Exploring Plants in our Lives

Useful Plants on the Prairie

Module for Grades 6-12

I. Introduction to Ethnobotany
II. History of Useful Texas Plants
III. Useful Plants on the Prairie
IV. Activity: Survivors on the Prairie

I. Ethnobotany

Capture interest in the native flora of a region by connecting those once wild species to the history and culture of a place. **Ethnobotany** is the study of how people use plants for food, medicine, shelter, clothing, and more. This interdisciplinary study relates the importance of plants in our everyday lives through the chemistry, botany, biochemistry, and history of common edible and useful plants we may encounter in our own region. Ethnobotany includes **ethnomedicine**, which is the study of how people use plants as medicine. There are many plants growing all around us with ethnobotanical and ethnomedical uses.

II. History of Useful Texas Plants

Some of the first European settlers in Texas were Spanish ranchers who settled along the Rio Grande River. The harsh environment in South Texas made everyday life difficult for the settlers. Locally growing wild edible plants were important to the settlers' survival. In the early 1700's, Spanish settlers learned about edible Texas plants from local native Americans. Some of these plants grow in your neighborhood. Commonly known as mesquite, or honey mesquite in English, *Prosopis glandulosa* is a member of the Fabaceae or bean family. Botanically, the honey mesquite is characterized by tan seed pods, small yellowish flowers, and compound leaves with opposite leaflets. We all know that mesquite wood is great for barbeque, but mesquite has many other uses. Because of their high sugar content, the pods can be used to brew beer, and to make biofuel, natural sugar, molasses, or syrup. Mesquite pods are rich in complex carbohydrates, sugars, and protein. Flour for tortillas, breads, and cookies are made

from the ground mature seeds pods, which are also used to make candy. The immature green pods are used to make a sweet syrup that is similar to maple syrup.

The prickly pear cactus was also important to early settlers and native Americans. The prickly pear is a member of the Cactaceae or cactus family; it has flattened stems called paddles or pads. On the ranches, muddy water was purified by adding 2-3 cactus pads, with the thorns removed and some slits cut in the middle, to a bucket of muddy water. A short time after adding the cactus pads to the bucket of muddy water, it would be clear. Ranchers have traditionally used the prickly pear as a source of drought fodder for their cattle. They burn the spines off, and the cattle eat the pads. The water stored in the plant provides essential water for cattle. The prickly pear is also an important food for people. The pads are edible and are still a popular food among Mexican-Americans today. They can be fried with eggs, served in salads, cooked with chili sauce, or even added to pizza. In addition, the brightly colored fruit, called tunas, can be used to make jelly, candy, and juice. There are many other modern uses for the prickly pear. The fruit and flowers have brightly colored compounds called betalains that can be used as natural food coloring. The cochineal insects live on prickly pear cactus pads and have been traditionally grown by Mexican Indians as a source of dye. Cochineal insects are still used today as a source natural red food coloring.

The maguey,or century plant, is a member of the Agavaceae family. Its scientific name is *Agave americana*. It has been traditionally used as a source of refreshing juice and is used to make tequila today. It is also the source of a natural sweetener. The roots contain poisonous compounds called saponins, so you should never eat them. However, these saponins are used as soap, and they were once used to wash clothes. The Spanish dagger, or Spanish bayonet (*Yucca* species), is another member of the Agavaceae family. Unlike *Agaves*, Spanish daggers have a spine at the tip, but not on the edges of their leaves. The flowers are large and drooping, usually white to cream-colored or purple. American Indians have traditionally used these plants as a source of fiber for rope and thread. The sharp tips were used as needles, and with the fiber still attached, they could be used to sew clothes. Like the century plant, the roots contain saponins, and are also used to make soap. The early pioneers once ate the flowers prepared like cabbage and sometimes pickled. The flowers and fleshy fruit are edible and can be prepared fresh, fried, sautéed with onion and tomato, pickled, and in salads. Do not eat other parts or woody fruit because they are poisonous!

Chili peppers are native to the Americas and are members of the Solanaceae or potato family. Several species of *Capsicum*, the chili pepper genus, can be found growing in Texas, including *Capsicum annuum* variety *glabriusculum*, aka bird pepper. It is a wild native Texas pepper, known for being extremely hot. It is called bird pepper because it is a popular bird food. Chili peppers contain the chemical compound called capsaicin and related compounds called capsaicinoids. Capsaicin is non-polar; so it dissolves in oily non-polar substances, and does not dissolve in water. That is why milk, a relatively non-polar substance, is better at reducing that salsa burning sensation than water. Capsaicin binds to nerve receptors in our skin and mouths, causing a burning sensation, even though we are not actually being burned. This effect is so strong that it eventually depletes the nerve signal molecules responsible for transmitting the sensation of pain.

Over-the-counter preparations containing capsaicin treat arthritis pain by depleting these nerve signal molecules. Capsaicinoids are also responsible for the burning pain caused by pepper sprays used in self-defense. Oddly enough, birds do not feel the effects of capsaicin, hence the popularity of bird pepper as a food among Texas birds.

Many plants that are considered "weeds" are actually useful edible plants. Pokeweed is a member of the Phytolaccaceae family. Its common names include pokeberry, poke salad, or inkberry. Its scientific name is *Phytolacca americana*. It is believed that the common names may be derived from the American Indian word for blood, *pak*, because of the strong purple-red dye made from its berries. Pokeweed grows 6-8 feet tall, with reddish or purplish stems, lanceolate (lance-like) leaf blades, white or pink flowers, and fruit that are purple-black berries. Pokeberry is very poisonous and it should never be eaten or touched. Even rubbing the berries on skin can cause toxic reactions. This plant is an interesting example of a toxic plant that has traditionally been used as a food. There are several records of people eating the young spring shoots after repeated boiling to remove the toxic compounds. Today, the shoots are even available canned in some areas of Texas. For early Texas settlers, these young shoots would have provided the first fresh vegetables of spring after the long cold winter (and lots of canned vegetables).

The dandelion is considered an annoying weed by many, but it once was held in high esteem as a food and a medicine. Its scientific name is *Taraxacum officinale*, which means "the remedy for disorders", reflecting its long history of use as a medicine. It is a member of the Asteraceae or sunflower family. The young root, best when harvested in the spring, can be roasted to make a caffeine-free coffee substitute that is also full of vitamins and minerals. The young roots can also be served boiled like parsnips or carrots. The young leaves, picked before flowering, can be used in salads, soups, and as a potherb like spinach. The flowers are the source of dandelion wine, quite popular during prohibition. The high levels of vitamins and minerals found in dandelion leaves and roots may partially explain their history of use as medicines. In the past, many illnesses were the result of malnutrition, so eating dandelions or drinking tea made from them may have been early forms of the modern-day multivitamin.

Sunflowers (*Helianthus annuus*) are also members of the Asteraceae family, and they grow everywhere in Texas. The seeds of the wild varieties are smaller, but they are edible for humans and animals. Sunflower seed oil is used in cooking, and can be found in supermarkets. Sunflowers were also important to American Indians as remedies for snake bites and more. The stinging nettle (*Urtica dioica*) gets its name from the burning sensation caused by brushing against the leaves. The pain is caused by microscopic stinging hairs that inject a toxin into the skin like miniature hypodermic needles. Despite this, stinging nettles are actually edible. Once they are boiled in water, the leaves lose their sting and can be eaten. They taste like spinach and are very nutritious. Stinging nettles contain vitamins and minerals, notably calcium, vitamin C, and beta-carotene.

Wild garlic and onions grow all over Texas. The leaves are long and grass-like and they produce flowers on the ends of long stalks. The leaves, flowers, and bulbs of wild garlic and onion are edible. They can be used in place of chives, garlic, or onions in cooking. In

addition, crushing the plants and rubbing them in to cuts helps to prevent infections. There are many edible North American species in the *Allium* genus, and none are poisonous. However, never eat a wild plant that like wild garlic or onions, but doesn't have a garlicky or onion-like odor. Crow poison is a look-alike plant for wild garlic, but it is poisonous. However, crow poison is easy to tell apart from wild garlic because it does not have the characteristic smell.

All plants contain chemicals, called phytochemicals, even those grown organically. Plants make chemical compounds for food storage, defense, and for color. These chemicals provide us with food and medicines, as well as potent poisons. How do we know which phytochemicals are poisonous, edible, or medicinal? Natural product chemists work with botanists, biologists, and other scientists to find biologically active natural products. Chemists define the word "natural" a little differently from most. Natural products are defined as chemical compounds found in nature, as opposed to synthetic chemical compounds like plastic. Biologically active natural products are chemical compounds found in nature that have a biological effect, positive or negative, on humans. The focus of natural product drug discovery is the search for new biologically active natural products, including compounds found in plants, marine life, animals, and insects. Many important cancer drugs are natural products originally found in plants, including vincristine and vinblastine from the rosy periwinkle and taxol from the bark of the Pacific yew tree. Natural products can be isolated from plants by making extracts, including aqueous extracts, alcohol extracts, and oils. For example, coffee is an aqueous, or water extract, of coffee beans. Bioactivity-guided fraction is one of the most commonly used methods of discovering new biologically active compounds from plants. Through the process of elimination, the biologically active chemical compounds are separated from the other phytochemicals in the plant extract. It takes a team of botanists, chemists, biologists, pharmacologists, and microbiologists working together to discover a new natural product drug.

Ethnopharmacognosy

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*Based on an original article and activity by **Marissa Oppel, M.S., Pharmacognosy**, Depart. of Med. Chem. and Pharmacognosy, University of Illinois at Chicago (UIC).

III. Useful Plants on the Prairie*

Caution: The information below is purely educational and should not be construed in any way as medical advice. Many plants are poisonous or cause severe allergic reactions. Identification of plants may sometimes be difficult. Always consult a physician before using plants as food or as remedies.

1. Sunflower *Helianthus annuus* Asteraceae

Uses: food- sunflower seeds and sunflower oil

The sunflower is a member of the Asteraceae family and has composite flowers. Some cultivars of sunflowers are grown for their seeds, which are sold as snacks and used for cooking oil. You can find both sunflower oil and sunflower seeds in your grocery store. Many people grow sunflowers in their gardens for the beauty of their flowers and to attract birds that eat the seeds. Sunflowers are often found growing in disturbed areas such as vacant lots and construction areas. Sunflowers were an important plant for native Americans who used them for food and in ceremonial medicine. In addition, the roots were a traditional remedy for snakebite among the Apache Zuni peoples.

2. Spanish Dagger *Yucca* species Agavaceae

Uses: Soap, shampoo, thread, rope, sewing needles, landscaping, edible flowers, some related species have edible roots

The Spanish Dagger plant is commonly grown in people's yards because the plant does not require much water to grow. The roots of Spanish Dagger contain chemical compounds called *saponins* that can be used to make soap and shampoo. Today, chemical compounds from Spanish Dagger plants are still important ingredients in detergents. *Saponins* are **poisonous, so it is important to never eat the roots, leaves, or woody parts of Spanish Dagger.**

The leaves of Spanish Dagger contain tough fibers which have been used by Mexican-Americans and native Americans to make rope and thread. In some parts of Mexico the fibers are still used to make cowboy lassos. Anyone who has bumped into a Spanish Dagger plant knows that the tips of its leaves are very sharp. These tips were sometimes used as needles to sew clothes. The leaf fiber still attached to these needles was used for thread. The flowers of Spanish Dagger plants were also an important food to pioneers who cooked them like cabbage and pickled the flowers. The flowers have been used as a folk medicine for coughs, and in Sonora, Mexico, the flowers were steamed and used as folk medicine for tuberculosis. The fleshy fruits are also edible and are used to make alcohol.

3. Wild Garlic, Liliaceae (Lily Family)

Uses: digestion, food, skin rub to protect from insect bites

Wild garlic, sometimes called wild onion, is native to North America and was used for food by native Americans. It has an edible bulb and stem that tastes like onion. Gardeners today use it to flavor foods and as a substitute for chives on baked potatoes. Rubbing wild garlic on the skins has been used for protection from infection as well as protection from insect bites, lizard bites, and scorpion stings.

4. Honey Mesquite, *Prosopis glandulosa,* Fabaceae (Bean Family)

Uses: Food- pods (flour tortillas, candy, syrup, beer), gum (drinks), wood (building, barbecue), eyewash, disinfectant, sore throats, lip sores

The honey mesquite gets its name for the sweet taste of its pods. The pods are a source of sugar, protein, and other nutrients. They can be ground to make flour for tortillas, bread, and cookies. In addition, the sugar in the pods can be used to make syrup and candy. The wood of the mesquite was once used to make corrals and houses called "jacales" on the old ranches. The wood is also good to burn in barbecues. In addition, honey mesquite has traditionally been used by Mexican-Americans as an eyewash and disinfectant. Research has revealed that this plant contains compounds with antimicrobial uses, supporting these traditional uses.

5. Prickly Pear Cactus, *Opuntia* species, Cactaceae (Cactus Family)

Uses: Food- Pads (nopales, nopalitos-salad, cooked with eggs, etc.) Fruit (tunas: candy, juice, and jelly); Traditional Mexican-American treatment for diabetes

You can find canned and fresh nopales (cactus pads) for sale in the supermarket. The fruit, commonly called "tuna", is very sweet and can be used to make jelly, candy, and drinks. Prickly pear cactus was very important on the old ranches as a source of food for people and cattle. During droughts, ranchers would burn the spines off of the cactus so that the cattle could eat it, providing the cattle with food and water found in the plant's tissues. The prickly pear cactus is a traditional Mexican-American remedy for diabetes. Today research is showing that it may actually help diabetic patients with their blood sugar and cholesterol levels.

6. Dandelion, *Taraxacum officinale,* Asteraceae (Sunflower Family)

Uses: Food: Leaves (small leaves, salads, fried like mustard greens, soaps, boiled like spinach), Roots – (tea, roasted to make a coffee substitute); Flowers (Dandelion wine); Roots used to make dye; Herbal Medicine – diuretic, acne, liver disorders, control of blood sugar levels, antibiotic, weight loss, appetite stimulant, and more; some anticancer compounds

We often view the common dandelion as a common, unwanted "weed." However, since Roman Times it has been considered an important medicine. It was highly valued as a medicine and

food during the Middle Ages. The dandelion is a highly nutritious plant that contains high levels of vitamins and minerals including Vitamins A and C and iron. Today, we believe that it was valued as a medicine because its high levels of vitamins and minerals helped to treat diseases caused by malnutrition, such as scurvy. Dandelion is used to today by herbalists as a diuretic and as a treatment for liver problems. Compounds found in dandelion have been shown to help battle cancer and control blood sugar levels.

Young dandelion leaves can be boiled like spinach or tossed into salads and soups. In addition, the roots can be roasted and drunk as a coffee substitute. The roots can also be used to make dye. **CAUTION: NEVER eat dandelions from a place where chemicals may have been used.**

7. Water Hemlock, *Cicuta maculate,* Apiaceae
(Carrot or Parsley Family)

Uses: HIGHLY POISONOUS. Known as the most poisonous plant in the North temperate zone, hemlock was used to kill Socrates. A single bite of this plant can kill humans and cattle. Children have been poisoned by using the stems as whistles.

Water hemlock is a tall, perennial herb with white flowers in umbels (umbrella structure). Many important cultivated members of this family, such as carrots and parsley, are important food sources, but this member id deadly. No wild member of this family should be eaten without absolute certainty that it is safe.

8. Chili *Capsicum* species, Solanaceae

Uses- Food (Spices and flavoring), arthritis pain relief, used in pepper spray, weight loss, stomach ulcer treatment, and more

People often grow chili peppers in their gardens and use them as spices in cooking. They are high in nutritional value, containing 357 times more Vitamin C than orange juice. The native Texas chili pepper is called bird pepper because the peppers are a favorite food for birds, who do not experience the hot, spicy taste that we do. The compound responsible for the hot spicy taste does not dissolve in water, but it does dissolve in fats. That is why milk will cool your tongue faster than water after you eat hot chili peppers. The chili pepper is native to North and South America and has 6,000-year history of use among Native Americans. Although chili peppers are now used in cuisines all over the world, including Europe, India, Africa, and Asia, no one outside of North and South America used them until Christopher Columbus came to the New World in 1492. Today, the compound that causes Chili's burning feeling is used to treat arthritis pain and is an ingredient in pepper sprays used for self –defense. Peppers contain natural antiseptic, antibacterial and antiviral properties.

*Based on an original article by **Marissa Oppel, M.S., Pharmacognosy**, Depart. of Med. Chem. and Pharmacognosy, University of Illinois at Chicago (UIC).

Some photographs courtesy of the Lady Bird Johnson Wildflower Center's plant database.

Recommended Books:
Foster S, Hobbs C. Peterson's Field Guide to Western Medicinal Plants and Herbs Boston: Houghton Mifflin, 2002. (ISBN/ISSN: 0395838061)

Tull D. Edible and useful plants of Texas and the southwest : including recipes, harmful plants, natural dyes, and textile fibers : a practical guide, Austin: University of Texas Press, 1999. (ISBN/ISSN: 0292781644)

Diggs G, Lipscomb B, O'Kennon R. Shinners and Mahler's Illustrated Flora of North Central Texas: BRIT Press, 1999. (ISBN/ISSN: 1-889878-01-4)

IV. Activity: Survivors on the Prairie

Disclaimer: The information presented in this class is for educational purposes only. Care should be taken when collecting wild edible plants, which can be confused with poisonous plants. Eat wild plants at your own risk!

Survivors on the Prairie Game

Survivors on the Prairie is a game that introduces young students to plants used by cultural groups as a means of survival during the early settlement days in Texas. Through an interactive, problem-solving game that can be replicated for any region of the world, children experience how people learned the value of wild plants, and in the process, discover connections between their own food and medicines and the plants they encounter each day on their school grounds and in their neighborhoods.

Learning Outcomes
Students will identify uses of plants by different cultural groups on the prairies during the early settlement era and compare with plants used by people in Texas today.

Age recommendation
Grades 4-12, but adaptable for other age groups

Literature connection
Spirit of Iron by Janice Jordan Shefelman
This historical fiction explores the cultures of different native American groups and their interactions with settlers. It shows how the Native American taught the settlers to use plants to treat injury and illness.

Background
How did people survive the sometimes harsh conditions in early Texas without the modern conveniences we enjoy today? With grocery markets and pharmacies on every corner, our children are disconnected from the source of their food. But the people who lived on the Texas prairies years ago had to use what was available to them to meet their daily needs. Out of necessity, they learned to rely on plants for everything from food to medicine to personal care products. Native Americans introduced many plant uses to the early settlers. Until they established a homestead and garden, pioneers gathered the plants they needed for medicines. The survival of their families depended upon their knowledge of plant use.

Native Americans were skilled in using plants long before settlers arrived. The shaman, or medicine man, acted as ceremonial priest in many tribes and was called on to treat anyone who became ill or was injured. Settlers from other countries and parts of the United States brought with them herbal remedies and other plant uses passed down to them from previous

generations. Many of those plants did not grow on the prairies and some of the plants they did find were unknown to them. Therefore, much of the information learned about the plants they encountered came from trial and error. Unfortunately, lessons about some of these plants were learned the hard way, watching family members suffer from exposure to poisonous plants or the result of using the wrong plants to treat an illness.

Procedure

Ask students if they have used a plant today. Lead into a discussion of the plants and plant products they use for food, medicine, clothing and shelter. Ask them where they go when they need to find medicines or food?

Instruct students to talk to their parents and older family members about the family's land of origin before coming to Texas. Are there family stories about unusual uses of plants? Which plants are still family favorites? How are they used? (Example: a favorite chili pepper and salsa recipe) Allow children to bring examples or pictures of the plant or plant product to class to show and tell stories.

Materials needed

- Copy of "Daily Dilemma" cards
- Copy of Useful Plants information
- Plant Profile pictures or live plants (sunflower, yucca, aloe vera, mesquite, prickly pear, dandelion, water hemlock* (*__***photo only***__ for this poisonous plant)

In this game, students will choose plants from Texas to survive daily crises in their lives. It is not necessary for students to have information about any of the plants beforehand because they will be learning through the "trial and error method", just as the early Texas inhabitants must have done.

To assemble the game

1. Make picture cards for the plants (pp. 11-14) or assemble dried or live specimens
2. Prepare the daily dilemma cards (pp. 15-18)

Directions

1. Divide the class into families representing 4 different cultural groups who lived in Texas. example: a native American family, a Mexican family, a German family and an Irish family migrating from the east coast of the United States.

2. Place photos of all the plants in the middle of the circle on the floor or where the families can see them all at once.

3. Take turns allowing each family to draw a dilemma card. The family looks at the dilemma card, then looks at the available plants they can use to solve their problem. The family decides which plant they need and points to it in the circle. They need to justify why they chose the plant.

4. Give students a copy of the Useful Plants on the Prairie handout and let them determine if they have chosen the right plant. Have each team report on whether they chose the right plant for their dilemmas and what will happen to them if they chose the wrong one.

5. If one of the families chose the Water Hemlock plant, let them know they have poisoned their family members! Their team loses.

Student Assessments

- *Survivors on the Prairie* is a problem-based activity, so students can be individually evaluated on how well they work with team mates to solve dilemma situations and learn from the mistakes of others.

- One sentence summary question: If you were traveling through Texas and could take 3 plants with you, which 3 would you choose and why?

Post Activity

Talk about the plants that were used in this game and compare to products that are used today for the same needs.

Ethnobotanical Treasure Hunt: challenge students to find the plants in their neighborhood, draw them, and document where they are. Caution them **not** to eat any of them and to only handle the ones they know are safe.

Sunflower

Helianthus annuus
Asteraceae

Sunflower Family

Spanish Dagger

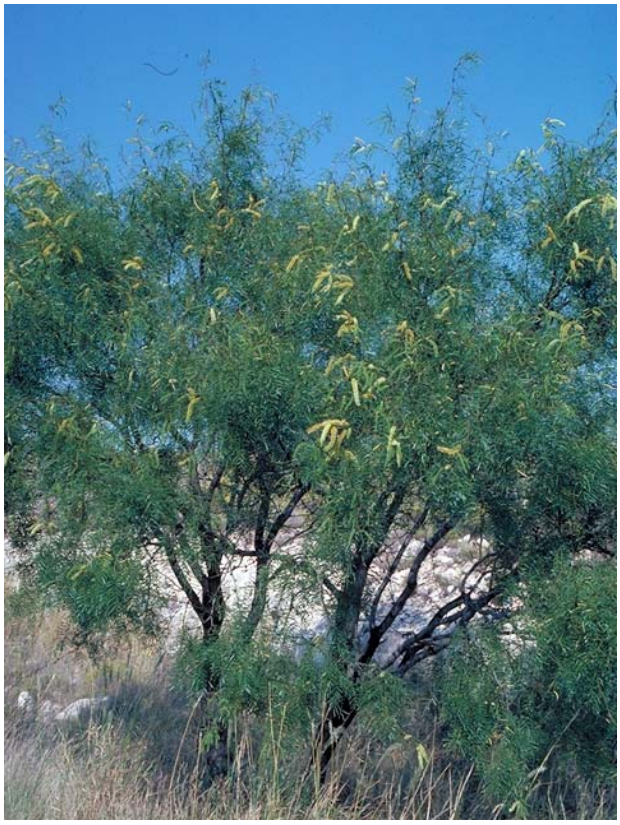
***Yucca* species**
Agavaceae

Agave Family

Honey Mesquite

Prosopis glandulosa
Fabaceae

Bean Family



Prickly Pear Cactus

***Opuntia* species**
Cactaceae

Cactus Family

Dandelion

Taraxacum officinale
Asteraceae

Sunflower Family

Allium canandense

Liliaceae

Lily Family

Water Hemlock

Cicuta maculata
Apiaceae

Carrot Family

Chili

***Capsicum* species**
Solanaceae

Potato, Tomato, Pepper Family

A

You are tired of eating beans, potatoes and hard biscuits. You want to find something tasty for a snack.

Which plant can you eat?

B

Your shirt is torn and you need to patch it.

Which plant can you use for a needle and thread?

C

Your head really itches
and you need a shampoo.

Which plant can you use?

D

It's been a long time since it rained.
Your cattle need food and water,
but the pond is dry.

Which plant provides both food and water
for you and your cattle?

E

You are surrounded by biting mosquitoes.

Which plant can you rub on
your skin to protect you from
insect bites?

F

Your family needs flour
to make bread and tortillas.

Which plant can be used as flour?

G

You have not been able to find
enough fruits and vegetables.
You feel sick
because of poor nutrition.

Which plant should you eat
for more vitamins?

H

You need shade from the hot Texas
sun during the day.

Which plant could you use to build
a shed to shelter you from the sun?