Report to Game Fish and Parks

Camp Arroya Nature Trail

Camp Arroya is located on 15 acres of land on the north side of Lake Mitchell, Davison County, SD. The camp is on land owned by the city of Mitchell which the Camp Arroya Association leases from the city.

As an organization, the Camp Arroya Association is chartered to serve youth and non-profit agencies in the Davison County area. The concept of developing a nature trail is consistent with that charter and the trail is designed to serve as an educational opportunity for local schools and youth groups. Primary developers of the trail were Dr. Tim Mullican and Clarence Pederson, Camp Arroya Board Members.

Work on the trail began in the spring of 1998. Boy Scout Troop 77 of Mitchell spent one day clearing and measuring the trail in May. Throughout the summer volunteers cleared areas and studied the land to determine appropriate interpretive sites.

In early August a group of students and the Presidential Council of Dakota Wesleyan cleared the final section of the trail. They also placed the first of 15 posts to delineate the interpretive sites. During the summer, Dr. Mullican and Mr. Pederson wrote descriptions of the sites that would be interpreted.

A graphic artist and publisher were employed to create the trail head sign and create the interpretive booklet. Another Camp Arroya Board member helped Mullican and Pederson build the trail head sign frame.

The trail head sign is 6' x 8' and constructed of rough cut green treated lumber. It is designed to serve as a focal point for the trail and as an enticement for people to take a walk in the woods. The sign itself is made of cut vinyl glued to a backing board and covered with clear Plexiglas. A second layer of Plexiglas will protect the sign from vandalism and the elements. The sign is currently still being made. This is a real frustration because they promised it to us by Nov. 1 and then did not deliver it on time.

Four foot cedar, 4" x 5" posts are used to mark the interpretive sites and trail heads. Mounted on the posts are engraved brown plastic signs with white lettering.

Following this report are pictures of each of the interpretive sites and copies of the booklet.

On November 1 a grand opening of the trail was held which 35 people attended. Invitations were sent to all school principals and middle school and high school science teachers in schools within a 25 mile radius of Mitchell. Also invited were local Girl Scout, Boy Scout and Cub Scout troops, members of the City Council, Park and Recreation Board, the local conservation officer, all members of the Camp Arroya membership including: Dakota Wesleyan University, First Lutheran Church, First United Methodist Church, and other interested parties. Another open house is planned for the spring.

It is hoped that as interest in the trail develops, other groups such as teachers will see the benefits of the trail and develop other interpretive sites and possibly create an outdoor classroom setting. The interpretive site numbering system is designed to make the addition of other sites easy without having to renumber the entire system. Posts and signs can be easily moved if desired.

This trail is a wonderful addition to Camp Arroya. It will provide a great opportunity for camp users to have an educational experience and learn more about nature and the ecology of Lake Mitchell. We are grateful to the South Dakota Department of Game Fish and Parks for support of this project.

Submitted on November 20, 1998

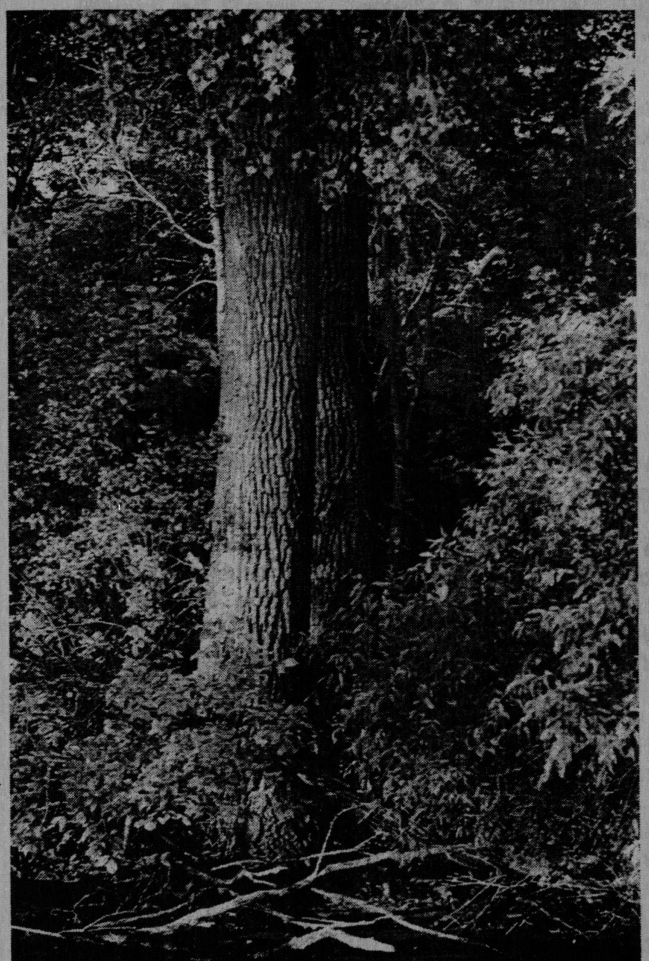
Dr. Tim Mullican

Tim Mullican

Clarence Pederson

Clarence Pederson

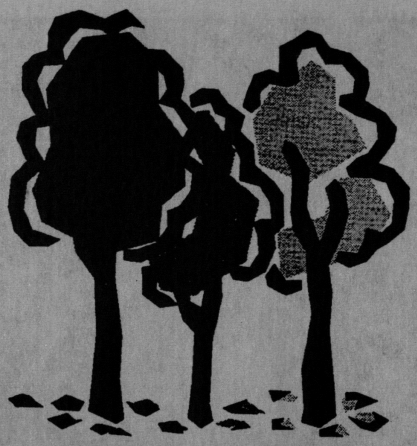
Camp Arroya Nature Trail



A guide to the Natural History and Ecology of Camp Arroya

by
Tim R. Mullican
and Clarence Pederson

Introduction



"Like winds and sunsets, wild things were taken for granted until progress began to do away with them. Now we face the question whether a still higher standard of living is worth its costs in things natural, wild and free."

Aldo Leopold
A Sand County Almanac

Welcome to the Camp Arroya Nature Trail, a place preserved wild and free for your appreciation.

As you walk the trails, you will notice that it is not completely natural, but shows the effects of the hand of man. Trees were planted in rows and terraces were built some time in the past to control erosion. But for the past several decades, the land has been allowed to revert to a wild state where the forces of nature operate with little intervention by man.

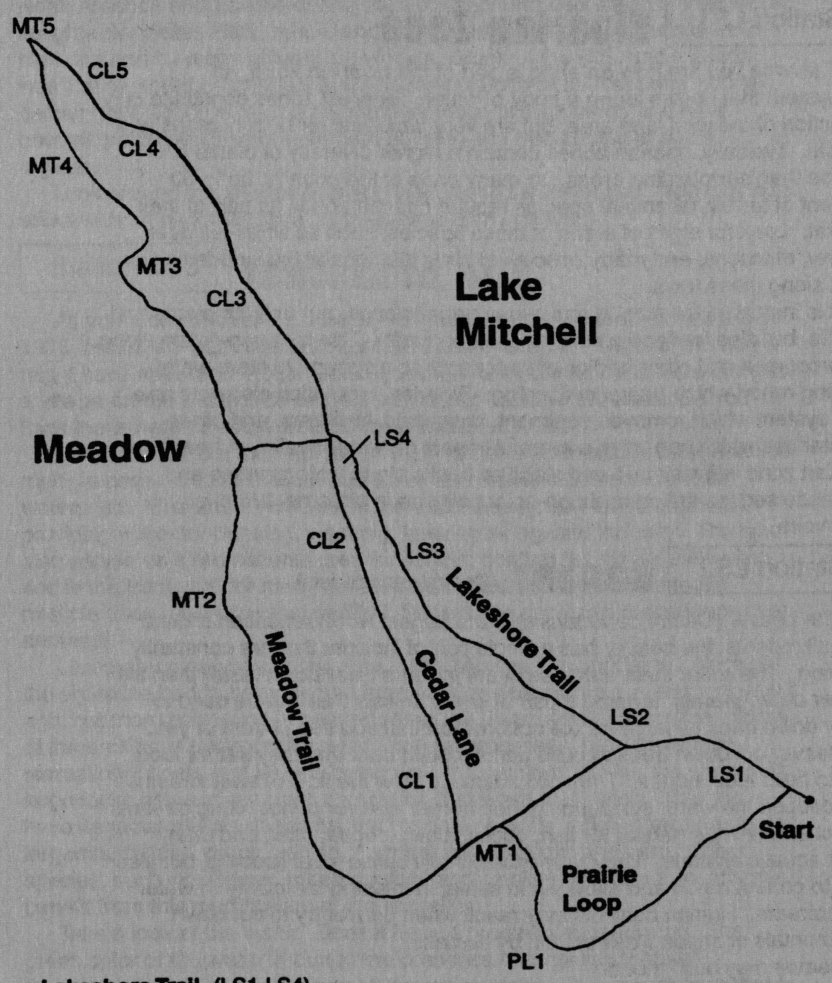
When the area was settled by European immigrants in the late 1800s, this land near the Firesteel creek was prairie with few trees and was used as farm and pasture land.

As the city of Mitchell grew, a decision was made to dam the creek and create a larger water source for the city. When the dam was built in 1929, the city purchased or acquired all the land on the lake shore. Lots were later sold for houses and other properties were set aside for public use. Since that time this area has remained largely undisturbed.

In 1933 the Girl Scouts began leasing property for Camp Arroya and in 1965 the camp was enlarged to include the area that contains these hiking trails. The Girl Scouts decided to withdraw from being the primary users of the camp in 1968 and The Camp Arroya Association was formed to manage the camp at that time.

We hope you enjoy your walk in these woods. This is a special place on Lake Mitchell and in Davison County. It is our hope that this trail and interpretive information will provide you with a place to study and appreciate the beauty of the natural world.

Map of Camp Arroya Nature Trail



Lakeshore Trail (LS1-LS4)
Riparian Zone, Beaver, Lakeshore Site, Lakeshore Prairie Remnant

Meadow Trail (MT1-MT5)
Tracks and Traces, A Symbiotic Relationship, Smooth Sumac, Pea Tree, Succession

Cedar Lane (CL1-CL5)
American Elm, Birds of Camp Arroya, Competition, Decomposers, Moss

Prairie Loop (PL1)
Plants

LAKESHORE TRAIL LS1 - LS4

Station LS1 Riparian Zone

The area you are now entering is part of the **riparian zone**, an ecosystem that occurs along a body of water. Riparian zones constitute only a fraction of the total land area, but are very important for both humans and wildlife. Typically, riparian zones contain a higher diversity of plants and wildlife than surrounding areas. In many parts of the country, up to 80 percent of terrestrial animal species require riparian zones as part of their habitat. Look for signs of some of these species, such as white-tail deer, beaver, raccoons, and many species of birds that inhabit the woods as you walk along these trails.

It is important for man to conserve riparian zones, not only for plants and wildlife, but also for flood control and water quality. The lush vegetation along watercourses and other bodies of water acts as a sponge to store water, slowing runoff which prevents flooding. Riparian vegetation also acts as a filter system which removes sediment, chemicals, fertilizers, and other substances which can have a harmful impact on water quality. A healthy riparian zone will maintain and stabilize banks along watercourses and decrease sedimentation and non-point pollution in streams, lakes, or reservoirs.

Station LS2 Beaver (Castor canadensis)

The beaver (*Castor canadensis*) is the largest North American rodent. Like all rodents, the beaver has a single pair of incisors that are constantly growing. The softer inner surfaces of the incisors wear down faster than the harder outer enamel, forming a pair of sharp chisels that can be used to gnaw down trees as large as the cottonwood that you see in front of you.

Beaver cut down trees to build dams, obtain bark that they eat for food, and to build their lodges. They build dams to slow the flow of swift streams and deepen the water surrounding their home. Beaver ponds along streams attract and provide habitat for fish, ducks, mink, moose, otter, and many other aquatic animals. They may occasionally cause local flooding, but also help to control runoff and allow silt to settle, increasing the clarity of water downstream. Human conflicts may result when beaver try to cut down ornamentals or shade trees valued by humans.

Beaver may build mound-shaped houses called lodges along streams, lakes or ponds, or may make burrows with underwater entrances along riverbanks. The framework of the lodge is made mainly of sticks, cemented together with mud, grass, and moss. The lodge may

beaver

have one or more underwater entrances that leads to a central chamber with a floor covered with wood chips, bark, and grass.

Beaver were almost completely exterminated over most of their range in North America and Europe during the 18th and 19th centuries for their highly sought-after pelts. Hats, robes, and coats made from beaver pelts were in high demand by many affluent individuals. Much of the U.S. and Canada was first explored by trappers and traders in search of beaver pelts. Today, beaver have become re-established over much of their range and have become pests because of their dam building and tree cutting in some regions.

Look around the shoreline as you walk along the lower trail. You may see sticks without bark that have been gnawed on by beaver.

Station LS3 Lakeshore Site

As you look out over the lake, try to imagine what the area looked like in 1928, before the dam was built across Firesteel Creek. Now imagine how it might have appeared 1,000 years ago when Native Americans were living in a village on the south side of the creek about ˙ mile to the east. Do you think there were as many trees then as there are now?

Lake Mitchell is a man-made reservoir rather than a natural lake, and has multiple uses. It covers about 600 acres and drains a 500 square mile watershed. First and foremost it is the water supply for 14,000 residents, providing water for drinking, washing, lawn watering, and industry. The lake also serves as a recreational area for fishing, boating, jet skiing, swimming, and is the front yard for many homes and cabins. What effect do these multiple uses have on water quality? Should one use have precedence over another?

Like many reservoirs in this area, Lake Mitchell has problems. Much of the shoreline had to be protected from erosion with rip rap a number of years ago, but more protection is needed along the Camp Arroya shoreline. Some of the erosion is undoubtedly due to natural processes, but wakes from recreational boats and jet skis compound the problem. Lining the shore with large rocks helps to cut down on erosion that leads to siltation. This may have negative effects on the habitat of some species of fish such as crappie, largemouth bass, perch, catfish, northern pike, bluegill, and carp. Other species, such as walleye, green sunfish, and smallmouth bass may actually benefit from this modification of the shoreline.

Take a look at the water. Does it have a greenish appearance? The green color of the water is due to the presence of large numbers of Cyanobacteria, formerly known as blue-green algae. This growth is probably the result of phosphate enrichment of the lake. Runoff from feedlots and pastures along Firesteel Creek as well as fertilizer applied to lawns along Lake Mitchell adds nitrogen and phosphorus, which are nutrients that are normally in limited supply. The growth of blue-greens peaks (blooms) in July and August and then starts to die off as the water cools in October.

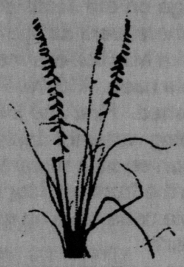
Large numbers of blue-greens are usually a sign of **eutrophication**. Eutrophication is a process of natural change leading to the filling in of a

body of water. The end result is the conversion of a lake or pond into a slough or marsh. Excessive runoff resulting from human activities can increase the amount of sediments and nutrients entering bodies of water such as Lake Mitchell. This speeds up the natural process of eutrophication, decreasing the useful life span of the reservoir. Dredging can often slow down the process, but doesn't solve the problem of excess nutrients.

The growth of photosynthetic organisms such as blue-greens adds to the productivity of the ecosystem, providing more food for fish and other aquatic organisms. However, heavy snow pack in winter can block sunlight. Without light, aquatic plants and algae cannot undergo photosynthesis which produces oxygen. Respiration, which uses oxygen, continues in these organisms. This depletes the oxygen and may result in winterkill of fish in shallow lakes. A few lakeside communities have added aerators to prevent this fish kill in the winter, but the cost is often prohibitive.

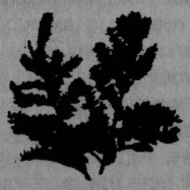
Station LS4 Lakeshore Prairie Remnant

The small meadow through which you have just walked is a tiny remnant of mixed-grass prairie. This plant association is distributed between the tallgrass prairie which is located further to the east in Iowa and Minnesota and the short-grass prairie to the west. Thus, mixed-grass prairie has a mixture of species from both types of prairie. Take a look at the grasses around this area. Do you see some species that are tall and others that are very low growing? What factors do you think restrict some species to areas further east and others to the areas west of the Missouri River?



side-oats grama

Some of the species typical of tallgrass prairie that can be seen near this site include switchgrass (*Panicum virgatum*), sandreed (*Calamovilfa longifolia*), Canadian wild rye (*Elymus canadensis*), rough gayfeather (*Liatris aspera*), and purple coneflower (*Echinacea angustifolia*). Another important tallgrass species which is not seen at this station, but can be seen along the prairie loop, is big bluestem (*Andropogon gerardii*). Big bluestem is one of the dominant species in pristine tallgrass prairie and may grow to a height of 3 to 6 feet tall. Early settlers would have often used the thick sod formed by the roots of this grass to cover the roofs of their houses.



lead plant

Some of the shorter species that can be seen at this station include side-oats grama (*Bouteloua curtipendula*), western wheatgrass (*Agropyron smithii*), lead plant (*Amorpha canescens*), and wild rose (*Rosa* sp.). Decreased precipitation apparently prevents taller species such as big bluestem from growing further to the west. However, there is considerable overlap in the

wild rose

asparagus

plant species that are found in both types of prairies.

Another species that can be seen at this station is asparagus (*Asparagus officinalis*). Asparagus is a domesticated species that frequently escapes and grows along fence rows, ditches, and other protected places. Such "wild" asparagus is sometimes harvested by people in the spring before the shoots become too tall.

MEADOW TRAIL MT1 - MT5

Station MT1 Tracks and Traces

deer tracks

raccoon tracks

Camp Arroya is the home of many mammals, both big and small. If you walk quietly, you might see white-tailed deer, fox squirrel, eastern cottontail, raccoon, beaver, thirteen-lined ground squirrel, and possibly a skunk. Although many of these animals are active only at dawn, early evening, or at night, you can still see traces of these animals if you look closely. Deer droppings are often seen in the meadows and along the shoreline of the lake where they rest. During the winter, one might see the fan-shaped wing prints of an owl that has swooped down on an unsuspecting white-footed mouse. Illustrated are some of the tracks that you might see in the fresh ground as you walk along this rutted trail. Please try to preserve any tracks that you see so that they can be enjoyed by others.

What other signs of animals can you see along this nature trail? Some animals, called **keystone species**, modify the environment so much that they completely change the ecosystem. Beaver, for example, may dam small streams and create a pond ecosystem that provides a home for many species. Wild boar, introduced in some parts of the southeastern United States, can destroy many native plants through their rooting activities as they search for food. One species, however, has modified the natural environment more than any other. As your visit to Camp Arroya ends, look in the mirror of your vehicle and you might get a glimpse of this dangerous animal which has threatened our planet through its destructive activities and overpopulation.

Station MT2 A Symbiotic Relationship

deer mouse

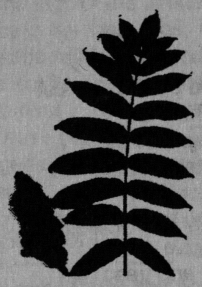
The deer mouse (*Peromyscus maniculatus*) is an inhabitant of this small patch of prairie and is probably the most widespread mammal in South Dakota. In fact, the deer mouse is the most widely distributed mammal in North America, occurring in nearly every terrestrial habitat from the Northwest Territories in Canada to Mexico. The prairie form (*Peromyscus maniculatus bairdii*) which inhabits South Dakota is an inhabitant of open areas and is usually absent from riparian areas and shelterbelts where the white-footed mouse (*Peromyscus leucopus*) is found.

Recently, the deer mouse has received considerable attention from scientists because it has been found to carry the Hantavirus, which causes a deadly, incurable, pneumonia-like illness. Hantavirus was first discovered in 1993 when several people died near the Four Corners area of the southwestern United States. Since then, it has been found to infect 10 to 35 percent of deer mice in many parts of the United States. The virus is usually acquired by humans from sweeping up dust containing infected mouse droppings in closed areas. If one of these mice is caught in a trap, the Center for Disease Control (CDC) recommends handling any of these mice in an open area while wearing latex gloves and disinfecting the trap with a 10 percent bleach solution before reusing.

Should we try to eliminate all deer mice in the wild to prevent future outbreaks of this disease? This likely would not be very practical given the widespread range of the species and its high reproductive potential. Deer mice also play an important role in nature. Besides providing an important food source for many predators, deer mice also feed on many seeds of weedy plant species and the larvae of harmful insects. Their burrowing activity also helps to aerate and drain the soil. Most importantly, deer mice actively seek out and feed upon the underground fruiting bodies of mycorrhizal fungi. Mycorrhizal fungi infect the roots of plants, increasing the plant's ability to absorb water and nutrients from the soil. Such a close relationship is called a **symbiosis**. The spores of the mycorrhizal fungi pass unharmed through the digestive tract of the deer mice after feeding on the fruiting bodies of these fungi. Thus, deer mice also form a symbiosis with the plants by dispersing the fungal spores when they defecate in new areas of their home range.

Station MT3 Smooth Sumac

The woody stemmed plant that surrounds you is smooth sumac (*Rhus glabra*). If you are hiking in the spring or summer, you will notice the bright green leaves that turn to bright red during the fall. In the winter the red B-B



smooth sumac

like seeds are conspicuous at the top of the plant.

Sumac seeds are eaten by birds and the sumac stem and bark are eaten by deer and rabbits. Early pioneers and Native Americans boiled the seeds to produce a tea. Some home owners now use the plant as a landscaping highlight.

The plant not only reproduces from seeds but grows from the roots so it can spread very rapidly. As you can see, it is taking over as the most dominant plant in this prairie. This raises questions. Should we allow the prairie to be overrun by the sumac?

What will happen if sumac fills this whole area? Should we intervene and try to halt the growth of sumac? If we try to halt the growth of the plant, what is the best way?

Land use and what plants should grow on a piece of land often raise questions of values. What is more valuable, the grass or the sumac? What criteria determine value? Is price a factor? It has been said that the definition of a weed is whether that plant is desired to be grown there. For example, corn growing in a soybean field could be considered a weed. Is the sumac a weed in this prairie?

Station MT4 Pea Tree

The many stemmed woody shrub or small tree that you see along this section of the trail is called the pea tree (*Caragana arborescens*). The pea tree is an introduced species that is often planted for windbreaks and hedgerows. During the summer it has small yellow flowers in clusters of 2 to 3. The flowers are about ∫ inch long and are similar in shape to those of the sweet pea which indicates that it is a member of the legume family. The legume family is economically important because its members have roots with bacteria-containing nodules that can fix nitrogen. **Nitrogen fixation** means that the bacteria convert atmospheric nitrogen to forms that can be used by the plants. Thus, beans and peas are sometimes rotated with other crops such as corn or potatoes because they add nitrogen to the soil.

Humans have a long history of introducing foreign species from other parts of the world to areas where they live. The problem with doing this is that frequently their competitors or predators that feed on the introduced species are not present in the new area. The introduced species often flourish in their new habitat, often at the expense of native species. One example of this is the introduction of smooth brome (*Bromus inermis*) from Siberia. Smooth brome is a grass with broad leaves that has been planted widely in the Great Plains and makes an excellent hay crop. The problem with smooth brome is that it spreads by rhizomes (underground roots) and outcompetes many native grasses and forbs. Wherever it is introduced, it forms a virtual monoculture and replaces native prairie. Once established it is almost impossible to eradicate, although controlled burns at certain times of the year may help in its control.

Station MT5 Succession

Take a look at the meadow, with the small cedars and wild plum trees just beyond the sign post. What do you think this area will look like if left undisturbed in 20 years? In 50 years? Ecologists have recognized that if a disturbed area is left alone for a long period of time, a predictable sequence of plant communities will develop in a process known as **secondary succession**. The plant community that you see in front of you is an example of one of the stages (called a **seral stage**) leading up to a stable **climax community**. The climax community is made up of the plants and trees that eventually develop if an area is left undisturbed for a long period of time.

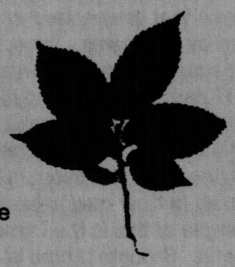
Historically, the frequent lightning storms that sweep over the Great Plains in the summer months started fires which prevented trees from becoming established. Following a severe firestorm, weedy species such as tumble mustard, Russian thistle, prickly lettuce, dandelion, and annual grasses develop. Subsequently, perennial grasses and herbs, such as goldenrod, become established. In a riparian zone, smaller trees, such as wild plum would appear next. Finally, slower growing hardwoods, such as cedar, elm, and green ash establish a stable climax community.

It is important that we preserve at least some mature climax communities for future generations. There are many species of animals that are adapted to climax communities and require them for their food and nesting sites. There are also some plants found mainly in climax communities that are the source of lifesaving drugs. Pacific yew, the source of the cancer fighting drug Taxol, is just one example.

CEDAR LANE CL1 - CL5

Station CL1 American Elm

The large tree that can be seen about 10 yards up the hill is an American elm, an important shade tree native to the eastern and central United States. American elm may grow from 80 to 120 feet tall and reach 2 to 4 feet in diameter. Its elliptical leaves can reach 4 to 6 inches long and 1 to 3 inches wide. The fruit of the elm (called a samara) is oblong and flattened with a papery wing surrounding the seed. The Siberian elm, a similar species, has been widely introduced to this area and differs by having smaller leaves.



American elm

Vast numbers of American elm trees have been destroyed by Dutch elm disease in the United States during the second half of the 20th century. This infection is caused by the fungus, *Ceratostomella ulmi,* which is transmitted by the European elm bark beetle. This disease was introduced to the United States in 1930 in a load of logs from the Netherlands. The fungus is carried

on the legs of the beetles as they burrow underneath the bark in search of a place to lay their eggs. Once underneath the protective bark, the fungus spreads within the wood and destroys the tree's water conduction system. The leaves then wilt and die, leaving nothing but dead branches. The only treatment for this disease involves injecting a fungicide into a hole drilled at the base of the trunk. This is only effective in treating trees in the early stages of the disease. Badly infected trees must be cut down and burned to prevent the spread of the disease to other trees.

Station CL2 Birds of Camp Arroya

Look around and notice how many different habitats there are in Camp Arroya. This variety of trees, shrubs, and lakeshore is ideal for birds because they are provided with water, food, and shelter. Usually, different habitats don't have distinct, abrupt boundaries, but blend into one another forming transition zones called **ecotones**. An ecotone has many of the elements of both habitats and frequently supports a higher diversity of animals than surrounding areas.

Some birds are year-round residents, whereas others are only seen during the spring or fall migration. Year-round residents that can be seen along this nature trail include chickadees, blue jays, downy woodpeckers, flickers, and crows. Common summer residents include robins, red wing blackbirds, and a variety of sparrows. Wood ducks nest in the houses attached to cottonwood trees. Numerous species of waterfowl use Lake Mitchell as a stopping place during migration including many species of ducks, pelicans, loons, cormorants, and grebes. In addition to water birds, the camp is a stopping place for many warblers, sparrows, and other migrating species. Other birds that might be seen or heard along the trail include owls, hawks, pheasants, and even wild turkeys which sometimes roost nearby.

Birding is an easy hobby to start, just get a bird identification book, a pair of binoculars and begin paying attention to what is around you. Many bird watchers keep a life list of the total number of species that they have seen. They sometimes have contests to see how many species that they can spot during the course of a day or a year. According to the records of avid birders, there are about 200 species that can be seen near Camp Arroya. How many species have you identified by sight or sound during your visit?

Station CL3 Competition

Competition is defined as a struggle for limited resources. This dog-hair stand of Eastern red cedar (*Juniperus virginiana*) is experiencing intense competition from members of its own species. What limited resources do you suppose each tree is competing?

Competition can be between members of the same species (**intraspecific competition**) or between members of different species (**interspecific competition**). Intraspecific competition is usually considered to be the more intense, because members of the same species are

competing for the exact same resources. Interspecific competition is rarely as intense, because members of different species occupy different niches. A **niche** is the sum of the resources used by a species. It includes such factors as moisture, humidity, soil, minerals, light, food, and many more.

Eastern red cedar

Interspecific competition is usually minimized by **resource partitioning** or the dividing up of the available resources over time. If two species have overlapping or similar niches, one is usually better able to obtain the limited resources and tends to exclude the other species. This is known as the **Competitive Exclusion Principle**. The Competitive Exclusion Principle can also be defined as "no two species can occupy the same niche." Gradually, each of the competing species becomes adapted to using slightly different aspects of the niche as a consequence of competition. This leads to resource partitioning which allows more species to coexist, increasing the diversity in an area.

Intraspecific competition, the competition between members of the same species, often leads to a stunting of growth. This can be seen in this stand of Eastern red cedar and in fish ponds containing bluegill or streams containing brook trout. Reducing intraspecific competition can often increase productivity of these systems. This can be achieved by thinning stands of timber or adding a predator to the system. For example, adding a predator such as largemouth bass or northern pike to a pond can often increase the average size of bluegills. This also has an added benefit in adding diversity to the ecosystem.

Station CL4 Decomposers

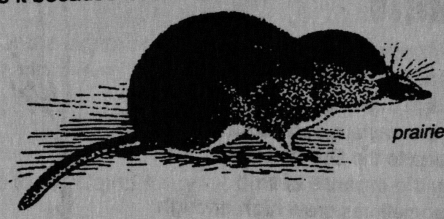
Take a look around at all the dead wood and trees. Some people might say, "What a mess. Why don't they clean up all this dead wood?" Doing so, however, would probably have harmful effects on the ecology of this area.

Rotting stumps and logs provide a home for many creatures. Knot holes provide homes for small animals such as birds, mice, or insects. As the wood decays, the number and kinds of inhabitants change. Some of the species that you might find in a rotting log include shrews, carpenter ants, beetle larvae, centipedes, millipedes, sow bugs, and worms. The dead tree on the other side of the trail could be the home for a downy woodpecker or a white-footed mouse. If you turn over a log to look for some of these animals, please return it as it was found so it can continue to serve as a humble abode for these creatures.

Dead trees and limbs also serve as a home for many microscopic decomposers. These bacteria and fungi not only cause the wood to disintegrate, adding important organic material to the soil, but they also recycle nutrients that can be absorbed by the living plants that remain. These decomposers are also eaten by many insects, which in turn provide

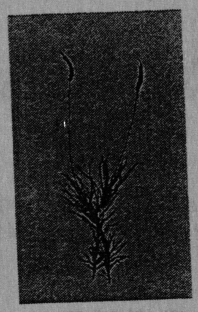
food for larger animals such as birds or mammals.

Why do humans have a desire to remove the remains of dead plants and animals? Is it because it reminds them of their own mortality?



prairie shrew

Station CL5 Moss



moss

The green carpet that can be seen just behind this post is made up of true mosses, which along with liverworts and hornworts, make up a group of primitive plants known as the bryophytes. Bryophytes differ from flowering plants and conifers in lacking specialized vascular tissue, which prevents them from having stems, roots, and leaves. There are about 14,000 species of mosses living in just about any place that is moist. Although easily overlooked, mosses play a vital role in many ecosystems. They can be found growing on soil, rocks, buildings, and trees, or in moister habitats such as bogs, sloughs, or shallow streams throughout the world, from the deserts of Australia to the rainforests of the Amazon.

Mosses, along with other non-seed plants such as ferns and lichens, are among the first living organisms to inhabit newly formed ground such as on volcanic islands. These plants produce secretions which break down rock, producing soil. They also add valuable organic material to the soil when they die and decompose, allowing vascular plants to eventually colonize. Sphagnum, or peat moss, may accumulate for many years without decaying in acidic bogs. Gardeners frequently add peat moss to soil to improve its water retaining capacity, and in some areas of the world, peat is gathered and used as a fuel.

Many other photosynthetic organisms are incorrectly referred to as "mosses." The mats of green or blue-green material floating in the water during the summer months in lakes and reservoirs are commonly called mosses, but are actually green algae or Cyanobacteria (blue greens), groups that are more primitive than the true mosses. Lichens, which are composed of algae and fungi in a symbiotic relationship, are sometimes erroneously termed "rock moss." Spanish moss, which hangs from the branches of trees in the southern United States, is actually a flowering plant (bromeliad family). True mosses differ from these others in that they reproduce by spores and in other aspects of their life history.

Station PL1 Plants

Some of the tall grasses and wildflowers that you see in this small meadow are components of the tallgrass prairie, an ecosystem that once extended along the western edge of the eastern deciduous forests from southern Canada to the Gulf of Mexico. Early settlers were awed by the expanse of lush country, with grasses that sometimes grew high enough to completely hide whole herds of cattle. Innumerable bison, elk, and wolves also roamed these fertile plains. Less than 1 percent of the total tallgrass prairie remains of the millions of acres that were once present. Today, most of it is found in tiny patches such as this one, as well as railroad right-of-ways, state parks, and nature preserves.

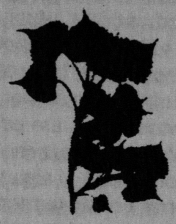
Camp Arroya is actually located in the mixed-grass prairie region. It has elements of both the tallgrass prairie further east and the drier short-grass prairie further to the west. One species that is typical of the tallgrass prairie further to the east that can be seen in this meadow is big bluestem (*Andropogon gerardii*). Big bluestem is the dominant grass of moist areas in the tallgrass prairie region. Its roots form thick sod that prairie settlers used to build their houses. By far the most numerous type of plant in the tallgrass prairie, however, are the forbs or wildflowers. Some of the forbs that are typical of tallgrass prairie that can be seen in this meadow are the lead plant (*Amorpha canescens*), purple cone flower (*Echinacea angustifolia*), purple liatrus (*Liatris aspera*), and skeleton plant (*Lygodesmia juncea*).

The mixed-grass prairie is typical of the Great Plains region. Shorter grasses predominate in this drier region as well as some of plants typical of the areas further to the east. Plants typical of the mixed-grass prairie that can be seen in this meadow include little bluestem (*Andropogon scoparius*), side-oats grama (*Bouteloua curtipendula*), western wheatgrass (*Agropyron smithii*), and wild rose (*Rosa sp.*). Trees are also typically present along streams, lakes, and man-made reservoirs, although historical records suggest that they were not as numerous in the past as they are today.

big bluestem

little bluestem

Canadian wild rye



cottonwood

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