of soil fertility due to erosion and associated declines in fertility due to agricultural practices is a key reason that Blackland Prairie farms were abandoned or converted to pasture during the middle of the 20^{th} century.

Erosion is a problem that is as old as agriculture. Plato wrote about severe erosion in Greece four thousand years ago. Still today soil is lost faster than it forms, a situation that is obviously not sustainable. As unbelievable as it sounds, a recent calculation by Dr. Marty Bender at The Land Institute (based on U.S. Department of Agriculture data) found that 2.5 tons of soil are lost to erosion for every ton of grain or hay harvested in the United States.

SOIL

Soil is a product of the interaction of rock, the climate and organisms. The basis of soil formation is rock. Rock becomes worn away into small particles due to the action of natural forces such as glaciers, ice, windblown sand and weak acids formed by the decomposition of dead remains of organisms. Fertile soil contains organic matter, decaying bits of plant roots and other organisms.

Soil is important because **almost all plants require soil to grow**. It holds plants up and provides a source of water and minerals. Many animals live in the soil, such as insects, earthworms, and burrowing mammals and birds. Microscopic organisms such as bacteria and fungi also live in the soil and play an important role in nutrient cycling.

Sandy soils feel gritty because sand particles are large (compared to other soil particles). Water drains through sandy soil rapidly, and therefore sandy soils can become very dry during droughts. In Grayson County, Texas, oak woodlands historically grew on sandy soils. Because the roots can easily penetrate through the soil, sandy soils are often good for growing root crops such as carrots and potatoes.
Clay soils feel smooth or slick because clay is composed of very fine particles. The fine particles hold water well. During droughts clay soils do not get as dry as sandy soils. Clay soils are also often fertile. The chemistry of the clay particles enables them to hold onto key nutrients that are needed by plants. The same nutrients tend to leach out of sandy soils (wash to deeper levels with sinking water). Clay soils often swell when they are wet and shrink when they dry out. In extreme cases cracks form in the soil, and building foundations become cracked as a result of soil movement.

Loam refers to soil that contains a mixture of sand, clay, silt (mineral particles of intermediate size), and organic matter. Loam is ideal for most gardening and farming.

Soil texture provides a clue to the type of soil. Sandy soil feels gritty. Clay soil feels smooth and sticky, and can easily be formed into a ball.

Color is an indicator of some soil properties. Soil color can range from very light tan to almost black. The Blackland Prairie got its name from the color of the soil, which was almost jet black. Early western settlers called it “black gumbo” because it was so dark and clay made it so sticky. Red soil usually contains a lot of iron. White soil usually has a lot of calcium. Dark brown soil usually contains a lot of organic matter.

Prairie Grasses

The Blackland Prairie was an area of exceptionally fertile soil that supported vast expanses of grasses and wildflowers. Four major species of grasses dominated this area: switchgrass, Indiangrass, big bluestem and little bluestem. These grasses provided excellent forage for grazing animals. They supported herds of bison that often numbered in the thousands. The rich grasslands also supported a wealth of other large animals including pronghorns, river otters, ringtails, wolves, badgers, black bears, mountain lions and even jaguars.

Though the Blackland Prairie was rich with grasses, there were very few trees. The huge herds of bison killed saplings by trampling on them, and prairie fires killed the tree stems before the trees were large enough to survive fires. In fact, trees were so rare that travelers often used stands of trees as important landmarks when traveling through the prairie.

Most of the Blackland Prairie was destroyed during the last 150 years. The bison were hunted almost to extinction, prairies were plowed up to plant cotton, and pastures were often overgrazed by cattle. As fields were plowed fires became rare. More recently, urbanization has added to the list of processes that have destroyed the Blackland Prairie. As a result, less than 1% of the Texas Blackland Prairie remains.

The loss of the Blackland Prairie led to a great loss of native organisms; most of the animals listed above no longer occur in this region. Also, the loss of native grasses with their deep roots has led to an increase in runoff and erosion when it rains. The runoff carries the rich, valuable

topsoil into rivers and reservoirs, where the settling mud reduces the water storage capacity of the reservoirs. Meanwhile, as more water runs off, less seeps down to replenish the groundwater. Finally, the native grasses have been replaced with grazing-resistant species that make poor forage for cattle.

Processes that Destroyed the Prairie

Two hundred years ago, the Blackland Prairie was almost completely covered by tall grasses and wildflowers; few trees grew on the prairie. Herds of bison, often numbering in the tens of thousands, roamed the area, eating the lush grasses. Huge prairie fires routinely swept across the land, burning until they reached a large river. The grazing bison and prairie fires stimulated the growth of the tall grasses and prevented invasion of the prairie by trees. When settlers came to the area, they caused many changes that led to the destruction of the prairies.

Slaughter of the Bison

When the settlers came west, the number of bison on the prairies astounded them. Huge herds of bison migrated across the prairies. The herds grazed intensively and then moved on to find more food. The native plants are adapted to intense but occasional grazing.

The bison were very attractive to hunters. The settlers began to hunt bison for their hides. More and more hunters flooded the prairies. In just a few decades tens of millions of bison were reduced to a few hundred individuals at the end of the 19th century.

Plowing of the Prairie for Agriculture

Early settlers called the prairie the Great American Desert but it did not take long to realize that some prairie soils were incredibly fertile, that the soil was rich with nutrients. With the invention of plows that could break the prairie sod, settlers began to plow up the prairies to grow crops. Farming an area has a cost, though; people have to remove the native vegetation and plow fields for their crops. Plowing destroyed almost the entire prairie.

The fertility of the soil was depleted by the erosion that occurred on plowed fields. Native tall grasses grew masses of deep roots that held the soil and enabled rain to be absorbed into the ground. When the native grasses were cleared, heavy rains washed a great deal of the valuable top soil into rivers and streams because crops do not have roots that hold soil well. Farming not only led to the destruction of the native plants, but also did terrible damage to prairie soil. During the drought of the 1950s many farms were abandoned.

Overgrazing of Plants by Cattle

The lush grasses of the prairies attracted cattle ranchers to Texas, but once plows were invented, most of the Blackland Prairie was plowed for row crop agriculture. After farms were abandoned many were converted to pastures. Unlike the free-roaming herds of bison, most cattle have been confined in fenced pastures where they returned to graze on the same plants over and over. This tended to eliminate the nutritious, native perennial grasses and resulted in pastures filled with plants that cattle would not eat, such as thorny trees, cedar trees and poisonous weeds. Many ranchers had to begin buying hay from other places because their land could no longer support their cattle. Other ranchers began to plant non-native grasses that grew quickly; however, these grasses were more reliant on chemical fertilizers and did not have the extensive root system to protect the plant against drought. So while bringing cattle onto the prairie did not actually destroy the prairie (this was done by plowing it for crops), overgrazing of cattle can hurt the native grasses, and hinder prairie recovery in fields that had once been plowed.

Lack of Fire
Prairie grasses were well adapted to fires. The flames of prairie fires reached fifty feet into the air, and they traveled as fast as the wind, up to fifty miles per hour. These fires would burn from one river to another, burning grasses, wildflowers and other plants. Prairie fires killed young trees, too, which explains why groves of trees were so rare on the prairie. Prairie fires did not impede the growth of native tall grasses though, which grew back quickly after being burned.

As new settlers plowed up the prairies, the plowed fields stopped fires. Meanwhile, the settlers began fighting fires to protect property. As a result, fires became rare. No longer did fires burn huge areas of prairie, stimulating grass growth and killing young trees. As a result trees became much more common, and grasses began to die in the shade of the trees.

Construction of Cities, Towns and Roads
During the 20th and early 21st century there has been a tremendous increase in the number of people who live in the area once covered by Blackland Prairie. With population growth comes construction of buildings, lawns, roads, parking lots, etc. This urbanization has now covered a substantial fraction of the Blackland Prairie region. With each new house or road that is constructed, less land is available for native plants and other species.

Summary
The prairie was and continues to be destroyed by several factors including the slaughter of bison, plowing, overgrazing, lack of fire, and urbanization. As a result, less than 1% of the Texas Blackland Prairie remains to this day.

Restoring prairies **provides native species of plants a place to live**. Many of these species disappear from the areas that are farmed or used for grazing.

Restoring prairies also **improves the forage** for cattle. Many of the ranches on which cattle graze have become overgrown with trees and plants that cattle will not eat. If the prairie is restored, native grasses will provide an abundant, nutritious food source for cattle.

Prairies play an important role in **water conservation**, too. Many prairie grasses are perennial, meaning they grow year after year. They have very deep and extensive root systems. During times of drought, these roots draw water from deep underground, allowing the grasses to survive. In addition, prairie grasses help water soak into the ground, which resupplies groundwater and reduces flash flooding.

The **prevention of soil erosion** by prairie grasses is also very important. The deep roots of the prairie grasses hold the soil and prevent erosion. When heavy rains dump tremendous amounts of water in an area, the grasses hold onto the dirt and help the soil absorb the water. This prevents erosion, which is a major problem because it destroys soil fertility and causes reservoirs to gradually fill with mud. If area reservoirs become filled with mud and other sediments, they become less useful for storing water.

Restoring the prairie is easier said than done. Scientists are conducting experiments to see which restoration techniques work best. There are several things that can be done to help restore prairies. **Prescribed fires** can be set to burn small trees and other unwanted plants. These fires also stimulate the growth of native grasses, helping them regain footholds in fields.

Some prairie lands have very few or no native plants remaining at all. These prairie lands are difficult to restore, because the native grasses just are not there. In these cases, fields are **seeded** with the missing species. Unfortunately, the necessary conditions for seed germination are not particularly well understood, and seeding is not always successful.

Cattle can also be a useful tool in restoring prairies. Proper management techniques can prevent overgrazing and cause cattle to have some of the beneficial effects of bison on the health of the tallgrass prairies. This often involves confining the cattle to particular areas. However, in these cases a lot of thought goes into just how long to let the cattle stay in one area before moving them to another location.

Mowing has also become a tool used to restore the prairie grasses. By cutting all of the plants, grasses, wildflowers and small trees, mowing has some of the same effects as a herd of trampling, grazing bison. In fact, many of the best remaining patches of Blackland Prairie are private lands that have been uses as hay meadows for decades (never plowed, used to grow crops, or overgrazed).

Restoration Information

Restoring the prairie is easier said than done. Scientists are conducting experiments to see which restoration techniques work best. There are several things that can be done to help restore prairies. **Prescribed fires** can be set to burn small trees and other unwanted plants. These fires burn the growing tissue in trees and shrubs, killing them or slowing their growth. However, the growth tissue in native tall grasses is so low in the stem that fire does not hurt it; native perennial tall grasses can grow back quickly while woody plants do not.

Some areas have few or no native plants at all. In these cases, fields are **seeded** - this means that native grass seeds are planted in the ground to try to reintroduce them into the area. This is more difficult than it sounds, because native tallgrass seeds require particular conditions for germination and successful growth. Seeding must be done at the proper time and in the proper conditions for it to be successful.

Depending on how they are managed, **cattle** can be a helpful tool in restoring prairies. Proper management techniques can simulate the effects of grazing bison, helping restore native grasses to the prairie. This is similar to the effect that fires have on a prairie. Cattle convert grass and wildflowers into manure which can increase the fertility of the soil. Their hooves can break up dead plant matter and help water penetrate into the soil. In addition, dung beetles and other insects are attracted to the manure, which then attracts birds that eat insects.

Mowing cuts down small plants and shrubs that are not native to the prairie fields, and mowing can stimulate native grass growth. These mowers (or shredders) are pulled across the fields by tractors. This helps native grasses compete against the non-native plants in a prairie environment. Some of the best examples of remaining Blackland Prairie are fields that have been mowed for hay each year for decades.

Suggested books for students:

The Prairie Ecosystem

Books

- Johnson, R. 2000. *A Walk in the Prairie*. Lerner Publishing Group.*
- Johnson, R. 2000. *A Walk in the Boreal Forest*. Lerner Publishing Group.
- Johnson, R. 2000. *A Walk in the Deciduous Forest*. Lerner Publishing Group.
- Johnson, R. 2000. *A Walk in the Desert*. Lerner Publishing Group.
- Johnson, R. 2000. *A Walk in the Rain Forest*. Lerner Publishing Group.
- Johnson, R. 2000. *A Walk in the Tundra*. Lerner Publishing Group.

Books

- Berman, R. 1992. *American Bison*. Lerner Publishing Group*
- Schwartz, D. 1993. *How Much is a Million*. HarperCollins Publishers*
- Baker, O. 1985. *Where the Buffaloes Begin.* Penguin Putnam Books*

Soil and Erosion

Books

- Hiscock, B. 1999. *The Big Rock.* Aladdin Paperbacks*
- Silver, D. 1997. *(One Small Square) Backyard.* McGraw-Hill*

Prairie

Books

- Freedman, R. 1997. *The Buffalo Hunt.* Holiday House*
- Jeffers, S. 1993. *Brother Eagle, Sister Sky: A Message from Chief Seattle.* Penguin Group (USA)*

Prairie Restoration and Preservation

Books

- Burnie, D. 2004. *Endangered Planet*. Kingfisher Publications*

Suggested Readings for Further Background Information

Diggs, G.M. Jr., B.L. Lipscomb, and R.J. O'Kennon. 1999. *Shinners & Mahler's illustrated flora of North Central Texas.* Sida, Bot. Misc. 16.
Detailed introductory chapter on the ecology and land use history of the Blackland Prairie.

Hayward, O.T. and J.C. Yelderman. 1991. *A field guide to the Blackland Prairie of Texas, from frontier to heartland in one long century.* Program for Regional Studies, Baylor Univ., Waco, TX.
Compact, ecologically-oriented history of the Blackland Prairie

Manning, R., 1995. *Grassland: The History, Biology, Politics, and Promise of the American Prairie.* Viking Penguin.
Just what the title says. Interesting read.

Packard, S. & C. F. Mutel (editors). 1997. *The Tallgrass Restoration Handbook*. Island Press.
Also just what the title says. Intended for individuals planning a restoration.

Savory, Allan. 1999. *Holistic Management.* Island Press.
A remarkable book that focuses largely on the management of livestock but describes the issue in the context of a method for making decisions in general, whether the issue is livestock and grasslands, or for example the management of a business, or the management of a school.