FireWorks Notebook for the Missouri River Country

2012

Contains the 30 species essays tailored for the Missouri River country of the Great Plains and Northern Rocky Mountains

If you would like to access essays on additional species, please use a FireWorks CD or go to: http://www.firelab.org/

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For more information please email: fmi@fs.fed.us

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Ants

At first glance, you may think we ants are all the same. But there are more than 80 species of ants found in the Great Plains—and about 15,000 species of ants around the world! We come in different sizes and colors, and we all have different diets, habitats, and behaviors.

Prairie ants: Ants are found throughout the world—from the hot tropics to the frozen tundra. But I'm going to tell you just about us, the ants of the prairie.

Most of us grassland ants nest in the soil. We are master architects who sculpt our environment to suit our needs. What you see aboveground and call "ant hills" are just the very top of our maze of tunnels that can extend 2 meters underground. Creating this huge network of tunnels is hard work. Imagine lugging around soil, grain by grain, day after day. That would be like carrying a boulder on your back all day long! No wonder it can take up to 10 years for a colony of ants to build a home.

We build these complex mounds and tunnels so we can survive changes in temperature and moisture. Like all insects, we are *cold-blooded*. That means that our body temperatures change with the temperature of our surroundings. In order to remain at just the right temperature, we build our palaces to have different levels and rooms, each with a slightly different climate. Some ants build hills that are perfectly angled to soak up the sun's rays. In the winter, we retreat to the lowest levels, well below the frost.

Always working: If it sounds like we are always busy, that's because we are. It takes a lot of cooperation and hard work to live in a large *colony*. Just like humans who have different jobs and skills, we ants have different roles. The vast majority of us are female "workers" who do not reproduce. In each colony, there are usually a few *fertile* males called "drones", and one or more fertile females called "queens".

The jobs of worker ants may change throughout our lives. We may start by caring for the queen ant and helping raise her young. Then we may help to keep our nest in tip-top shape and defend the nest. Eventually we may *forage*—gather food to bring back to the nest.

Food is our way of life: Prairie ants eat other insects, but we also have a sweet tooth. Even though we have similar tastes in food, different species of ants get their meals in different ways.

You may not think of ants when you think of predators, but most prairie ant species hunt and kill other insects. We are very successful hunters because we hunt in groups. We patrol the ground and crawl all over the plants as we search for soft insects to capture, cut up, and bring back to our nest to feed our young.

You may also notice us savoring the sweet nectar produced by flowers, buds, and leaves of plants like sunflowers. Worker ants may appear lazy while waiting for flowers to produce nectar, but watch out! When other insects—or

perhaps your hand—approach this delicious feeding ground, we may attack. Plants do not seem to mind us sipping up their nectar; it is a small price to pay for protection from insects that will cut up and eat their leaves.

Some kinds of ants raise plant-sucking insects called aphids, just as dairy farmers raise cattle for their milk. Aphids suck the sweet sap from plants and then ooze out the extra sugar as *honeydew*. That would be like humans sweating sugar water. Can you imagine all the insect visitors you would have if you sweat sugar?! As you might guess, we love the honeydew that aphids produce.

We raise and protect our aphids so we'll have a constant supply. Some aphid-rearing ants do their job aboveground, while others remain underground their entire lives, raising aphids that feed on plant roots.

Baby ants? Most ant species breed once a year. Only the female queens and the male drones are able to breed though. You may be able to recognize the queens and drones because of their wings. During the summer, they fly away from the colony to mate. After mating, the queen finds a place to begin a new colony, where she will break off her wings, lay her eggs and care for them.

The queen's eggs hatch into *larvae*—soft and white—and look nothing like us attractive adult ants. When we were larvae, worker ants fed and cared for us. They even *regurgitated* prey for us. That means that they stored food in a special "social stomach" and then brought it back up to their mouths to share. Doesn't that sound delicious?

As we grew, we transformed several times until we finally became adult ants, with our 6 legs and strong outside armor, or *exoskeleton,* that you would recognize.

Are we useful? We build our elaborate nests for our own needs, but in the process, we help the soil and plants. By lugging around grains of soil, we move nutrient-rich particles from deep below to the surface of the soil. As we stir up the soil, we improve the fertility of its top layer, the layer that plants use most for nutrition. We also enrich the soil because we are *decomposers*. As we collect, break up, and eat our prey, we scatter our waste products throughout the soil—tiny particles of digested plant and animal parts. These decay and improve the soil for use by plants.

All of these activities make the loose, fertile soil of our abandoned mounds into a great place for prairie plants and animals to live.

Fire and ants: When fires sweep through the plains, we have to make our way underground to escape. If we burrow under the soil deep enough, it will protect us from the intense heat. Some ants try to make their homes safe from fire. They keep the vegetation cleared around their hills. Such tidiness creates fuel free islands that may keep anthills from burning in the midst of burnable prairie.

There are many different species of ants in the Great Plains, and we don't all respond to fire in the same way. Some of us may benefit from fire, while others may be harmed. Scientists have hardly begun to study how prairie fires affect us, but some think that most fires help us thrive by increasing our food selection. I suspect they're right. My mouth waters just thinking about all the scorched insects that fires leave behind. What easy pickings!

Ant trivia: Although individual ants weigh only 1/10,000th of an ounce—less than a grain of rice—all together, ants weigh more than all of the humans on earth!

Arrowleaf balsamroot

I am a flowering plant. My scientific name is a lot like my English name: *Balsamorhiza sagittata*, meaning "arrow-shaped balsamroot."

Where do I live? I am native to the western part of the United States. I live in dry places, both in prairies and forests; in plains, foothills, and mountains. I grow with sagebrush, too. In the Black Hills, you can often find me in ponderosa pine forests. Farther west, I also grow with Douglas-fir or lodgepole pine. If the forest is thick and shady, I can grow new leaves year after year, but I don't produce many flowers. I prefer more open places.

What do I look like? I have big, fuzzy, arrow-shaped leaves. They are green, but thick hairs make them look a little bit grayish. My flowers grow on a stem that gets about half a meter tall. My bright yellow daisy-like flowers are actually many tiny flowers all grouped together. In fact, each "petal" is its own entire flower! Can you see all of the tiny flowers in the picture below?

I am a perennial plant. This means I grow for many years.

Growing Up: I start growing from seed, but soon I grow a thick, woody taproot that goes almost straight down into the soil. At the top of this root I have a strong underground stem called a *caudex*. From the caudex, I sprout leaves and flowers every spring.

Growing Points: I have growing points in my roots and on my underground stem.

How do I reproduce? I can reproduce from seeds. It takes about 4 year before I start to make flowers and seeds because I am so busy growing my caudex and getting bigger. At the end of the summer, my yellow flowers fade and fall to the ground and my seeds begin to ripen. I am very lucky that animals and wind help to spread my seeds. The following spring, my seeds can sprout to start new plants.

After winter, I grow back from sprouts on my underground stem. I can do that after fire too, and after animals eat my

top off. Scientists aren't sure whether I can grow a whole new plant from my underground stem or not.

BOTANICAL FACT: Above ground, I look like a medium-sized plant. Underground, I'm often much bigger. Like a gigantic carrot, my taproot may get thicker than your wrist. It is usually only 20 to 30 centimeters long, but it can reach more than a meter down into the soil!

My calendar: My leaves begin to grow in April or May. Within a week, my flower stalk comes up. A month after that, I am in full bloom. My seeds are ripe by early July and then they fly off in the wind or catch a ride with an animal passing by. This means that my year's work is about done by the time the hot, dry summer weather comes to the prairies and forests where I live.

Am I useful? It seems like someone is eating me all year-long! Pronghorn, mule deer, and bighorn sheep eat my leaves and flowers, especially during spring and early summer. Elk eat me even in winter. Cattle, sheep, and horses like to eat me too. Mice eat my seeds. Small birds may hide under my huge leaves.

Native Americans know how to harvest my stems, roots, and seeds for food. I can also be used as medicine. I have been used to relieve pain and to treat burns, wounds, colds, sore throats stomachaches, headaches, fevers, insect bites, and swelling. Wow!

What does fire do to me? My stems and leaves are burned by fire, especially if the fire comes through in summer or fall, when my leaves are brown and dry. Fires hardly ever kill my underground stem, so I can easily resprout. My roots are even tougher than my underground stem, so fires hardly ever damage them.

Life After Fire: I sprout very soon after fire, ready to use the nutrients in the ashes. I usually grow my best crops of leaves and flowers in places that have burned in the last few years. When shrubs and trees grow over me and shade my leaves, I don't grow as well. I come up year after year, though, ready for another fire and another chance to show off my bright yellow blossoms.

Bald eagle

Do I look bald to you? I should hope not! My head is covered with white feathers. A long time ago, the word "bald" meant white. Perhaps that is where I got my silly name. My scientific name is *Haliaeetus leucocephalus*, which means "sea eagle with a white head". At least that name makes sense.

Bald eagles are found throughout North America near rivers, marshes, lakes, reservoirs, and coasts. As you probably guessed, I love to be near water. I also like to have old-growth forest nearby because big trees make good places to nest and *roost*—a roost is a place to sleep and rest. Bald eagles live all over North America, and we respond to the seasons differently depending on our habitat. In places where you can fish all year, we may remain in the same place year-round. If we nest in places where the water freezes over or other prey animals hibernate, we're likely to *migrate* south for the winter. I spend my summers up in Alaska with lots of other eagles, but I fly down to the Missouri River country for the winter.

Starting out: Up in Alaska, my parents prepared for my birth by spending a whole month in early spring building a nest out of sticks and twigs. Our nest was gigantic—about 2 meters wide, weighing more than 1000 pounds. That weighs about as much as 12-15 kids put all together! Once the nest was built, my mother laid 2 eggs and my parents *incubated* them for about 35 days. By sitting on the eggs, my parents kept us warm and protected us from predators like squirrels and ravens.

Finally, after about 5 weeks, my brother and I hatched. We were completely helpless. Our eyes were partially closed, and our legs couldn't even support our weight. Even our soft, downy feathers did little to keep us warm and nothing to help us fly. We depended on our parents for everything.

Because we were such fast growers, we were always hungry. Our parents had to hunt constantly to bring us food. It only took me 6 weeks to grow from a tiny eaglet to be the size of my parents. Finally, when my brother and I were 3 months old, we were strong enough to learn how to fly. We stayed with our parents for one more month though, so we could learn how to hunt. Then we were on our own!

Mmm, fish: Fish are my favorite food. That is why I spend so much time near water. I am a great fish hunter. My eyesight is much better than yours. Imagine being able to spot a little fish from across a football field! Those fish must be so surprised when I swoop down at 100 miles per hour and snatch them out of the water! But I don't always fish for myself. Sometimes when the fishing isn't going well, I'll steal a meal from other birds. I might harass ospreys or other eagles until they drop their catch, or I might just grab my meal right out of their talons.

Fish are my favorite food, but I will also eat birds, reptiles, amphibians, small mammals, or

carrion—dead or decaying flesh. I simply eat whatever is available. I guess I have earned my reputation as a *scavenger*.

Growing up: Once I learned how to hunt, I left my parents' nest. I still hung around with other eagles so I could learn some more hunting skills, and of course I practiced some fish thievery. I made a lot of mistakes in my first few years. Many times, I tried to snatch a fish out of the water but missed, and then ended up swimming to shore. How humiliating!

When I was a youngster, my head and tail were brown like the rest of me. It took about 5 years to develop the white head and tail that mark me as a bald eagle. Because I am a female, I grew bigger than my brother. My wingspan is more than 2 meters from tip to tip. That is a much longer distance than humans can stretch out their arms.

Migration time! In the fall, when the lakes and rivers begin to freeze up in Alaska and the fish can hide under the ice, I fly south where it is warmer. I have to travel thousands of miles to find a place where food will be available all winter. Because I have to go so far, I don't want to flap my wings the whole way. Instead, I look for a free ride on the air currents that flow over the mountains in the fall. If I find a thermal or a dense wave of air formed by the wind, I might glide south for miles without flapping my wings

There are many winter destinations to choose from, but I chose the Missouri River country. From the middle of October until late winter, you can find me perched on a cottonwood tree or hunting along the river. I love to hunt near Gavin's Point Dam on the border of South Dakota and Nebraska. Have you seen me there?

Time to start a family: When I was 5 years old, I found a mate. I will stay with him for life. We started building our nest in early spring so I could lay our eggs in May. We had to work quickly, because Alaska has such a short summer. We chose a great big dead tree next to a river to support our nest. We will use this nest year after year, adding new sticks every spring. Maybe someday it will get as big as my parents' nest. We will mate almost every year. Over our 25-year lifespan, we can have a whole lot of eaglets!

Fire and me: I don't worry much about wildland fires. I'm not concerned about getting burned because I can fly away. Luckily, during the months when I'm taking care of eggs and eaglets, my habitat up north is moist and unlikely to burn. Fire is more likely in late summer.

If a fire burns through the places where I live, I might like it because it could make more broken or dead trees to use for my nest, and it might encourage the grass and wildflowers to grow. I don't eat the flowers, of course, but mice and jackrabbits do. And when they get all the food they need, they're fat and juicy, and I get to eat them! But I wouldn't like a fire if it burned the nest I've built up for so many years or if it messed up my favorite fishing spots. If the river gets too warm or too muddy for fish, I'll have to find a new place to live for awhile.

Back from the brink of extinction: About 50 years ago, there were very few bald eagles left in the United States. One of the reasons that bald eagles became so rare was because they were harmed by pesticides that were sprayed onto plants. Chemicals in the pesticides were accidentally eaten by small animals, and then eagles ate those animals. These chemicals moved up the *food chain* and eventually harmed the adult birds and their eggs. Fear that the bald eagle would disappear forever caused the species to be protected by the Endangered Species Act and the harmful pesticide to be banned. Protecting the bald eagle was a huge success. Today, there are more than 10 times as many bald eagles as there were 50 years ago.

Bison, Buffalo

When you think of prairie, you should think of bison. Bison are BIG in almost every way. We're the biggest animal native to North America, and we eat huge quantities of food every day. Before the late 1800s, we migrated across the prairie in herds with thousands of bison. And we have a big influence on all the plants and animals that share the prairie with us, including people.

Big, brown, black-horned:

That's a good way to describe me. A grown-up bison bull can weigh a ton and stands nearly 2 m at the shoulder. Cows like me are about half that size, but don't think we're small. We might outweigh a grown human by a thousand pounds.

All of us have black, curved horns and a big hump of muscle across our shoulders. We are very strong. We can run about 60 km per hour, travel 80 km in a single day, and swim across rushing rivers. We need this strength because we are often on the move, looking for food.

Eating the prairie: I eat about 14 kilograms of food a day. I'm not picky. My diet might include 20 or 30 plant species—wildflowers, berries, even tree branches. But grass is my main food. A herd of bison puts away tons of grass. We would eat nearly everything in sight if we stayed in one place, so we are traveling animals. We graze our way across prairies, hills, and valleys, always seeking fresh grass.

In April and May, my herd of cows and young animals nearly always goes to the same valley to have our calves. We need a place where the grass is already green and nutritious, water is plentiful, and we can see long distances, watching for predators. After most of the calves are born, we begin our summer travels, moving across the prairies in search of food, stopping in one place for a few hours or days, then moving on.

In summer, food is abundant and life is easy. We often graze in the morning and late afternoon, resting through the hot part of the day and chewing our *cud*. That's food eaten earlier in the day that we bring up and work on for a second time! Life would be perfect, except for flies. They buzz around our ears and bite us around the eyes and nose. This can make life miserable unless we find a *wallow* to roll around in, where we get a thick covering of mud for protection. If there's no mud available, the dust in a patch of bare soil will do. We might create a dust wallow ourselves by stirring up the dirt with our hooves. We sometimes move into a grove of trees so the shade will cool us down, but it seems there's no hiding from the flies.

By the middle of summer, we begin looking for mates. Many cow-calf herds, like mine, come together with groups of bulls for a few weeks, so you might find thousands and thousands of bison in one place. Then fall approaches, and the smaller herds disperse again, looking for food.

Winter is an uncertain time for us. Some herds move west to the edge of the mountains, where aspen groves protect us from storms. Others stay out on the prairies, perhaps close to a river bottom in case we need the shelter of cottonwoods and shrubs. We move as often as necessary to find food, using our huge heads to sweep the snow aside from the grass. We add the branches of shrubs and trees to our diet. It's important to keep the herd together so we can watch for predators and use each other's bodies to shelter us from the biting, wind-driven winter storms.

Providing for Everyone: We bison don't just eat our way through life without giving something back to the world. You already know about the predators and scavengers that feed on us. Before Europeans settled on the prairies, bison provided almost everything for the people who lived here. Our meat is very nutritious—much better for you than beef. Our coats provide warm clothing and skins for tipis. Bison bones can be used to make tools and weapons. Our horns can be used to carry things, including the coals for fire, as people move from one camp to the next. Our dung makes good fuel for campfires. Almost nothing of the bison is wasted in the Native American way of life.

Some people think prairie is boring—mile after mile of grass, all the same. That is so wrong! The prairie has a lot of variety, and we help keep it that way. Bison wallows hold water long into the summer, so moisture-loving plants often grow there. We carry seeds in our thick, brown hair, dispersing them as we travel. We eat seeds but don't digest them very well, so we deposit them along with fertilizer in our dung—which is then eaten by insects and prairie dogs. We rub our horns on tree bark, especially during the mating season. This can kill the trees and keep them from spreading too far into our precious prairie. Because we eat up the fuel for surface fires, our feeding patterns may even change the pattern of fire spread.

HISTORY: Before the mid-1800s, millions of bison lived in the grasslands from Alaska to Mexico. In the United States, bison were hunted almost to extinction in the late 1800s. A few hundred were protected on Native American lands and in nature preserves, and today's herds descended from these protected animals. Thousands of bison live in the United States today, but they can no longer migrate at will across the open prairie.

Fire is essential to the life of the prairie. A fire every few years increases our food supply and removes the shrubs and trees that like to spread from gullies and forest edges into the prairie.

Because we're such great travelers, we can usually get out of the way of prairie fires. Sometimes we just stand around the edge, waiting for the flames to die down. We soon move in to eat the nutritious new growth—which is much easier to find after fire has burned away the tough old stems and litter. We also help plants grow back into a burn by distributing seeds on our coats and in our dung.

We like to graze in recent burns, but we'll move on after a few days or weeks, then visit again next year. In a couple of years, this will look just like the rest of the prairie. It will be ready to burn again.

LIFETIME FACTS: Bison must always be ready to travel. Their calves are able to stand within half an hour of birth. In a few days, they start to eat grass alongside their mothers. Within a couple of months, they develop little horns and a hump of muscle begins to form across their shoulders. They can mate when they're 2 to 4 years old. A cow has one calf every year or two; twin bison are rare.

Bison might reach the ripe old age of 20 or 25, but most die before then. Wolves and coyotes thin the herd during the winter, and many may starve or freeze to death. Eagles, vultures, ravens, and magpies feed on bison carcasses. Grizzly bears come out of hibernation in spring, and winter-killed bison are often their first meal. They also hang around during calving season, looking for a tender meal.

Black Bear

Den mother. I began life in my mother's winter den in the mountains. My mother started preparing for my arrival several months before I showed up. She searched for a good place for a den. This could be a cave, a place with thick shrub and soft earth, a sheltered spot under fallen trees, or a hollowed out tree. When she finally found a spot that would fit all three of us (Mother, Brother, and me), she cleared enough space and lined the den with grass and rotten wood so it would be cozy all winter.

Mother entered the den late in the fall and went to sleep for a long time. She woke up when we were born, in the middle of winter, but went right back to sleep after cleaning us up. She must have been tired! Inside the den it was dark, but it was also warm and snug against the harsh winter weather. What a comfortable, safe place for my brother and me to be born!

A small start: This may be hard to believe, but I was about the size of a rat when I was born-- much smaller than you were. I was totally helpless, too. I was blind and didn't have any teeth. My brother and I stayed inside the den for the rest of the winter, nursing and growing. By the time I was strong enough to walk and keep up with Mother, it was springtime outside, time for us to see what food the melting snow might uncover.

Mother taught me all about food. My brother and I followed her everywhere, carefully watching what she ate.

Did I tell you I'm an *omnivore*? I love to eat grass, flowers, and seeds, but I'm not at all picky. I'll also eat insects, mushrooms, and small animals—dead or alive. If I find garbage lying around outside, I'll eat that too. In fact, I'm a master burglar when it comes to garbage cans, coolers, and backpacks. Don't leave them anyplace where I might find them!

What Mother taught us: Wet meadows provide juicy new grasses and horsetails in the spring, when not much else is up. As the weather warms and the snow melts in the mountains, foothills, and forests, wildflowers like spring beauties and glacier lilies cover the hills and meadows. I forage on the flowers and dig up some yummy roots, but that doesn't fill me up. Luckily, insects also begin to emerge, so I fill up on grubs, ants and beetles.

Throughout the summer, all sorts of berries ripen—bearberries, Saskatoon serviceberries, rose hips. I like them all, but I'm especially fond of sugar-filled *Vaccinium* berries. In places where oak trees grow, I gorge on acorns.

In the fall, I sometimes move to places where the limber pines and whitebark pines grow. Their cones are full of high-energy pine nuts. Since I'm a good climber, I can climb up and get the nuts right out of the cones. But it's easier to let squirrels climb the trees for me, and then eat from the cones they collect. They stockpile cones on the ground in caches called *middens*. Most of these middens are in dense forests where pines are mixed with spruce or fir trees, so that is where I go. When I find a midden, I just help myself... finders keepers!

I can find a meal almost anywhere. An ant colony in a decaying log, a boulder swarming with mating ladybugs, honey in a bee tree, even the rotting carcass of an elk that

didn't live through the winter—they're all food for me!

Fat is where it's at! Why am I constantly eating? For a bear, storing up lots of fat makes the difference between life and death. By eating as much as possible when there's plenty of food around, I'm well prepared to make it through the winter when all my food has vanished beneath the snow. You could say I store my winter's food supply right on my body.

If I have enough stored fat, I can go for nearly six months without eating or drinking. How? I go into a deep sleep. This sleep is similar to hibernation, but I am able to wake up at any time to take advantage of warm winter days. This kind of sleep is called *torpor*. During this time, my body changes stored fat into the energy I need to stay alive. Nothing leaves my body, because my wastes are recycled. Amazing, isn't it? I'm totally inactive during this time; I don't move much except to get more comfortable. When spring comes, I might have lost a quarter of my weight, but my muscles are still as strong as ever.

Fast food. So bears have a challenge from spring through fall: to quickly put on as much fat as possible. Moving around between little snacks uses too much energy for the amount of fat gained. Finding lots of high-energy food in one spot is much more efficient. The tricky part is knowing exactly when and where to look for large concentrations of food. Another lesson from... guess who? Teacher Mom, of course!

When you're willing to eat anything, many places provide good food: shrub patches, avalanche chutes, wet meadows, and hillsides, and river bottoms. I just hang out and eat until all the food is gone. I wake up before sunrise to start eating, I usually take a nap for a couple of hours in the middle of the day, and I'm often in bed soon after sunset.

My family and I cover lots of ground to check out our traditional feeding areas. Sometimes we roam over one hundred square kilometers searching for food.

Big two year-old. I'm into my second year of life now, and look at me! I weigh almost 100 kilograms. How much did you weigh when you were two? My brother and I take care of ourselves now. Our mother will find a mate when summer begins and have more cubs, so this will be our last spring together. My brother and I might stay together for a few years. When I'm 4 years old I'll be ready to mate and start my own family. If things go well, I'll have a pair of cubs every three years or so. Over my 20-year life span I might have 15 cubs if I'm lucky.

FIRE FACTS: A wildland fire is no problem for a black bear. It just moves away from the fire and wanders somewhere else to find food. Within its large home range, there are always unburned areas to explore.

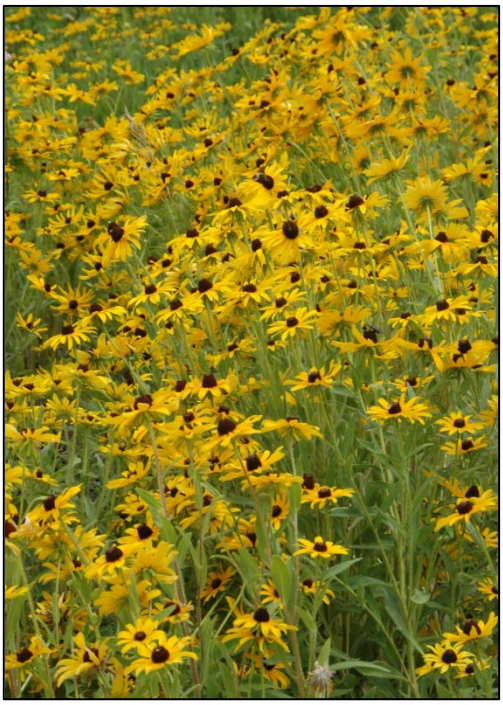
Fires create one of the black bear's favorite feeding spots—a berry patch. It doesn't take long for a burned area to grow into a brush field loaded with berries. Decades later, the same spot is likely to be a dense forest.

Forests with a patchwork of burned and unburned spots are ideal black bear habitat. A bear can feed in the openings but has the cover of trees nearby, providing a safe spot for rest and sleep.

Did you know that black bears are a threatened species in South Dakota? If you see a black bear in the Black Hills, consider yourself lucky!

Black-Eyed Susan

I am an *herbaceous* plant. I dot the plains with my bold golden flowers. My scientific name is *Rudbeckia hirta*. The word *hirta* refers to the hairs found along my stem. Funny that my scientific name refers to my hairs rather than my showy flowers!



Where do I live?

I can be found throughout North America, especially east of the Rocky Mountains. I can I grow in open forests and mountainous meadows, but I prefer to grow in grasslands. I simply love the sun; that is why the Missouri River country is a perfect place for me. When conditions are just right, I can grow into a field of gold, dotted with dark brown spots.

What do I look like?

When I grow in a perfect spot, I can be 1 meter tall, but sometimes I am quite a bit shorter. I have leaves clustered near the ground and also along my stem. At the top of my stems are my beautiful golden flowers with brown centers. Do you think my flowers look like brown eyes?

My roots can take different shapes. Sometimes they form a delicate cluster below the soil surface, and sometimes they form a strong *taproot* that grows deep into the soil, reaching for water.

Growing Up:

I start growing from seed as soon as it is warm outside. I pack a lot of living into a short time. In some places, I am an *annual,* meaning that I can produce stems, roots, leaves, flowers, and seeds all between the last frost of spring and the first frost of fall. That is a lot of work for just one summer! In other places, it takes longer to get all this work done. In most places, I grow as a *biennial*—living for 2 growing seasons. I usually spend my first year growing strong roots and a cluster of leaves close to the ground, a *rosette*. I wait until my second year to produce stems, flowers, and seeds. If it takes more than 2 years to do all this, people call me a *perennial* plant.

Growing Points:

I have growing points in my roots and on my *root crown*. That is the place, right at the surface of the ground, where my stem meets my roots.

How do I reproduce?

I reproduce from seeds. In the spring, if I am growing as a biennial or perennial, I sprout new leaves and stems from my root crown.

My calendar: In the Great Plains, I start growing in the spring and can begin flowering as early as May. But early to mid-summer is when you are likely to see me in full bloom, when it looks like blankets of gold have been tossed over patches of the prairie. At the end of the summer, my seeds ripen and fall to the ground.

When I grow as a biennial or perennial, I don't flower in my first summer. Instead, I use my rosette of leaves to make nutrients that are stored through the winter in my root crown. Then I wait patiently for spring, when the stored food will help me get a head start at flowering and making seeds.

Am I useful?

While I am blooming, it seems like I have a never-ending stream of visitors. My flowers produce sugary-sweet nectar that butterflies, bees, and other insects can't seem to resist. I do not mind sharing, because when my visitors are drinking my nectar, they get pollen all over themselves. They carry this pollen along when they move on, and some of it will *pollinate* the next black-eyed susan they visit. This is how pollen from the male parts of a flower gets to the female parts to make a seed.

Deer and cattle like to eat me, and many small animals like ants, spiders, and beetles use me for shelter.

Because I can grow quickly in soil that has been stirred up or plowed, I grow well along roadsides, and people often plant me in places where they can't get other plants to grow. People also plant me in their gardens—I don't blame them—I am very nice to look at.

What does fire do to me? My stems, leaves and flowers will burn in a wildfire, especially in fires that sweep through the prairies in the late summer, when I am all dried out. Sometimes my root crown may be killed in the fire, but it often survives, so I can sprout the following spring and soak up all the sunlight that's available after fire clears out some of the tall shrubs and trees.

Life after fire:

Wildfires can be good for me. Places that have recently burned can make great nurseries for my seeds to take root. Open, warm soil is the perfect place for me to grow, especially in years when the soil is moist. I am quick to take advantage of the sunlight and get established before the other plants can shade me out.

But sometimes I don't do well after fires. I may be more sensitive to fires that come while I am busy growing my leaves, stems, or flowers. I usually prefer the fires that burn after I have finished growing for the season.

Botanical Fact: Black-eyed Susans are considered long-day plants –or short-night plants. They flower when they detect shortening nights in the spring and early summer.

Black-tailed Prairie Dog

In spite of my name, I'm more closely related to squirrels than to dogs. I'm a *rodent.* I'm about 35 cm tall, and I weigh a little over a kilogram. My coat is tan, but the tip of my tail is black, just as my name says. There are five species of prairie dogs in North America and none on any other continent. We live in grasslands all the way from Canada to Mexico. The most important thing about prairie dogs is *we're never alone*.

Another name for me is "mountain gopher."

Townhomes and condos: We live in *towns* that have all the streets and homes underground. A prairie dog town can hold thousands of animals and cover an area bigger than a football field.

A prairie dog town contains a complicated network of burrows, and each burrow is home to a large, extended family of prairie dogs. My family's burrow contains many interconnected tunnels and rooms. We have nursery rooms, sleeping rooms, even toilet rooms! We spend many hours digging, building, and rebuilding our home.

Our burrows have many entrances, so we can easily go out to search for food and run back to hide from predators. It's easy to find the main entrance to our burrow. Just look for a ring of dirt piled up as tall as me and packed hard by all of our little noses and feet.

Little town on the prairie: Prairies are the best places on earth for me. Where else could I find so much grass? That's my main food. I eat my weight in grass and other plants about every 10 days. I feed a lot near our burrow. This keeps the grass short so we can watch for danger. I also feed around the edges of town, but I stay close enough to hear the alarm call and dive into the burrow if someone barks a warning.

Our town is on land that's fairly level. It slopes just a little toward the south, so we get some solar heating during the winter. We are all soil experts. We know just what kinds of soil are likely to hold up as we burrow into them. We wouldn't want to dig a big network of burrows and then have them collapse on us when the soil gets wet or dries out, or when we have a visit from one of our larger neighbors, like a bison!

Prairie dogs are engineers, remodeling the prairie from above and below to meet our needs. We change the vegetation, stir and mix the soil, and add fertilizer to the ground. A few years after we establish a town, it starts to look different from the surrounding prairie. It has shorter grass, more wildflowers, and more small shrubs. Burrow entrances and patches of bare soil become obvious. It may also be

noisier than before we came, because one of our duties is to stand sentry. Sentries usually stand up tall on the entrance mounds. If they spot a predator, they warn the whole town with a sharp whistle or bark, then dive into the burrow for safety.

Family life: I was born in the spring inside my family's dark, warm chamber. Two brothers and two sisters were born along with me. We were helpless at first. We relied on our mother for milk, warmth, and protection. We couldn't even see until we were about a month old. When we were 2 months old, we got to go "upstairs" to see daylight and start looking for our own food—grass, grass, grass, a few wildflowers, and more grass. Now that we're five months old, we're nearly grown up. We forage in the mornings and evenings, and spend hot afternoons down in the burrow, resting from the bright sunlight. If the weather is cloudy, we might be out all day long. If it's rainy, we go in. We hate to get wet!

To find my way home in the maze of burrows within our town, I learned the "prairie dog kiss." I come up close to another dog and touch its teeth. If the other dog smells and tastes like home, I know I'm welcome there. If not, I leave fast, for I'm likely to be chased away.

Prairie dogs have trouble finding enough grass to eat in the winter, so we add small shrubs to our diet, and we eat a lot of underground plant parts. Roots and rhizomes are not just "buried treasures" for plants; they're buried treasures for us when aboveground food is scarce.

Many prairie animals worry about finding water, but that's not a big problem for us. We like to be near a river or stream, but we don't have to drink there every day. We can get much of the water we need from juicy prairie plants. Prickly-pear cactus is an especially good water source.

When my brothers and I are 1 or 2 years old, we'll move out and start our own families. Our sisters will stay near home to raise their families. We might live 3 or 4 years. Few of us will live longer than that.

If we build it, they will come: Nearly half of the birds and mammals of the prairie use our towns for food or shelter. Bison, elk, and pronghorn graze here because our constant feeding keeps the grass fresh and nutritious throughout the summer. Bison like to wallow in our mounded entryways. The mountain plover, a small, tan bird, makes its shallow nest in the bare soil. Burrowing owls nest in our burrows. Sometimes we collect their eggs as rent!

Like all small mammals, we often provide food for someone else. Hawks, eagles, and owls may dive out of the air for a prairie dog lunch. Foxes, coyotes, and bobcats may make a meal out of us, but they must be very fast to catch us before we dive underground. Even there, we're not completely safe. Badgers and rattlesnakes hunt us in our burrows, and we have a very healthy respect for the black-footed ferret, our most formidable predator. Ferrets are especially fond of eating prairie dogs, and they're very good at catching us. They explore our burrows to hunt us down. They even raise their own young in our burrows, right in the midst of town! One family of ferrets needs about 1,400 prairie dogs per year to stay alive. That's nearly 4 *each day!* Yikes! You can see why we're always on the alert for this predator.

Fire: Anything that is a friend of the prairie is also a friend of the prairie dog, so fire is our friend. It encourages the grasses and wildflowers to grow, and it kills off the trees that might otherwise spread into our towns.

Our burrows protect us from fire. Because our towns have a lot of bare soil and we keep the grass trimmed short, fires don't usually burn very long here or produce a lot of heat as they pass over. If a fire does come through, the grass must sprout back quickly or we'll have to find a new place to live. We sometimes build a new town in a recent burn because the fire has cleared away the shrubs and made the sprouting grasses more nutritious.

Bur oak

When you think of large, beautiful trees dotting the prairie, I hope you think of me. My common name is bur oak, but some people call me mossycup oak because my acorns look like they have fuzzy moss growing on them. My scientific name is *Quercus macrocarpa.* That refers to my large acorns, sometimes as big as golf balls.

Where do I live? I can make my home in 36 of the 50 United States. You can find me up north in Canada, way out east in Maine, and down south in Mexico. I can grow in woodlands and forests, prairies, and river bottoms. Pay attention if you spot many of us scattered across the prairie; this kind of habitat is called an *oak savanna*.

I have different neighbors in different parts of my homeland. In the prairies of Missouri River country, grasses often grow all around me, a green blanket covering the deep soil that I love. In the Black Hills, ponderosa pine is one of my neighbors. When I grow along rivers, you'll probably find chokecherry or Saskatoon serviceberry nearby.

What do I look like? I am a tree that can grow up to 40 meters tall. My size depends a lot on my water supply. When I grow where there is a lot of water, I can be very tall and have a wide, rounded crown. From far away, my shape looks like a big stem of broccoli! But if I live where it is dry, I may be only 5 meters tall—or I may even take the shape of a thick shrub with crooked, gnarled branches.

My large, wavy leaves are green and shiny on top but covered with white hairs underneath. I grow new leaves every spring. They turn brown in the fall and fall off, usually a few at a time, throughout the winter. This makes me a *deciduous* tree.

My roots extend deep and wide. Sometimes they reach 4 meters down into the soil and just as far out into the prairie from my trunk.

Growing Up: I start growing from seed soon after my acorn falls from the tree. While I'm growing up toward the sun, I'm also growing a long root deep into the soil as fast as I can, so I'll be able to reach water during the weeks or months when it doesn't rain. In my first growing season, my taproot can reach 1.5 meters down, and my sideways roots may reach nearly 1 meter away from my trunk. This huge network of roots helps me survive in dry places, where few other trees can grow.

Growing Points: I have growing points inside my bark (in my *cambium*), at the tips of my branches and roots, and in my *root crown*. That is the place, right at the surface of the ground, where my stem meets my roots.

How do I reproduce? I have to be about 35 years old before I can make acorns. How do I do that? By growing two different kinds of flowers on the same tree! My

female flowers produce eggs, and my male flowers produce pollen, which contains sperm. After my female flowers are *pollinated,* they develop a tiny, tiny oak plant packaged in the acorn, which might be a couple of centimeters across.

I can also sprout new stems from my root crown if my stem and branches are damaged.

My calendar: My leaves unfurl from their buds in the spring. Soon after my leaves appear, I produce male flowers. After their pollen has flown off on the wind, my female flowers come out, receive pollen from other trees, and develop acorns. My acorns ripen throughout the summer, and they fall to the ground between August and November.

Am I useful? It seems like everyone loves to eat me! Black bears, deer, squirrels, and deer mice eat my acorns. Deer and elk, cattle and goats browse on my leaves and stems, especially in fall and winter. Sharp-tailed grouse, wild turkeys, woodpeckers, and other birds like my acorns too.

I am also very important to many species of butterflies and moths. In Canada, I am the only food that caterpillars of the barrens dagger moth can eat. Imagine what would happen to the moth without me!

Many kinds of birds use me for shelter. Mountain bluebirds, white-breasted nuthatches, and northern flickers nest in my *cavities.* Those are the holes in my trunk. Wild turkeys also like to nest in the shade and protection of a bur oak.

What does fire do to me? When I am full-grown, fires usually do not damage me. My thick bark protects my cambium from getting too hot. If a fire burns while I am still small, it will probably kill my aboveground stems, buds, and leaves. But that's OK, because it may not kill my roots. I can probably sprout from my root crown even if I'm only 1 meter tall.

Life after fire: Fire keeps other trees from growing in our shade and taking over our habitat, and it keeps us from shading out the prairie grasses and wildflowers. But it is possible to have too much of a good thing. If my home is burned very often, my seedlings may be killed or not have enough time between fires to sprout new stems and strong roots. My reaction to fire is hard to predict, and scientists are trying to learn more about it. Maybe you'll be able to help!

Bur oak, past and present: Bur oaks are not as common or widespread as they once were. Native Americans of the Great Plains probably helped maintain oak savannas by setting fires. Nowadays, with so many people living in my home and farming the land, with cattle grazing all around me, and with fire a rare visitor, it's harder to survive and grow new trees.

Even though there are fewer young bur oaks than there used to be, some have been around for so long that they serve as "witness trees". These old trees have seen the people, plants, and animals change all around them. In prairies farther east, some bur oak witness trees were marked to help map the land.

Chokecherry

I am a small, shrubby tree. My name suggests that you would choke on my cherry-like fruit, but that is not true. Your face may pucker due to my sour flavor, but choking is surely an exaggeration.

Where do I live? Chokecherries are found throughout most of the United States and Canada. There are three kinds of chokecherry and all of us share the scientific name, *Prunus virginiana*. You can find all three types somewhere in the Missouri River country, but black chokecherry is the most common. I often grow along river banks, floodplains, and stream beds, but I am also found on hillsides and in forests. Depending on where I am growing, you may find me living with plains cottonwood, willow, bur oak, aspen, and Saskatoon serviceberry. You might even find me with conifers like ponderosa pine and limber pine.

What do I look like? I can be a small tree or a large shrub. This means that when I grow like a tree, I have 1 main stem, but when I grow like a shrub, I have many stems sprouting from my base.

I can grow up to 6 meters tall, but I am usually about 4 meters tall and 5 meters wide. That gives me kind of a round shape—I'm about as tall as I am wide.

I have a huge network of roots; they can grow 2 meters deep and 10 meters out from my base. Since I have many branches and often grow together with other shrubs, I can form dense thickets. You'll have trouble walking through these tangles of leaves and branches!

My white flowers grow in long clusters and smell very sweet. My fruits look like ropes of small reddish or blackish cherries.

Growing Up: I start growing from seed, but I also grow *rhizomes.* These are underground stems that grow horizontally and can sprout new plants.

I can grow in the shade of bigger trees, but I grow best and thickest on the edges of forests, openings, and other places where I can get lots of sun. That's why I

love the Missouri River country, where I live in places with lots of sunshine, a few trees or shrubs as neighbors, and a little shelter from wind and snow.

Growing Points: It seems like I have growing points everywhere! I have growing points at the tips of my branches, in the buds that produce leaves and flowers, on the tips of my roots, on my rhizomes, and on my *root crown*. That is the place, right at the surface of the ground, where my stem meets my roots.

How do I reproduce? I can reproduce from seeds or from my underground rhizomes. Inside my cherry fruits are my seeds, which look like cherry pits. My fruits fall to the ground near my trunk. They may sprout there, but they usually don't stay put for long. I'm lucky that many animals eat my fruit because I can trick them into scattering my seeds far and wide. After a bird or bear eats my cherries, it may travel a long distance before pooping out my seeds—all cleaned up and ready to start growing a new plant!

My calendar: My leaves burst from their buds in the spring, and by the middle of June, they are fully grown. In the early summer, my flowers bloom for about 2 weeks, then leave the ground below covered with little white petals. My cherries ripen in July or August, and my leaves and seeds begin to fall in September. By the end of autumn, most of my leaves have fallen. That makes me a *deciduous* tree.

Am I useful? I provide food and shelter to many animals. My fruits, leaves, and twigs are eaten by bears, coyotes, pronghorn, elk, deer, and many small mammals. Birds also love to eat my cherries. Cattle and sheep eat me too, but they have to be careful because my seeds, leaves, and bark are poisonous if too much is eaten at once. My thick growth provides important cover for many mammals and birds.

My roots help hold streambanks in place, and my leaves and branches provide shade to keep stream water cool in the summer. This way, I also help fish survive and reproduce.

What does fire do to me? My aboveground stems, buds, and leaves are usually killed by fire. But that's not a problem because I can sprout new stems from my root crown. In fact, after a fire I often grow even more stems than I had before the fire. Even if my root crown is damaged in a fire, chances are, I can still sprout from my rhizomes. It pays to have so many growing points!

Fires can also help me by heating up my seeds. No, it doesn't cook them. It only breaks apart my tough seed coat, making it easier for them to grow new plants.

Even though I usually benefit from fire, it is possible to have too much of a good thing. If my home is burned very often, my seedlings may be killed or not have enough time between fires to sprout new stems and strong roots. This means that, with frequent fires, woody shrubs and trees—like me, won't creep out onto the prairie and grasslands won't be slowly changed into shrublands and forests.

Food and medicine:

Chokecherries have been an important source of food and medicine for thousands of years. The fruit was a staple food of Native Americans in the plains and the Rocky Mountains. Chokecherries can be eaten fresh, dried and preserved whole, made into cakes or mush, or crushed and used in pemmican, a mixture of dried meat, fat, and fruit. The harvest of chokecherries was so important to the Dakota people that they named July, the month when cherries are ripe, *Chanpa-sapa-wi*, which means "blackcherry moon".

Chokecherries can also be used to treat cold sores, sore throats, and diarrhea. The stems and bark can be also boiled into different teas to treat fevers, colds, or diarrhea.

Clark's Nutcracker

I am named for the famous explorer Captain William Clark of the Lewis and Clark Expedition. During late August, 1805, Clark recorded watching a flock of robin-sized, gray and black birds. They were cracking open pine cones. It is amazing that he should witness the one activity that is so important to my way of life! Every year when late summer and early fall roll around, you'll find me hoarding pine nuts. When the cones are ripe, I spend all day, every day, selecting and burying these big seeds from pine trees. Only when most of the cones are harvested do I finally take a break. Whew!!

Nuts about Nuts. Why am I so nuts about pine nuts? My life revolves around those big brown seeds. Nuts are my major food through most of the year.

But pine nuts are on the trees for only a short time in the summer and fall. How do I manage to eat them during the rest of the year? Well, if I work really hard, I can collect and hide a whole year's supply in a few short weeks. Here's how it happens:

Searching for nuts. I spend my time searching for pine seeds throughout the forests. My favorite kinds are the big ones that come from trees growing up high or in dry, rocky places. That's why my favorites are limber pine and whitebark pine. But I'm not picky. I'll eat seeds from many other trees, including ponderosa and pinyon pines. Since I'm not a picky eater, I usually don't grow hungry, even when my favorites aren't available.

Limber and whitebark pines produce cones that are perfect for nutcrackers. The cones are very slow to open. They hold tight to the seeds inside, as if they're waiting for someone to help them distribute the seeds.

That's easy for me. I can pry those cones open with my long, chisel-shaped bill. Once I have broken into the cone, I use my bill like a pair of tweezers to pluck out the waiting pine nuts. One by one, I collect them in my mouth. But I don't eat them. Instead, I send them on a detour. The nuts go into a specially designed pocket, called a *sublingual pouch*, under my tongue. Only nutcracker species have these pouches, and the biggest one belongs to me! My pouch lets me collect and carry lots of pine nuts at one time. My pouch can stretch until I've stored more than 100 limber pine nuts. Now where am I going to put all of them? My winter meals depend on how well the nuts are hidden.

Hide and seek. The spots where I hide my precious seeds are called caches. I cache seeds in lots of places, but open areas work best. Windswept ridge tops and recent burns are great spots because snow melts off quickly in the spring. I also like to hide seeds along the edges of the prairie. I might fly 30 kilometers or more to bury my treasures. A full pouch is a very heavy load. Lucky for me, I'm a strong flyer.

As soon as I pick a place for a cache, I go right to work hiding seeds. I use my bill to stir up the soil just enough to make a small hole.

Then I bring up pine nuts from my pouch and poke them into the same hole, one by one. Once I've stuffed in 3 to 15 seeds, I cover them up and move a short distance to make another small cache. I keep repeating this until my pouch is empty. Then it's off to get more seeds.

When I'm all done harvesting for the year, thousands of my seed caches are scattered in openings throughout the mountains and along the edge of the prairies. I've buried maybe 20,000 to 100,000 seeds . How am I going to find them all? Easy! I have a super memory! By remembering patterns made by rocks and logs and trees, I know where to look for a seed cache.

Safe and sound. I won't find all my seed caches, but I'll remember enough to support me through the winter. I'll even remember enough to support a family. In February, when my mate and I start nesting, our forest is still a winter wonderland. We depend completely on buried seeds to feed our young. In fact, buried pine nuts are our nestlings' main food from birth until the new nut crop ripens in late summer. Don't worry! Our young will have plenty to eat. Windy ridge tops and rocky openings are often blown free of snow in the winter, so I can find those caches easily. If deep snow covers a cache, I can always tunnel down through the snow and still be right on target.

Most caches are safe from animal burglars. Red squirrels know better than to rob a cache buried out in the open. A golden eagle might have that squirrel for lunch!

Tough old bird. So I'm all set to live where the limber and whitebark pines grow. But a lot has changed in the two centuries since Captain Clark came through. White pine blister rust is changing the forests where I live. This fungus arrived in North America from Europe in 1910 and is killing many limber and whitebark pine trees. There have been a lot of mountain pine beetles recently, too, and they damage many of the pine trees that supply my food. There are fewer pine nuts now than there were a hundred years ago. My tough life has become even tougher.

FIRE FACTS: Clark's nutcrackers can easily fly away from fires. By the time fire season comes around, they have finished nesting and their young can also fly well enough to escape.

Limber and whitebark pines often live in windy, rocky places. Sometimes there's not enough fuel on the ground to carry a fire. But if a fire does get started and the wind comes up, the flames are likely to get into the tree tops and kill many trees. That wipes out part of the nutcracker's food supply. It's hard for the birds to find a new stand with trees producing seed. To survive, nutcrackers often fly to ponderosa pine forests looking for seeds.

Although large burns don't produce many pine nuts, they are great cache sites. Nutcrackers carry thousands of seeds into the middle of large burns. Someday the forgotten caches will grow into trees that produce pine nuts for future generations of nutcrackers.

Clark's nutcrackers live wherever they can find pine nuts: in the mountains and foothills, and along the wooded edge of the prairies. In Missouri River country, they can be found in high subalpine forests, ponderosa pine forests at low elevations, prairie edges, and isolated mountains like the Black Hills of South Dakota.

Cottonwoods

You have probably noticed tufts of snow-like "cotton" drifting through the air on summer days. These clusters of soft, white fibers come from the pods where I keep my seeds. When the seeds are ripe, I send them off in a little pillow of "cottonwood down" so they can sail long distances on the wind or float far on the surface of a river. This is how I got my name.

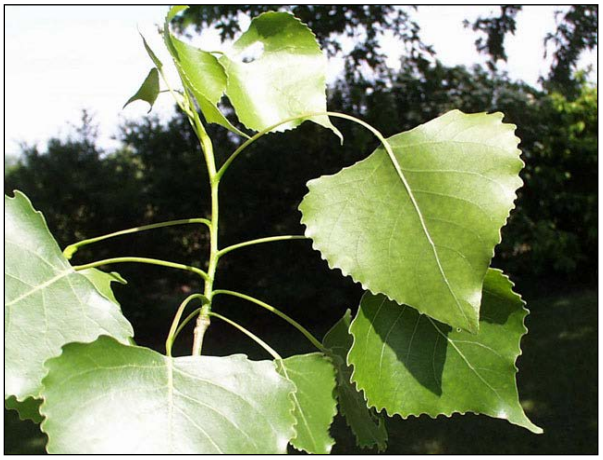
Where do I live? There are many types of cottonwood trees native to North America. In the Great Plains, you will probably notice eastern cottonwood and plains cottonwood. But we all have something in common; we prefer areas with lots of light and water, so we often live next to rivers and streams. If we choose to live in the plains or on a mountainside, you can bet there is moisture underground.

I'm not picky about my neighbors. If there's water available, I don't care if I'm in a forest, shrubland, or prairie.

What do I look like? I am 30 meters tall, and my trunk may be over 5 meters around— so big that two or three children can't reach all the way around. My family members come in all shapes and sizes; when they are full-grown, some are only 3 meters tall, while some are almost 60 meters tall! Some of us have one big trunk, but some are like giant bushes, with many branched trunks.

My leaves are wide at the base and pointy at the tips, kind of like a triangle with rounded edges. I grow new leaves every spring and spend the winter with bare branches. That makes me a *deciduous* tree.

When I am young, my bark is smooth and grayish. As I get older, my bark grows thick and develops deep grooves and wrinkles.



Growing Up: I grow best where light and water are plentiful. Because I have such good taste in habitat, I am often the fastest growing tree around.

BOTANICAL FACT: Eastern and plains cottonwood trees are the fastest growing native trees in North America. Eastern cottonwoods can grow up to 5 feet in 1 year.

I have growing points at the tips of my branches, in the buds that produce leaves and flowers, in my root crown, and on my roots.

How do I reproduce? It takes two cottonwood trees to make seeds, because some of us produce only pollen (which contains sperm) and some produce only eggs (which grow into seeds). This means that only half of us produce "cottonwood down". Some of us can sprout new plants from our roots. If a branch breaks off and gets stuck in the wet sand on a river bank, it can grow into a new tree.

My calendar: My flowers appear in the spring. Soon afterward, my leaves unfurl from big, sticky buds. Sometime between May and July, I release my cotton-borne seeds. They will have the rest of the summer to grow. In August or September, my leaves turn yellow, so a stand of cottonwoods seems to have a golden roof. Then the leaves fall, giving the woods a golden floor.

Am I useful? I provide shelter for many animals: I hide the deer as they come down to the stream to drink. I shade the river, keeping the water temperature cool enough for fish. I provide high branches where song birds can build nests, and my soft inner wood is the perfect place for woodpeckers to make nest holes. I also provide the only natural habitat for fox squirrels that live in the ribbons of forest I create along streams and rivers.

I provide food for big animals, like deer, and tiny ones, including mice. These mammals eat my buds, twigs, and inner bark. My leaves are an important food for the tiny animals living in the river bed, and I protect the river itself by holding on to the soil with my roots.

Plains people have been using me for thousands of years. During the hot summer days, I offer welcome shade. And during the cold winter, saplings can be fed to horses and cattle. In fact, my inner bark and young sprouts have been eaten by people because of my nutritional value and sweet taste. In the Great Plains, where there aren't many other trees, my wood is valued for firewood. Native peoples use smaller trees as lodge poles and for building travoises (a frame used to drag loads over the land). Yellow dye can be made from my leaf buds in early spring. You can also fold my leaves into toy tipis.

What does fire do to me? My buds and cambium are sensitive to heat, so most fires kill the parts of me that live above-ground. Sometimes when I am big, my thick bark protects me from fire. Occasionally, when fires don't kill my roots, I can sprout new plants. But fires often do kill me, so it's good that I usually live in wet areas and near rivers, where fires often skip over and around me.

BOTANICAL FACT: Floods can be good for my health! Even though I can be damaged by heavy flooding, when floods sweep through a riverbed, they clear out the old brush and deposit fresh, moist gravel bars—the perfect place for my seedlings to grow. Sometimes the floods deliver my branches from upstream, and they grow into new trees too!

Coyote

You may know me best by my sharp yips and howls echoing throughout the night. Or maybe you recognize my cunning hunting skills. Or perhaps you have heard stories about us passed down through the generations. Chances are, even if you haven't seen me, you know my reputation as a trickster. Let's just say I'm very, very clever.

As you can see, I am a member of the dog family—that includes coyotes, wolves, and domestic dogs. My scientific name is *Canis latrans,* which means talking dog, maybe because we like to have long, yipping conversations at night. Coyotes are found throughout North America, but I am a special kind—a **plains coyote**. I can be found throughout the plains, east of the Rocky Mountains from Canada to Texas. I'm very much at home in Missouri River country.

Starting out: My 5 brothers and sisters and I were born in the spring. We spent our first 3 weeks huddled in a brushy den with our mom. Thankfully, our father and older siblings helped care for us and brought food for our mom. It must have been hard work caring for the 6 of us! After those first few weeks, we began to venture outside our den. We often moved from one den to another. That made it hard for predators to find us, and to help us avoid some of the parasites that like to live with us. Throughout the spring and summer, our mom showed us where to find food and taught us how to hunt.

Its all about the food: Even though I eat some plants and seeds, I prefer to eat meat. Rabbits and hares are my favorites, but I am not picky—I will eat just about anything! If I am hunting alone, small rodents or ground-dwelling birds will do. But if I am hunting with a pack, we can take down big animals like pronghorn, deer, and elk. I have no problem eating leftovers; animals that I find dead still taste good to me.

Our ability to eat so many different kinds of food means that coyotes can live almost anywhere in North America. We may have evolved and flourished in the plains because of all of the food choices in the open grasslands, but nowadays our range has expanded all the way from the tropics in Guatemala to the tundra in northern Alaska. Our range has also expanded because there are fewer grizzly bears and wolves than there used to be, so we can hunt their prey. Lucky us!

Growing up: When I was about 8 months old, I moved away from my parents. My sisters stayed in the pack with my parents, but my brothers and I left to join other packs. Being part of a pack is great because we all chip in to raise pups, defend against predators, and hunt large, delicious animals like deer.

From dusk 'til dawn, I spend most of my time hunting in open areas. I still look for food in the middle of the day, but I also enjoy resting under the cover of trees and shrubs. Resting in the brush also helps me hide from predators like wolves, mountain lions, and humans.

Now that I am two years old, I will look for a mate. I'll begin courting in the fall. If all goes well, I will mate this winter and my mate will have a litter of pups in the spring. My

mate and I will probably stay together for many years, perhaps for life.

I'll help raise my pups and bring my mate her meals, just like my father did for my siblings, Mother, and me. When my pups are very young, I will even chew and swallow my prey and then *regurgitate* it back at the den. This means that I can bring up food from my stomach into my mouth—all mashed up and ready to be eaten by baby pups. Did your parents do that for you?

Our family can be huge in years when food is plentiful; we could have as many as 15 pups! But when food is scarce, we may have only 3 or 4. If I'm very clever and lucky, I may live a long life of 7 years or so.

Hunting facts: Coyotes have a keen sense of smell and terrific vision, talents that help them search for prey. Their exceptional hearing helps them zero in on mice hiding under snow and grass. Coyotes are also very fast. Did you know that they can run up to 40 miles per hour?

Coyotes have earned their reputation for being clever for good reason. They sometimes watch for ravens circling up in the sky, knowing that hovering ravens signal a dead animal below—and of course, a free meal.

Fire and me: Wildland fires are no problem for coyotes. I might run away when fires are burning, or I might hang around the edge of the fire to see if mice and rabbits run away from the flames and smoke. They would be an easy catch for me.

I'm usually happy when fires burn in my home range, especially if they burn across some areas and not others. That creates a perfect patchwork of habitats that my prey species love. Places that have burned usually produce a great crop of new grasses and wildflowers in the years after the fire—plentiful food that my prey can't seem to resist. And if it is good for my prey, it is good for me!

Fires also kill small trees and shrubs and burn up grass litter, making it easier for me to hunt.

Coyote legends: Stories about coyotes are common in Native American cultures. Coyotes appear in many different roles. In creation myths, Coyote may act as the Creator, but he may also be the messenger, the hero, the trickster, or the fool. In other stories, Coyote may change from one form to another: He may be a handsome young man, an animal, or a sacred power. But most often, the Coyote is portrayed as a very clever animal and a trickster. Do you know any Coyote stories?

Deer Mouse

Do you think that I look like a deer, as my name suggests? I certainly do not think so! I got my name because I am such a good runner and jumper—like a deer—not because I look like one. My scientific name is *Peromyscus maniculatus*.

Where do I live? Deer mice are found throughout North America. You can find us living from hot deserts to the high mountainsides. We live in grasslands, shrublands, woodlands, and forests. Although it seems like we can live just about anywhere, that is not exactly true. There are 66 different kinds of deer mice, and some prefer to live in forests, while others prefer grasslands. I love prairie grasslands; Missouri River country is my home.

Starting out: My 4 brothers and sisters and I were born in our mother's cozy nest. Before giving birth, our mom dug a burrow in the soil and made a cup-shaped nest out of grass and roots. It may not sound luxurious to you, but it kept us warm and protected us from predators during those early days, when we were blind, naked, and completely helpless. We spent our first few weeks huddled in our nest with our mom. Raising the 5 of us must have been hard work for her. It is a good thing that some of our older brothers helped out.

We weren't helpless for long. By the time I was 2 weeks old, I had a full coat of fur. By 3 weeks, I could finally see. In fact, I was almost full-grown and ready to leave Mom and the nest when I was only 6 weeks old! Can you imagine being on your own when you were that young? I suppose in *deer mouse years*, I wasn't really that young.

Growing up: Deer mice don't live long, often less than 1 year. That means that we need to grow up very fast! When I left my mom's nest, I didn't go very far—I only travelled about 500 feet away before I picked out the area that would be my new home.

When I was about 7 weeks old, I found my first mate and became pregnant. It was only 3 weeks from the time I became pregnant to the time I gave birth. The amount of time that I'm pregnant is called my *gestation period*. I had 3 mouse pups in my first litter; deer mice can have as many as 9 pups in a litter—what a huge, sudden family!

Even though I can breed all year long, I am more likely to breed in the spring, summer, and fall, when food is abundant. It only takes a few months to raise a family, so I will probably have about 4 litters in my lifetime. That means that I could have as many as 36 babies, but around 16 is more likely. It's exhausting just thinking about it!

To eat…or to get eaten: It probably sounds like all I do is mate and raise pups, but I also spend a lot of time searching for food and eating. I am *nocturnal,* which means I'm active at night and I rest during the day.

I eat mostly seeds and *arthropods* like insects, caterpillars, and spiders. I also eat nuts, berries, and small fruits; sometimes I even eat

leaves. I am not picky; I just eat what's available. In the spring, I eat whatever seeds I can find and lots of insects. In the summer, I gorge on seeds and eat some fruit. In the winter, I eat even more insects and other arthropods. Even though I don't hibernate, I like to fatten up and store some seeds before winter. It is harder to find food when I have to tunnel through the snow looking for buried treats. Some winter nights I would rather not leave my nest at all!

During the day, I rest in my nest. I like to stay hidden because so many animals love to eat me. Snakes, owls, coyotes, and foxes are only a few of my many predators. Deer mice are an important part of many animals' diet. Life as someone's dinner is quite stressful!

Fire and me: If a fire burns through my habitat, I will probably be OK. I usually burrow underground where the soil will protect me from the heat and flames. But deer mice can get hurt or die in wildfires if they can't escape in time. I sure hope not to be one of them!

Deer mice usually love areas that have recently burned. After the ash settles into the soil and the plants sprout back to life, there is often a tasty supply of new plants and lots of insects. The seeds in this new crop of grass and wildflowers are perfect for me. I also love it when fires burn the grass and leaf litter, because that makes it much easier for me to run along the open ground and to find food at night. In fact, populations of deer mice are often much higher in the first spring or summer after a fire than before the fire.

Fires can create one problem for me: visibility. In the first days after a fire, there's little cover to hide me, so I have to be extra-careful to avoid predators.

Deer mice in prairie dog towns?

Deer mice seem to love prairie dog towns—even more than the mixed-grass prairie that surrounds them. Prairie dogs keep their towns neatly groomed, which makes it easier for deer mice to travel and search for food. Deer mice are also attracted to the quick-growing plants that grow on the disturbed soil of prairie dog mounds. And abandoned burrows are perfect for nesting and escaping from predators!

Limber pine

I am a tree. My scientific name is *Pinus flexilis*, meaning "flexible pine."

Where do I live? I am native to the Rocky Mountains and the Great Basin. I am also found in scattered populations as far as California in the west and South Dakota in the east. I like places where the soil is dry and rocky. In some places, I form the highest forests on the mountainsides. My neighbors might be subalpine fir, Engelmann spruce, or lodgepole pine. In other places, I grow at low elevations, mixed with sagebrush and grass at the prairie edge.

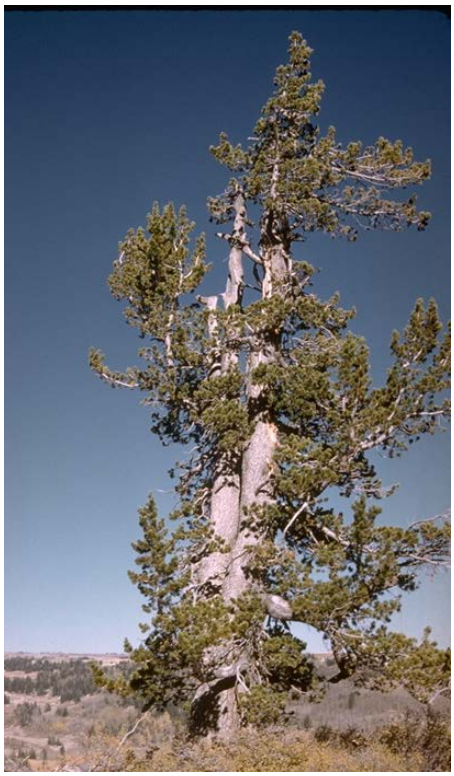
What do I look like? I am an evergreen tree. The bark on my twigs is smooth and light gray, while the bark on my trunk can have dark brown "scales". I grow to be 10 to 15 m tall—unless I'm in a very rocky, windy place. On ridges and mountaintops, wind and ice trim my branches every winter so I may only grow 1 m tall. My roots grow deep into the soil. My needles are 3 to 9 cm long and grow in bundles of five. I have growing points inside my bark (in my *cambium*), at my very top, and at the tips of my branches and roots.

In places where the wind is very strong, it nearly tears my branches right off the trunk! Luckily, they can bend in the wind without breaking. Remember, I'm the *limber* pine!

BOTANICAL FACT: Limber pines sometimes grow in clusters of three or more trees. They all started from a little pile of seeds buried years earlier by a Clark's nutcracker.

Growing Up: My seedlings grow well in dry, open places with bare ground, so I may be the first tree to show up in a burned area. Getting seeds from a parent tree to the middle of a burn is no problem for me. The Clark's nutcracker provides me with a special seed delivery service. Nutcrackers can easily carry my seeds 10 km or more before they bury them, several together, in the ground.

I grow slowly in my dry, rocky habitat. I don't produce many seeds until I'm 100 years old. I have plenty of years ahead of me, though. I may live to be over 1,000!



How do I reproduce?

I am a conifer, so of course I put my seeds in cones. New cones are pollinated in the middle of summer. More than a year later, in late summer, my seeds are ripe, stored in yellowish-brown cones about 8 to 10 cm long. In late summer, Clark's nutcrackers come to harvest them. They break off the cone scales and pry the seeds out, then bury the seeds in caches of food for winter. They don't eat all the seeds, though. Some grow into new pines.

Nutcrackers don't get all of my cones. Some fall to the ground, where red squirrels gather and pile them in huge *middens*, so they can use the seeds as winter food.

Am I useful?

Because my seeds are large and rich in energy, nutcrackers and squirrels aren't the only animals that eat them. Bears pull cones off the trees and feed in squirrel middens. Ground squirrels and chipmunks harvest and store my cones. Jays, nuthatches, finches, crossbills and grosbeaks harvest my seeds. Deer mice don't climb into the trees to harvest seeds, but they feed on any they can find on the ground. People eat my seeds too; they are very tasty!

I provide shelter and hiding places for mule deer and elk. Woodpeckers nest in my trunk, and porcupines like to eat my cambium and live in my upper branches. Mountain pine beetles feed on my cambium too. The female beetles lay their eggs there. When the *larvae* hatch, they eat their way out, growing bigger as they go.

BOTANICAL FACT: White pine blister rust is a fungus that was accidentally brought to North America from Europe and can kill five-needled pines, including limber pine. Blister rust infects a tree's cambium all the way around, or *girdles* it. In older trees, blister rust kills the tops, where needles and cones are found.

What does fire do to me?

My bark is thin, so it doesn't protect my cambium well from the heat of fires. Luckily, I usually grow in places where trees are very scattered, so it's hard for fire to spread from one treetop to another. Fuels are sparse in these rocky sites, so sometimes I survive surface fires too; they leave a scar on my trunk that records their visit.

Life After Fire:

If I am killed by crown fire, don't worry—I won't be absent for long. Clark's nutcrackers will collect seeds from limber pines living nearby and bury the seeds in the burn. If they don't eat all of their stores, my seedlings may emerge when the soil becomes warm and moist. In a cold place, however, it could take many years to get conditions just right for seedlings to start growing.

Subalpine firs and other trees grow near me except where the soil is very dry. My own seedlings can grow in windy, dry openings, but firs need the shelter of my branches to start to grow. If hundreds of years pass without fire, and if beetles or blister rust kills the old trees, I may become a rare sight on the mountaintops and prairie edges.

Lodgepole pine

I am a tree. My scientific name is *Pinus contorta*, meaning "twisted pine." Four kinds of lodgepole pine live in the United States. I am the kind called “Rocky Mountain” lodgepole pine.

Where do I live? I am native to the Rocky Mountains of North America. But I can also be found as far east as the Black Hills of South Dakota and as far west as Oregon. I like cold forests. I can grow in dry, frosty places where most other trees can't survive. I also grow with subalpine fir, Engelmann spruce, western larch, and Douglas-fir. You can even find me growing with limber pine and whitebark pine in high forests.

What do I look like? I am an evergreen tree. When I grow up, I'm about 20 to 30 meters tall. If I grow close to other pines, my lower branches usually drop off and I have needles only on my top branches.

My roots usually grow near the soil surface, but some grow deep into the soil.

My needles are about 5 centimeters long and grow in bundles of two.

Growing Up: I grow very fast in sunlight. I can start from seed right after a big crown fire and be 6 meters tall when I'm 20 years old! I begin making seeds well before that though, when I'm only 5 or 10.

BOTANICAL FACT: In sunny places, lodgepole pines grow much faster than subalpine fir or Engelmann spruce. Thousands come in after a big crown fire, so it may look like lodgepole pine is the only kind of tree growing on a whole mountainside.

Growing Points: I have growing points inside my bark (in my cambium), at my very top, and at the tips of my branches and roots.

How do I reproduce? I am a *conifer*, which means I put my seeds in cones. My cones are brown, small, and woody, with tiny, sharp prickles on them. My seeds are small and brown, with a paper-like "wing" that helps them float on the wind when they fall out of the cone. They may travel 50 or 60 meters before they land.

Some of my cones are *serotinous*, which means “late.” They are sealed tight by resin and won't open unless they're heated. Fires that burn in the tree crowns open these cones and free millions of seeds to start a new forest.

My calendar: My new cones are pollinated in spring. More than a year later, in summer, they are finally ripe. Some open then and drop their seed. The others, the late, serotinous ones, store their seed until a fire melts the resin that seals

them.

Am I useful? Many kinds of insects eat my cambium. Female mountain pine beetles tunnel into my cambium to lay their eggs; they bring fungi in, too. When the beetles' eggs hatch, the larvae eat their way out, growing up as they go.

Fungi use the nutrients stored in my trunk. A plant called *mistletoe* grows on me and sinks its roots into my branches and trunk to get nutrients.

Crown fires are deadly to me, but they make me into good habitat for different kinds of animals. Within hours after a crown fire, beetles show up to feed on my burned wood and lay their eggs in it. Wasps follow right away, laying THEIR eggs in the beetles! And woodpeckers follow to eat all the insects living under the burned tree bark. One kind, the Black-backed Woodpecker, almost always nests near a forest burned recently by crown fire.

I provide hiding cover and shelter from storms for deer, moose, elk, and bears. Red squirrels, chipmunks, and small birds eat my seeds. Grouse eat my needles for winter food.

People have used my wood for their homes for thousands of years. Native Americans cut young lodgepole pines to support their tipis. Lodgepole pine logs are often used to build homes and furniture, and to make plywood and paper.

Sometimes Native Americans used to eat my cambium layer and use my sap for medicine.

What does fire do to me? I can survive some surface fires, but many fires kill me. My bark is thin, so it doesn't protect my cambium well from the heat of fires. Since my roots may grow shallow or deep, some fires damage them and others do not.

Life After Fire: If a surface fire burns through light fuels, I may survive, and my seedlings will grow well in the new openings.

Crown fires kill me, but I reproduce right away from seed stored in my serotinous cones. My seedlings grow especially well where fire has cleared the duff from the ground.
My seedlings don't grow well in shade. Firs and spruces *do* grow in my shade, and they gradually "take over" the forest where I live. I may be only 100 years old or so when I quit growing and die. That may be a long life for a person, but it's short for a tree.

ECOLOGICAL FACT: Mountain pine beetles love to find a forest where most of the trees are old lodgepole pines. Millions of female beetles lay their eggs under the tree bark. When the eggs hatch, the larvae feed on the trees' cambium. Helped by a fungus they carry, the beetles may kill nearly all of the trees. Then the forest looks like it's full of red trees, like those in this picture, until the needles fall off.

Mountain Pine Beetle

I am an insect, native to western North America. I love to live in lodgepole and ponderosa pines.

Where do I live? For almost my whole life, I live under the bark of a pine tree. I come out into the sunlight only at the end of my life, when I'm grown up and ready to mate.

I'm especially fond of forests that have lots of pines growing close together. That's why I like dense lodgepole pine and ponderosa pine forests that haven't burned for a long time. When these forests get really crowded, it is a treasure trove of food and shelter!

Growing Up: I begin life as an egg but, like most insects, I change dramatically through my lifetime. Let's start with the egg.

It was the middle of summer, just last year. My mother chose this lodgepole pine as the place to mate and lay her eggs. She bored a hole through the tree's thin bark. At first, a lot of pitch came out through the hole-- so much that she almost drowned-- but she finally got into the tree's cambium. There she began tunneling in an almost straight line toward the treetop. Every so often she would stop to lay a tiny, pearl-white egg along the side of the tunnel. By the time she had laid all of her eggs, her tunnel was nearly 60 centimeters long.

It took only two weeks for me to hatch. You probably would have taken one look at me and said, "Gross!" I was short, thick, soft, and wormlike—a *larva*— all white except for my little brown head. I spent the whole fall and spring inside the tree bark, eating the cambium. I didn't do much at all during winter, when the weather was cold. I made a tunnel while I ate, but my tunnel went sideways, *perpendicular* to my mother's tunnel. Between my mother and me and all of my siblings, we created a sculpture inside the tree's bark that was

shaped like a tall, wide feather. Scientists call our masterpiece a *gallery*.

When I was about eight months old, I formed a soft white shell. Inside it, I could finally become the kind of beetle you'd recognize-- very dark brown and shiny, about 6 millimeters long, with stiff little wings and a small head. After slipping off my old shell, I bored through the tree's bark and saw daylight for the first time! Now I'm ready to fly off. I'm looking for a mate and a perfect pine tree for laying my own eggs.

Never alone: The number of pine beetles in a forest depends on how many yummy trees that forest has. Where there are pine trees, a few of us are always

around. If there's a forest with a lot of trees big enough to nurture our larvae, our numbers increase year after year until there are millions of us—an *epidemic*.

Lodgepole pine forests are "ripe" for an epidemic when they're about 70 to 100 years old. Ponderosa pine forests that are too crowded are also perfect for us to attack. Most of the pines are big enough to nurture our larvae, but they're no longer strong enough to make lots of pitch and drown us out. Thousands of us attack each tree, and then millions of our larvae tunnel through the cambium.

Even if a mountain pine beetle looks like it's by itself, it really isn't alone. I always carry the *spores* of a *fungus* along with me. When I bore through a tree's bark, I carry the fungus in too. The fungus grows from the cambium into the wood, staining it blue! As this *blue-stain fungus* grows, it interrupts the flow of water from roots to leaves. This keeps the tree's moisture just perfect for my larvae to survive in.

Beetle galleries and blue-stain fungus are great for me, but they're not good for pine trees. As our galleries crisscross the tree's cambium and fungi grow throughout the tree, they interrupt the flow of water and nutrients from roots to leaves and leaves to roots. Together, they often kill the tree.

Am I useful? Life is pretty uncertain for a mountain pine beetle. Some kinds of worms eat my eggs before they even hatch. Woodpeckers think that a tree full of my larvae is a feast just for them. Some wasps lay their eggs in my larvae, so their larvae will have me for lunch after they hatch! Nuthatches and other birds eat me when I'm out in the daylight. Flies and other beetles eat me, too. I certainly do my part to support the other living things in the forest!

Fire and Me: Crown fires kill us when they kill the trees we're living in. But there are so many pine trees and pine beetles in the forest that crown fires don't ever get rid of us completely. Instead, they mark the beginning of a new pine forest that will be ready for us to live in after a few decades.

Surface fires don't kill us, but sometimes they injure our host trees. Any time the tree is weakened and produces less pitch, it's easier for us to get in to lay my eggs. So surface fires sometimes help us reproduce.

Surface fires also kill some trees, making the trees a little farther apart and making sunny openings for seedlings to grow in. We can live and reproduce well in this kind of forest, with trees of different sizes and ages, but we're not likely to cause an epidemic there.

We may be small, but we can actually change the way fire burns in a forest. If we've killed thousands of trees in an epidemic, the dead trees and their dried-out needles provide a great fuel supply for a fire. If a fire starts before the needles fall off the trees, it may spread very fast and be very dangerous**.** Yes, we're little, but we're powerful to change a forest dramatically—and our influence lasts a long time.

Did you know that the original name of mountain pine beetle was the "Black Hills Beetle"? The pine beetle was first discovered in the Black Hills and so it was called the "Black Hills Beetle", but once the beetle was also discovered in the Rocky Mountains, the name was changed.

Northern Flicker

I am a woodpecker about 30 cm long, living mainly in forests and woodlands. Some people think I look fancy, with my black-spotted belly, red "moustache," and pink feathers under my wings and tail. But don't let my good looks fool you! I am a hard worker who helps other animals in the forest find a place to live.

Family matters: My scientific name, *Colaptes auratus,* means "golden chisel." My cousins who live in the eastern U.S. have yellow under their wings and tail, so scientists call our whole family "golden." Although I'm not yellow, I sure do like to chisel wood! That part of my scientific name is right on.

Rotten to the core: I hang out in all types of forests, but I particularly like ponderosa pine forests and cottonwood groves, where trees are very large and sometimes rotten inside. Terrific! They make wonderful nest trees while they're still standing.

BIRD FACT: Flickers get their name because they have cries that sound like "flick, flick, flick" or "flick-errr." They also call "quick-quick-quick-quick," as if they're in a hurry.

Wood pecking. Many people think that dead trees are useless, but I don't know what I would do without them! My favorite kind of tree is one that is large, dead, and rotten. I excavate a nest cavity in the rotting wood so I'll have a safe place to raise my family. My large neck muscles and chisel-shaped beak make it easy for me to pull the wood apart. While I'm working to loosen chips of wood, I use my hard tail feathers as a 'kick-stand' to give me more balance. With the help of my mate, we can build a nest cavity in 12 days. It's a lot of work, so if we find a natural tree cavity we will use it as our nest… but don't think I'm lazy. I'm just smart!

My mate lays 3 to 12 eggs each year. We take turns incubating them. After about two weeks, the eggs hatch. For the next month, I catch food to feed the nestlings. After that, the young flickers are ready to fly from the nest and find their own food.

Finding food: Although I like to nest and roost in trees, I am one of the only North American woodpeckers that comes down to the ground to eat. My favorite food in the whole world is a big mound of ants. In fact, flickers eat more ants than any other bird in the United States! I have a special tongue that helps me catch ants. It is really long with a flattened tip that can maneuver eggs, pupae, and adult insects from the soil.

I spend a lot of time digging into the soil to find ants, but I will also hunt for

termites, beetle larvae and caterpillars, and sometimes I perch on bushes to eat berries.

Bigger is better. This year my mate and I are once again nesting in our favorite tree, a huge, dead ponderosa pine. It doesn't actually look much like a tree anymore. The top broke off long ago. All that's left is the tree's trunk stretching to the sky. The bark is completely gone from the top half, leaving the wood weathered and gray. This standing dead tree is called a *snag*.

After our young grow up, we'll move out of this snag, but our hard excavating work won't go unappreciated. Small owls, chickadees, bluebirds, or flying squirrels may use our old nest cavity to raise families of their own.

FIRE FACTS: The western forests and prairies have lots of variety. On north-facing hillsides, they often have dense trees, both small and large. These forests may burn in crown fires every century or so. Other forests and woodlands have had many surface fires, which thinned out the small trees that started growing after the last fire. Large ponderosa pines survived easily because of their thick bark and high branches. Cottonwoods were sometimes killed, but they sprouted soon after fire.

Old trees are very likely to have some kind of decay, especially a rotten center. Standing trees with heart rot provide ideal nest sites for northern flickers.

Plains prickly-pear

I am a cactus with long, sharp spines. People call me "prickly", but I think that's an understatement. I do have small, prickly hairs dotting my pads, but I think my spines deserve some attention too. Maybe I should be called "spiny-pear"! My scientific name is *Opuntia polyacantha*.

Where do I live? I can make my home in all of the western states. I grow in dry places from up north in Canada to down south in Texas. You can find me in forests and woodlands, shrublands, grasslands, and deserts. I especially love growing in the Great Plains; perhaps that is why I got my name, "plains" prickly-pear.

I have different neighbors depending on where I make my home. In the plains of the Missouri River country, I grow with prairie grasses like blue grama and buffalo grass. I love growing out in the open where there is lots of sun, but sometimes I also grow under the canopy of ponderosa pines.

What do I look like? I'm a cactus that grows low to the ground—usually no higher than your knee. When I'm growing in my perfect habitat, I can form big mats about as wide as a school bus. I'm sure you wouldn't want to cross my prickly path! Like other cacti, I grow differently than most other plants. Can you guess where my stems are? Or my leaves?

My wide, flattened "pads" are actually my stems, and my sharp spines are special leaves. Having special stems and leaves helps me live in dry places. My spines help me conserve water by shading my pads from heat and wind. My spines also lose much less water than "normal" leaves, helping my pads stay nice and juicy.

Do you think it's odd that my stems are green and my leaves aren't? In most plants, *photosynthesis* occurs in the green cells of the leaves. Photosynthesis is the process that plants use to capture the sun's energy to make sugars that plants use for food. Instead of using my spiny, special leaves for photosynthesis, I use my pads!

I grow my roots like a thick net woven into the top layer of the soil. This helps me absorb moisture as fast as possible after short rain showers. I capture the rainfall before the grasses with deeper roots can get it.

Growing Up: Have you noticed that my pads are connected to each other in segments? That makes me look like a chain of pancakes all linked together. Each year, I grow new pads from the previous year's segments.

Growing Points: I have growing

points on my pads and roots, and in my *root crown*. That is the place, right at the surface of the soil, where my pads meet my roots.

How do I reproduce? I'm lucky that I have so many ways to reproduce. I can reproduce from seed, I can sprout from broken-off pieces of pads that get buried in the soil, and I can also reproduce by *layering*. That is when my pads touch the ground and form their own roots. These rooting pads can become separate plants if they get separated from my main stem. If my pads are damaged, I can sprout new ones from my root crown. And scientists think that some kinds of plains prickly-pears can sprout new plants right from their roots.

My calendar: Each spring, my older pads green up after my winter's rest, and then I grow new pads out of my old ones. I open my big, beautiful yellow flowers in the summer. My flowers ripen into pear-shaped fruits. In late summer or fall, they fall to the ground.

Am I useful? Even with my armor of spines, lots of animals manage to eat me! In the winter, when there is little food available, black-tailed prairie dogs can't seem to get enough of me. And after my spines are singed off by fire, pronghorns love to eat me. Some ranchers even burn prickly-pears so cattle will eat us after our spines are burned off.

In very dry, windy areas, I may help other plants to grow. It can be very hard for grasses to start growing where the wind constantly scours away the soil, but I'm strong enough to manage these harsh conditions. As I get bigger, my pads trap the wind-blown soil and provide protection from the wind, and this is how I create a protected nursery—a perfect place for grasses to establish and grow. As my neighbor grasses get bigger, my spines protect them from grazing animals. Who would want to eat grasses that are intermingled with miniature daggers?

What does fire do to me? Fires often kill my pads and fruits. But when fires are not too intense, some of my pads can survive, develop new roots, and start growing again. Even a pad that has broken off from the main stem may be able to grow into a new plant. I can also sprout from my root crown if it isn't damaged by fire.

I don't do too well in areas that burn very often. It's hard enough to recover from being burned, but when my spines are destroyed too—and I turn into a tasty treat for grazing animals—I may not be able to grow back.

Tasty pears: People have treasured my prickly-pears for a long, long time. These tasty fruits can be eaten raw, cooked, or dried. Native Americans of the Plains worked hard to collect my fruits and remove all of their prickles before they could be eaten.

My pads can also be eaten and are a popular dish in the Southwest and Mexico. In Missouri River country, my pads haven't been as popular as my pears. People have sometimes eaten my pads when they couldn't find other foods.

Ponderosa pine

I am an evergreen tree. My scientific name is *Pinus ponderosa*. *Ponderosa* is a Spanish word meaning "large, heavy, *ponderous*." There are three kinds of ponderosa pine. I'm the kind called an "interior" ponderosa pine because I live in the *interior* part of the western United States, from the Great Plains to the North Cascade Mountains.

Where do I live? I am native to the Rocky Mountain West and the western edge of the Great Plains. I usually like warm, dry, open forests. I can grow in low-elevation places that are too hot for many evergreen trees. I also grow in the hills at the edge of the Great Plains, where I can escape the summer heat of the prairie. Depending on where I am living, you can find me growing with different neighbors. In the Black Hills, you may find me with bur oak, quaking aspen, and paper birch. But in the Rocky Mountains, I often grow with Douglas-fir and western larch, and sometimes with lodgepole pine.

What do I look like? I am an evergreen tree. I often grow to be 25 to 35 meters tall, but if I am living in my perfect habitat, I can be up to 50 meters tall. My trunk can be as big as 1.3 meters wide—wider than most children can spread their arms. I have the longest needles of any pine growing in the northern states—up to 17 centimeters long. My needles grow in clusters of two or three.

My bark gets very thick as I age. On old trees, my bark is yellowish and has deep, dark furrows. Then people call me a "yellow pine."

I grow many thick roots. Sometimes they grow 2 meters deep into the soil, and they may reach out 30 meters from my trunk.

Growing Up: I sprout from a seed when the soil is warm and moist. I love sunlight and I grow much faster in the sun than in the shade. Even though you may see me growing tall above ground, I am also growing a long taproot underground as fast as I can. That way I'll be ready to pull moisture from deep in the soil when the dry season comes. I can be a meter tall when I'm 7 or 8 years old. By the time I'm 10 to 20 years old, I am able to make cones and seeds.

BOTANICAL FACT: Ponderosa pines can live for many centuries. The oldest known ponderosa pine was found in Colorado and was 1,047 years old when it died. That means that it was alive for hundreds of years before Europeans came to North America.

Growing Points: I have growing points inside my bark (in my *cambium*), at my very top, and at the tips of my branches and roots.

How do I reproduce? I am a *conifer*, which means I put my seeds in cones. My cones are big, brown and woody, with large, sharp prickles. My seeds have a paper-like "wing" that helps them float away on the wind when they fall out of the cone. They may travel 40 meters before they land.

My calendar: I begin to grow new wood in spring. At the same time, the buds that I prepared the summer before begin to grow. In about a month, they will open and my new needles will unfurl. My roots and trunk continue to grow all summer, while my branches make new buds that will hold next year's fresh needles.

The wind helps me make new trees. First, it carries pollen to my new cones in late spring or early summer. More than a year later, in the fall, the seeds in these cones are finally ripe. The cones open.

Wind comes again and shakes the seeds loose, so they can float away on the breeze. If they land in a good spot, they may start growing into new trees.

Am I useful? I provide nutrients and habitat for animals, other plants, and even fungi. Many kinds of insects eat my cambium. Female pine beetles tunnel into my cambium to lay their eggs. When the larvae hatch, they eat their way out, growing as they go. A parasitic plant called *mistletoe* grows on my branches and sinks its roots into my branches and trunk to get nutrients. Fungi can get nutrients from my trunk, branches, or roots.

Rabbits and mice eat me when I am very young. Squirrels and many types of birds eat my seeds. Squirrels even eat the cambium on my twigs. I provide hiding places for many animals including pronghorn, elk, and deer. If they are very hungry, they may eat the buds and needles of my seedlings.

When I get large, the wood in my trunk may begin to rot. Then woodpeckers make holes in my trunk for their nests and for roosting. Pileated woodpeckers may use a hole for one year, but other animals move in after the woodpeckers move out. Flammulated owls are some of my favorite guests. I even make a great home once I am old and dead.

People use my long, thick, straight trunks to build their homes. Native Americans used to peel the bark from some of my oldest, biggest trees in the spring. They would peel off narrow strips of the cambium from inside the bark and eat them as a sweet treat. You can tell the difference between wounds caused by fire or from peeling bark because fire scars usually start at ground level and scars caused from peeling start above ground. See the scar made by peeling?

What does fire do to me? I can survive surface fires when I'm only 6 years old! The older I get, the thicker my bark gets and the easier it is to survive a fire.

Surface fires used to burn often through my homeland. In South Dakota, fires burned about every 22 years in forested areas and about every 12 years out on grassy savannas. Fires killed my lower branches and the small trees that grew in my shade, but the flames rarely reached my leaves and the buds high above the ground. Surface fires also burned up the dead needles and fallen branches on the ground before these fuels got deep. This kept fires from being hot enough to kill my roots.

Life After Fire: My seeds grow well in sunny openings created by fire, especially if the fire also killed off some of the other plants surrounding me. Shrubs, grasses, and other trees can use a lot of moisture! The environment after a fire can be so perfect for us that sometimes thousands of ponderosa pines all come up at once, eventually creating a dense "dog-hair thicket".

If my homeland does not burn for many years, I may not be able to produce healthy young trees. Thickets of many small trees grow in my shade and there can be too much leaf litter on the forest floor for my seeds to take root. The trees in these thickets may also be "stressed out" and vulnerable to disease and pine beetles because they are growing so close to each other. In these crowded forests, it is easy for fire to climb into the tree crowns and kill even the biggest, oldest trees.

Prairie turnip (breadroot)

I am a plant with many names. Some people call me prairie turnip, others call me breadroot, or prairie potato—and that is only a few of my names. I probably have so many names because I am so important to so many people. My scientific name is *Pediomelum esculentum*, which means "plain apple" and "edible". I bet you can guess why I am so widely treasured.

Where do I live? I am native to prairies throughout the Great Plains. I can be found growing in grasslands all the way from Canada in the north to Texas in the south. You can find me on hillsides, valleys, plains, and woodlands—almost always in dry, sandy, or rocky places.

What do I look like? Above ground, I am only about 15 centimeters tall. My leaves are divided into 5 parts and are covered with hair, so they look somewhat like a hairy hand. My bluish flowers cluster at the tops of my stems. I hide my most famous feature below ground. That is my deep root, which has a thickened area that looks similar to a potato. People living in the Great Plains have eaten this nutritious food for thousands of years.

Growing Up: I start growing from seed. I am a slow grower. It took me about 3 years to develop my large root. At the top of this root I have an underground stem called a *caudex* that can sprout new leaves and flowers every year. My ability to live for many years makes me a *perennial* plant.

Growing Points: I have growing points on my underground stem, on my roots, and in the tips of my stems.

How do I reproduce? I reproduce from seeds, and in the spring I usually sprout new leaves from my caudex. I am picky about when to grow flowers and seeds, so I don't make them every year. In fact, only half of us make flowers during any given year. Perhaps, we only bother to grow flowers in wet years, or after fires burn—when our seeds may land in a cleared area of soil and have a better chance of sprouting. Some years I don't even produce new stems and leaves; I just spend the whole year hiding underground!

My calendar: In the years that I flower, I usually sprout leaves from my underground stem in May. By the middle of June, I am in full bloom. If I am lucky, my flowers will be pollinated by insects and my seeds will be ripe by the end of July. What perfect timing! When I have finished making seeds, I dry out in the hot summer sun. Then I break away from my roots and tumble away, scattering my seeds as far as the wind will take me.

In the years that I don't flower, I

wait to come up until late June, but I stick around longer, often until mid-August. Instead of flowering, I send my nutrients down into my big root and save my energy until next year when I will flower again.

Am I useful? I am quite famous in Missouri River country. Native Americans of the plains have been eating my turnip-like root for thousands of years. My nutritious root may have been the most important wild food on the plains. It can be prepared and eaten in many different ways. You can eat it raw, dry and store it, pound it into flour, and boil or roast it. It's used as a special ingredient in fry bread!

People aren't the only ones who appreciate me; animals large and small like me too. My root was a favorite food of the grizzly bears that used to roam the Great Plains. Insects, like bees, collect my pollen. Unfortunately, cattle like eating me a little too much. They sometimes munch down too low and destroy my underground stem, so I can't sprout again.

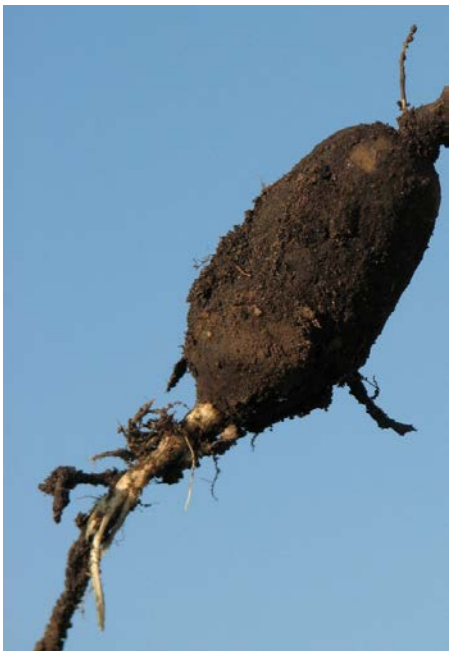
Prairie turnip harvest: In the Lakota language, the month of June was called, *tinpsila itkahca wi*, which means "the moon when breadroot is ripe". The season to harvest prairie turnips is quite short, lasting only about 6 weeks. It is important to know when the prairie turnip is ready to harvest. If you're too early, the root will be limp; if you're too late, the above-ground part of the plant

I'm good for the soil. My roots work closely with bacteria in the soil to capture nitrogen from the air and store it in my tissues. Eventually, I release that stored nitrogen into the soil, and it can be used by other plants. So you can think of me as a natural fertilizer.

What does fire do to me?

When fires burn across the plains in late summer, my aboveground parts have probably dried up already and blown away. What good timing! If my stem and leaves are still standing, they will burn up, but that is OK. Chances are that the soil protects my caudex and roots are from the fire's heat, so I should have no problem sprouting the next year. Scientists haven't studied my relationship with fire very much. Perhaps you know someone who has seen how the prairie turnip grows after fire?

Botanical Fact: Nowadays, prairie turnips are not very common. This is partly because people rarely eat them anymore. When prairie turnips were collected from the wild, Native people planted their seeds in the holes left by the roots, and these seeds grew into even more plants. This harvesting and re-seeding produced enough prairie turnips that people came back to harvest them year after year, and their work made bigger and bigger patches of prairie turnips



Prairie grasses

We are the grasses, the heart of the prairie. We come in many shapes and sizes. We blanket the land with green in spring and summer, with brown in fall and winter. We hold the soil tight, keeping wind and water from taking it away. We feed millions of animals, large and small, above ground and below.

People who fly over in a plane or race along on a highway might not notice how interesting we are. They might think, "Grasses are all the same. A prairie is just a lawn that never gets mowed." Are they ever wrong! Each kind of prairie grass is very particular about where it lives and how it survives.

Who grows in the driest parts of the prairie? Some of us thrive in the shallow, dry soils near the western headwaters of Missouri River country, at the foot of the Rocky Mountains. In these "shortgrass" prairies, most of us grow low to the ground so the wind won't dry us out or blow us over. Bend down to look at our delicate flowers! Buffalo grass flowers come in tiny, red bundles. Blue grama flowers look like the long eyelashes of a baby—except they're pink!

Don't let these plants' fragile flowers fool you, though. They are tough, clever survivors. Buffalo grass is an important food for—you guessed it!—the buffalo, and these grass plants don't seem to mind feeding thousands of heavy, furry visitors. Being eaten might even help them produce more plants.

Blue grama has a special way to survive hot, dry weather. When its leaves begin to dry out, they curl up into a tube smaller than a soda straw. This tiny space helps them conserve water so they can keep growing through the hottest part of summer.

The shortgrasses don't reach high above ground, but most of them reach deep underground. Their roots thread through the soil like long, thick, tangled hair. For example, blue grama grows only ankle-high, but its roots may grow 2 meters down into in the soil! When you grow where water is scarce, it's helpful to have roots that reach out and down, seeking every possible drop of water.

Grasses have other buried treasures, too. Many of us have a big supply of buds that can grow new stems. They're stored either underground or right at the soil surface. You might think that buds close to the surface are in danger of being frozen or eaten, trampled or burned to death, but no. We protect them by growing in thick bunches, with lots of stems and leaves huddled around the buds like a fortress.

The buds of buffalo grass also live

on the surface. This grass has special stems called *stolons,* which grow along the ground and produce new plants all along their length. The plants on these long stems look like they're playing leapfrog.

There may be wide spaces between grass plants, where our roots have stolen the moisture from the soil and created tiny patches of desert. No wonder you can find cactus plants growing in the middle of the shortgrass prairie!

Who grows where the soil is deep and water is plentiful? Some of us love the deep, black soils of the eastern prairies and river bottoms. This soil is loaded with decaying plant material that holds water and nutrients well. Living in these "tallgrass" prairies is like spending your whole life in the kitchen, where food and water are plentiful and you can grab them whenever you want.

This great environment lets us grow really big. We can be as tall as a basketball player, with thick, deep roots that weigh more than the stems and leaves above. How can a skinny grass stand so tall? Only by relying on its neighbors. Our stems and leaves lean on one another, shining and rippling like ocean waves in the wind. We grow close together underground too, where we produce a thick mat of interwoven stems called *rhizomes*. The soil protects these buried treasures so well that they can sprout new plants even after the coldest winter or the hottest fire.

Big bluestem is the tallest grass in the tallgrass prairie. It certainly is big, as its name suggests, but it looks blue-green only in early summer; by fall, its stems and leaves turn reddish-gold. Its flowers give this plant a second name, "turkey foot". The photo below shows the flowers of big bluestem towering above a patch of 1-meter-tall black-eyed susans. Do the grass flowers look to you like the toes of an upside-down bird?

Like many grasses, big bluestem uses sunlight in a special way. All plants use light and air to make food—that is, to *photosynthesize*. We bring in air through little windows in our leaves, called *stomates*, which we can open and close as needed. Most plants do all of their photosynthesis in the daytime, but that can create problems for us. If we keep our windows open all day here on the prairie, they'll let out too much moisture. So we've found a way to store the sun's energy until evening, when we open the windows, draw in fresh air, and finish making the sun's energy into food.

I've told you about the shortgrasses in the dry places out west and the tallgrasses in the moist prairies of the east. What about the biggest areas of all, between the two extremes? That's where we grow in "mixed-grass prairie", covering thousands of square kilometers. In this vast area, the short and tall grasses are mixed up with many others, making a crazy quilt pattern across the land. Every fold in the land and every change of soil beneath creates a different mixture of species, so mixed-grass prairies are filled with variety. Let me introduce you to three of us:

Western wheatgrass is one of the bison's favorite foods. This plant grows rhizomes just a few centimeters below the soil surface, so they're protected from grazers but they can sprout new growth quickly after the stems are eaten. The plant's roots grow deep, sometimes more than 2 meters down, so they can find moisture even in the driest part of summer.

Needle-and-thread has the perfect name, because each seed of this plant is attached to a long, curly, thread-like *awn*, which can easily catch in your socks as you walk past—or hitch a ride on any furry animal traveling by. When the seeds eventually drop to the soil, the awns help them drill into the ground so they'll get the moisture they need to grow.

Sweetgrass is precious to the people of Missouri River country. It is kind of secretive, growing in moist places along the edges of creeks, ponds, and woodlands. Sweetgrass is special because of its fragrant leaves, which smell a little like vanilla. They can bring a sweet, fresh smell into a home. People sometimes give sweetgrasss braids as a gift and blessing. People also burn sweetgrass for incense and weave the long leaves into baskets.

I've only told you about a few of the prairie grasses, but there are many more. **Nearly 150 grass species grow in the prairies of North America!**

What about fire? The grasses that live in Missouri River country have different opinions about the best place to live. Some say the deep soils of the east are best. Others say it's best to live in the dry land at the base of the western mountains. Some love to be out in the wind, and others like the shelter of a creek bottom. But we all agree on one thing: We need fire! Even though fires burn our tops off, we all have a better life if a fire comes through every few years. We are strong enough to survive trampling by millions of bison hooves. We are strong enough to grow a thick green blanket across the land even after the coldest winter. But without fire, our growth slows down and our strength fades. We get smothered by dead leaves and stems from previous years, and shrubs and trees grow over us, stealing our sunlight. Fire cleans house for us and keeps us strong.

You must get out of the way when our fires come through! They can run faster than a pronghorn, and they may have flames as tall as a house. But they help us grow thick and fast every summer, so we can protect the soil and provide for the millions of animals that depend on us.

Pronghorn

I'm the pronghorn. When Europeans first saw me, some thought I might be a goat. Others thought I was an antelope. None of them were right! I'm so special, I'm in a category all by myself. I guess that's why my official scientific name is *Antilocapra americana*, which means "American goat antelope". My name covers all the possibilities!

Home, home on the range. I'm very much at home on the wide open spaces of Missouri River country. Pronghorns are native to the middle parts of North America from southern Alberta and Saskatchewan south through the western plains to northern Mexico. We are found nowhere else on earth!

My fur coat is mostly reddish-brown to tan, but my stomach and rump are white. The distinctive white markings on my face and neck look like no other prairie animal. Pronghorn males, like me, have black horns that are 25-31 cm long; females' have much smaller spikes. The shape of my horns is very unique. They are flattened from side to side and point straight up from the top of my head before curving backwards. They branch only once, with a little notch on the front that points forward. Some people call this a "prong". Now you know where I got my common name!

You can't catch me! Predators have to be extremely lucky to catch an adult pronghorn like me. Mountain lions, wolves, coyotes and bobcats don't have many places to hide on the treeless parts of the prairie, and that suits me just fine. I like open, low rolling plains where the shrubs don't grow too tall and predators can't lurk over the side of a hill. Prairies are the perfect place for me!

I have keen eyesight so I can spot predators up to 6 km away. Once I see them, I can run like the wind, reaching speeds up to 97 km an hour. In fact, I'm the fastest land mammal in the Western Hemisphere, and I'm second only to the cheetah in the entire world. The cheetah can run fast only for short distances, but I can go super fast for a long time. I've been able to run fast practically my whole life—I could run faster than a human when I was just three days old!

Because I'm so fast and can see forever, hunters always have a hard time catching me. Long ago, people would set snares to trap me or try to drive a herd of us over a cliff like they drove the buffalo. They weren't very successful; we can dodge and dart our way out of any trap!

Food from the prairie. I eat a wide variety of prairie plants—mostly *forbs* (herb-like flowering plants), some shrubs and grasses, and even cactus plants. Forbs make up much of my diet during the spring, summer and fall. Scarlet globemallow is one of my favorites. In the early spring I'll eat the tender young shoots of grasses such as blue grama, Indian ricegrass, and needle-and-thread. Shrubs, like sagebrush and western snowberry, which stick out above the snow, are a good winter food when I can't find other, low-growing foods. Many of the plants I find delicious are *toxic* to most other grazing animals. That's fine; it leaves more for me!

You've probably heard about the millions of bison that roamed the prairies long ago. Well, equally large herds of pronghorns traveled behind the bison. People believe these vast buffalo herds helped the pronghorns by eating the prairie grasses, leaving the forbs to

grow thicker and taller after the grass was eaten—creating the perfect salad bar for a herd of pronghorns.

My family and me……. My parents mated in the fall, and my twin sister and I were born the following May. My mother was very choosy about where to give birth. She picked a spot where a clump of tall grasses, shrubs, or rocks would hide us. When we were first born we tried hard to be invisible. We had no scent; we would lie perfectly still for hours at a time; and the color of our fur matched the surrounding prairie. Our mother stayed away from our hiding spot for most of the day so she wouldn't give us away. She fed us only a couple of times a day, just for a few minutes. How would you like that?

My twin and I were extremely fortunate that no predators found us during our first month of life. Adult pronghorns have no problem running from predators, but new-born fawns are easy to catch if predators can locate them. Our predators, especially coyotes and eagles, kill about half of the pronghorn fawns each year. Yikes!

I stayed with my mother for about a year before I launched out on my own. But I didn't move out to be alone. I'm *gregarious*, which means that I hang out in a herd most of the time. You'll usually find me in a loose herd of *bucks* and *does* from the end of breeding season through the winter. On winter range, my herd might reach 100 pronghorns. In the spring and summer, we break up into smaller bands. The does and fawns hang out together, so we call those bands "nursery groups". I'll wander alone or with a few of my guy pals. I migrate about 70 km between my summer and winter ranges, but some pronghorns migrate much further—some go as far as 300 km, twice a year!

Fire and me. Fires don't bother me much. I can just run away and leave the flames in my dust! Fires do affect my habitat, however. Burns are great places for me to find food. Grasses on new burns usually start growing earlier than on unburned prairie and the new sprouts are tender and delicious.

Even better, prairie fires are pretty hard on the shrubs that like to spread through the prairie, shading out the forbs I like to eat. For several years after fire, these forbs grow and reproduce wonderfully because they have more sunlight, water, and nutrients than before the fire.

Burned areas with lots of prickly pear cactus are especially attractive to me. The flames singe off the spines of prickly pear cactus. Yum! With those pesky spines removed, I can easily chow down on those tasty *succulent* cactus pads!

Pronghorn facts: Although pronghorns may be the fastest land mammal in North America, fences give them big problems. They won't jump over a fence. Instead, they try to go underneath it! Scientists believe that pronghorns have lived so long in the wide open spaces, that they've never learned how to jump over a barrier, even though they are physically able to do it. Some people have started building fences where the bottom wire is made of smooth wire, not barbed wire. That way, pronghorns can squeeze under without hurting themselves.

Quaking aspen

How could you possibly *not* notice me? I have found a way to draw attention to myself even in the slightest wind. I simply *never* stop moving. Even when everything around me is quiet—the grass unmoving, the air completely still—my leaves are trembling and making a gentle, rustling sound. I do that with a neat trick. Each leaf has a flat stem that shakes in response to the slightest breath of air.

Special uses: Quaking aspen is good fuel for heating and cooking because it makes few sparks.

Native Americans use quaking aspen to reduce fever and treat urinary infections.

The inner bark of this tree could be eaten in spring and used as winter feed for horses.

Even if you haven't noticed my constant motion, you surely have noticed me in the fall, when my leaves become bright yellow against the dark green background of evergreen trees. I do that because I'm a *deciduous* tree, shedding my leaves in the fall and growing new ones each spring.

My trunk is slender and white. I grow 10 to 15 m tall. Where the branches break off from my white trunk, they leave round, gray scars that look like big eyes.

My leaves are 4 to 7 cm long. They are almost round, but they have a pointy tip like a "spade" in a deck of playing cards.

Where do I live? I am a *circumboreal* species. That means I live in northern lands all around the world. In the eastern United States, I am found at low elevations. On the prairies, you can find me in moist spots and north-facing hillsides. In the mountains, I form bright-green patches between dark-green patches of pine forest. I like cool, dry summers and snowy winters. I live best in places where the soil is moist.

BOTANICAL FACT: Quaking aspen is the most widely distributed tree species in North America. It occurs from Newfoundland in the east to Alaska in the west, and all the way south to Mexico. In Utah, Minnesota, and Wisconsin, quaking aspen covers more land than any other kind of forest.

Growing Up: A single aspen tree is not really separate from other aspens growing nearby. Underground, I am connected to many of my neighbors. In fact, aspens seldom grow from seed. We simply sprout from the root of another aspen tree.

A new aspen growing from roots, like me, is called a *sucker*. If a fire or avalanche comes by, our trunks may be broken and look dead, but the next year our roots will produce

thousands of suckers. Every sucker has the same *genes* as the parent tree. No doubt you have heard of identical twins or triplets. The aspen grove where I live is like identical "thousandtuplets." The special name for our patch of related trees is a *clone.*

Growing Points: I have growing points at the tips of my branches, in the buds that produce my leaves and flowers, in my root crown, and on my roots.

Making Seeds. Even though I can sprout new trees from my roots, I work hard at seed production each year. In the spring, before my leaves come out, I produce long, slender *catkins* that hold my flowers. After the flowers are pollinated, I release them in cottony packages that can travel many miles on the wind. The seeds will live less than a month. That's a very short time to get settled in a moist, warm location free from other trees so I can begin growing. No wonder few seedlings survive!

Am I useful? Beaver, deer, elk, and grouse eat my bark, leaves, and buds. Many birds nest in my trunk and branches. I'm especially proud of the fact that all three kinds of bluebirds in the United States use me for nesting.

People use my wood and enjoy my colorful fall leaves, but I am most useful to them in a quiet way. I help the soil absorb water from rain and snow, filter the water so it is clean, and store it in the soil.

What does fire do to me? Most fires pass me by because of the moist locations where I live. When I do get to burn, fire usually kills my above-ground parts—leaves, branches, and trunk—but it rarely harms my roots. This gives me a chance to grow a new crop of suckers. How invigorating!

Life After Fire: Severe fires usually kill most of the conifer trees in a forest. The conifers have to reproduce from seed, but my huge root system gives me a head start in the new forest. My roots easily grab the moisture and nutrients needed to grow new suckers. They will come up by the thousands, and they'll be 1 to 2 m tall within a year. I recover so quickly after fire that managers sometimes use prescribed fires to get more aspens on the landscape.

Saskatoon serviceberry

I am a tall shrub that is native to western North America. I grow well in low-elevation forests, even where the soil is a bit dry. You can find me in all but the highest, coldest forests of the northern Rocky Mountains and the Intermountain area. I grow very well in open, sunny places, so I really like the prairies of the Missouri River country too.

What do I look like? I can be only waist-high, or I can grow very big for a shrub—as high as 8 meters tall. I have woody stems and oval-shaped leaves with little points along the edges. My white flowers grow in small clusters near the ends of my branches. I grow a purplish berry that many animals eat.

I am a *perennial* plant. This means I grow for many years.

Growing Up: I can grow from seed, but most new plants begin as sprouts. I have growing points at the top of my roots, a place called my *root crown*. Some new plants come from underground stems called *rhizomes.*

BOTANICAL FACT: My root crown can be 10 centimeters across. I have rhizomes 70 centimeters underground, and my roots go much deeper!

I grow best in open, sunny places. This is also where I produce my best berry crops. I can grow for a while under forest shade, but I will die out if the forest over me grows dense and dark.

My calendar: My leaves unfold from their buds in early spring. Flowers come out at almost the same time. By the end of June or early July, I've done most of my summer's work. My leaves are full-sized, my stems have finished growing for the year, and my berries are getting ripe.

Am I useful? Bears, deer, elk, bighorn sheep, mountain goats, and moose feed on my branches during the winter. Bison eat my twigs. Cattle and sheep eat my twigs and branches, too.

Many kinds of birds eat my berries. So do snowshoe hares. The animals can't digest the seeds inside the berries, so they distribute seeds for me as they travel!

People eat my berries and make tea from my branches. Native Americans know how to make arrows, spears, and digging sticks from my branches.

I provide hiding places and shelter from storms for grouse and many kinds of small birds.

What does fire do to me? Fires usually kill my buds, but I can almost always grow back from my root crown. If a fire kills my root crown, it's still not likely to kill me. I just sprout from my rhizomes instead.

Deer and elk like the way fire burns away my old, dead outer branches. That makes it easier for them to reach my new, tender shoots.

Life After Fire: I can live for twenty years or more after fire. As the forest grows back and covers me with more and more shade, my growth slows down. I produce fewer berries, and I slowly die. I need another fire!

Saskatoon serviceberry was a very important food of native people of the northern prairies. The berries were eaten raw, cooked, and dried.

Serviceberry may be the most important vegetable food in the Blackfoot way of life. Each summer, when berries were ripe, camp was moved to a good location for picking. Women and girls gathered the fruit in rawhide bags and dried it in the sun. The berries were used in great quantities in soups and pemmican, and dried fruit was often used in trade.

The wood of serviceberry shoots is hard, dense, and flexible, so it makes good arrows. The shoots were peeled, roughly smoothed, tied in bundles, and hung to dry, then smoothed and sanded to the right thickness. To be finished, they were straightened and passed through a circular hole drilled in a buffalo rib or a mountain sheep's horn.

Sharp-tailed grouse

Sometime you may be walking across the prairie or through an aspen grove, minding your own business, and suddenly a bird blasts out of the grass at your feet, wings beating a mile a minute, exploding the quiet with its sudden flight. That would be a grouse like me. We don't do this just to startle you; it's for our own protection. We stay in hiding as long as we possibly can, absolutely still and quiet, hoping you'll turn away without noticing us. We will startle and fly only at the last possible minute, when you nearly step on us. Then we get away in a big hurry and hope to scare you away at the same time.

There are many kinds of grouse in the prairies and mountains. I am a sharp-tailed grouse, named for my elegant pointed tail. Some people also call me a prairie chicken. My feathers are white and many rich shades of brown. With all of these earth colors blended into stripes and speckles in my feathery coat, I am almost invisible in the dried grass of the prairie. Males like me are a little fancier than female birds. We have a wide, yellow eyebrow. During the breeding season, we can move the feathers away from a *neck sac* on each side of our throat. This shows off a patch of purple skin that, we hope, will be totally irresistible to females.

Home on the Prairie: We live in the grasslands of North America, all the way from Utah and Colorado north to Alaska. Our favorite habitat is prairie mixed with patches of woods and shrubs. This mixture provides

everything we need.

Springtime brings the mating season for sharp-tailed grouse. We perform a special mating dance, and we use a special place, called a *lek,* for dancing. Leks are big openings with short, sparse plant cover that won't get in the way of our performance. We males gather in the leks and coo, hoot, twirl, leap, and quack to attract the females! We shake our wings and stamp our feet on the ground for accompaniment. We show off our purple neck sacs, and the hens watch. Then we mate, and the hens move away to nest in a place with more cover. In a spot with dense grass and shelter from some shrubs or trees, they build a nest on the ground and lay their eggs.

Hens lay one egg a day for about 12 days, then protect the eggs and keep them warm for the next 24 days. All of the eggs hatch in a single day. You might think the hen would suddenly be terribly busy trying to feed all her young, but don't worry. We are very mature when we hatch. Before I was one day old, I was ready for Mother to lead our family away from the nest, and I began to feed myself.

I remember being especially fond of grasshoppers at that age.

Within a couple of weeks, I had learned to fly. By the time I was a month old, I had moved away from my family to seek food and shelter on my own.

Summertime, good eating: The best summer habitat for me is a place with lots of variety. I like an open area full of grass and wildflowers. Some of my favorite prairie plants are the bunchgrasses, with their delicious long leaves, and arrowleaf balsamroot, which provides food and hiding cover under its big leaves. I also like to be near a creek with shrub cover, where I can hide and feed on berries later in the summer. My favorites are Saskatoon serviceberries and rose hips. I also like to be near a few trees so I can rest on their branches, well hidden from predators. I'm especially happy in aspen groves because they have plenty of grass and wildflowers on the ground.

Winter, just surviving: In fall, we males go back to the lek to display and check out the other males. Then winter comes, and we need all our skill just to stay alive. Sometimes we form flocks and search together for food and shelter.

Snow can help us or harm us. We burrow down into it to get out of bitter cold temperatures and blizzard winds, but snow also buries much of our food supply. Insects are impossible to find in the cold weather, and snow covers many plants and seeds.

When the snow gets deep, we take shelter in a grove of trees or shrubs, often along a river. There we find both shelter and food. We eat fruits and berries, and we nibble off the buds at the tips of branches. Aspen, willow, and cottonwood branches are among our favorites.

Not all of us survive the winter. Foxes and coyotes may hunt us on the ground; owls, hawks, and eagles hunt us from the air. We're especially easy to catch in winter, but we provide nutritious food for many animals year-round. Of course, that includes people!

Fire, a good friend: Fires occur every few years on the prairie, and our habitat wouldn't last very long without them. Fires help the grasses and wildflowers stay healthy and produce lots of seed. They push back the shrubs and trees that would otherwise spread across the grassland. They keep our leks from being overgrown with plants. Fires even reduce the ticks and other pests that make life miserable for us in summer. Spring fires destroy some of our nests, and fall fires destroy much of our winter food supply. But overall, fires do much more good than harm to our homeland. Fire is the friend of the prairie and the animals who live here.

Western snowberry

I am a shrubby plant whose white berries stand out from my backdrop of green and brown. I think my common name suits me perfectly because my berries are snow-white. My scientific name is *Symphoricarpos occidentalis*—what a mouthful! *Symphoricarpos* means "fruit born together." This describes how my flowers and fruits occur in pairs or clusters, like twins—or even quadruplets or octuplets! And my species name, *occidentalis* means "western".

Where do I live? I can be found throughout most of North America, except in the very southeastern and southwestern states. I can grow in forests under the shade of trees, or out in the open grasslands. In the western parts of Missouri River country, you can usually find me growing with ponderosa pine. In the east, I might live near bur oaks. And in floodplains and along rivers, I grow with cottonwood and green ash. You may see me growing in patches throughout the prairies.

What do I look like? I am a shrub that can grow up to 5 feet tall. Sometimes, I grow very close to other snowberry bushes; our leaves and stems weave together to form dense thickets that you wouldn't want to walk through.

I have an impressive network of roots and *rhizomes* underground. Rhizomes are underground stems that grow horizontally and can sprout to produce more plants. My rhizomes can be nearly 1 meter long, and the roots that extend downward from my rhizomes can reach 1.5 meters deep. No wonder I can form such extensive thickets!

You may not notice my flowers at first, but if you look closely you will see clusters of pale pink flowers nestled along my branches. As you can see, my fruits look like round, white, puffy marshmallows.

Growing Up: I start growing from seed and from sprouts on my underground rhizomes. My new sprouts can grow very fast. In one year, they can become as tall as the rest of my stems. I am lucky, these young sprouts will produce fruit in their first year.

I can grow in the shade of trees, but I grow best and thickest on the edges of forests, openings, and other places where I can get lots of sun. That's why I love the Missouri River country, where I can have lots of sunshine and a few trees or shrubs as neighbors that help shelter me from wind and snow.

Growing Points: I have growing points at the

tips of my branches, in the buds that produce leaves and flowers, on the tips of my roots, and on my rhizomes.

How do I reproduce? I can reproduce by seeds, but I am more likely to reproduce from my rhizomes. As more and more plants sprout from these buried treasures, I form large *colonies*, or clusters of plants. Sometimes my colonies are bigger than a football field!

My calendar: My new stems sprout through the soil in the spring. At the same time, shoots on my older stems begin to grow, and leaves burst from their buds. In Missouri River country, I flower between June and August. My snowberries begin to form as my pale flowers fade and fall to the ground. After I lose my leaves in the fall, my ghostly white berries are hard to miss hanging off the ends of my naked branches.

Am I useful? I provide food and shelter to many animals. My fruits are eaten by small mammals and birds. In the fall and early winter, sharp-tailed grouse love to eat my berries. Pronghorn, elk, and deer browse on my leaves. Sometimes cattle and goats even like to eat me.

Many birds and small mammals seek shelter under my protective thicket of leaves and branches. Birds, like wild turkeys and sharp-tailed grouse, love to nest within my cover. Wild turkeys would rather nest under me than under any other kinds of plants!

My roots and rhizomes help hold streambanks in place. In the places where I grow together with cottonwood trees, our leaves and branches combine to provide shade that keeps stream water cool in the summer. This way, I also help fish survive and reproduce.

What does fire do to me? My aboveground stems, buds, and leaves are usually killed by fire. But that's not a problem because I can sprout new stems from my underground rhizomes. In fact, I can even sprout new stems within a couple of weeks after a fire. After fires, I often produce even more stems than I had before.

Life after fire: Wildfires are often good for me. If fires kill my neighboring trees, I'm quick to take advantage of the sunlight. I like to get established before other plants can shade me out.

Even though I usually benefit from fire, it is possible to have too much of a good thing. If my home is burned very often, my sprouts may be killed or I may not have enough time between fires to sprout new stems and strong roots. I hate to admit it, but frequent fires actually help maintain my home, the prairie. They keep trees and shrubs like me from creeping out onto the prairie and changing it into a shrubland or forest.

Western yarrow

I am a *perennial* wildflower that grows in dry, sunny places. You may not notice me right away, since I often grow among other wildflowers and large bunchgrasses. But I am a true citizen of the world, at home in North America, Europe, and Asia.

What do I look like?

I usually grow half a meter to a meter tall. My fuzzy, gray-green leaves are shaped a bit like ferns or feathers. My leaves smell very sweet when crushed, and they can be used to slow the bleeding of a wound or make a refreshing, healing tea. The leaves of my neighbors, the grasses and other wildflowers, dry out and die by the end of summer, but some of my leaves stay green and fresh all winter long.

My dozens of white or light pink flowers come out early in summer, mostly in May or June. They cluster at the top of my tall stem, sitting side by side, so close together that they look like a little umbrella.

Where do I live?

I can grow almost anywhere if I can get enough light. I live in prairies, shrublands, open woods, and mountain meadows. You can find me along trails, in road ditches, even in vacant lots, but you won't find me in dense forest. I don't need deep soil or lots of moisture to grow, but I sure need sunlight.

Growing Up:

I reproduce from seed and by sprouting from rhizomes. I can produce thousands of seeds in a single year. Most of my seeds fall very near me, but a few are blown away by the wind or carried by animals, water, and gravity to a new home.

I produce a lot of rhizomes. They spread out underground from my base, and they can sprout a new plant every few centimeters. They can produce a new plant even if their connection to me is cut off. A piece of rhizome just takes root wherever it lands, then grows a new stem and leaves. This is very helpful in places where the soil has been torn up by flood, grazing animals, or construction. People have found yarrow plants growing from little pieces of rhizome that are buried 30 cm in the soil!

Am I useful?

My rhizome network protects my habitat by holding the soil in place. Sometimes people plant yarrow after they've built a road or dug a ditch; I spread out quickly in those places and help stop erosion.

Humans use me in medicines, and other animals like me too. Bighorn sheep, pronghorn, and deer occasionally eat my flowers. Sage-grouse chicks rely on me for food when they're just a couple of months old.

Yarrow can be used to stop bleeding from wounds and cuts. It can also be used in a poultice to heal burns and open sores. The chemical that enables yarrow to stop bleeding has been used in laboratory experiments showing that it reduces the clotting time of blood.

Fire and Me: I get along well with fire. I do my growing early in the summer, before my habitat is likely to burn. If a fire does come through in spring, before I've finished growing and producing seed, it could be bad for me, but I don't burn easily. I'm likely to survive.

My rhizomes are my best defense against fire. Growing underground, they're protected from all but the most severe fires.

After fire, I often have a couple of really good years. My seedlings receive lots of sunlight so they grow well in the warm, ash-blackened soil. My rhizomes produce many new plants, which in turn produce lots of flowers and new seed. A few years after fire, I may cover ten times as much area as I did before. After a few years, though, I relax and take my place again as a small part of the plant community where I live.

WORD FACT: Yarrow's Latin genus name, *Achillea*, refers to a Greek myth more than 2,000 years old. When the Greek hero Achilles was a baby, according to legend, his mother dipped him in the River Styx to protect him from injury. But she was holding him by the heel, which did not get dipped into the protective waters. Achilles seemed invulnerable in battle until an arrow pierced him in his heel, his one vulnerable spot, and he died of the wound. The name *Achillea* was chosen for western yarrow because its leaves can be used to slow the bleeding of a wound.

Wild turkey

I am a *wild* turkey. Even though the turkeys that you see in farms or grocery stores are the same species as me, I am wild! My scientific name is *Meleagris gallopavo*, but I prefer to be called a "gobbler", which refers to one of the sounds that male turkeys—like me, make.

Does it pay to be popular? Nowadays, wild turkeys can be found throughout North America, but our native range was much smaller. Originally, we only lived in the central and eastern states, but humans have brought us all over the country because they like us so much. They like us not only because we're interesting and handsome, but also because we're good to eat. That's why I wonder if it's good to be popular.

My favorite places to live are in open forests and woodlands. In the Missouri River country, oak woodlands are perfect for me because I can find plenty of food to eat, fly around easily, and roost in the trees. I can also see my predators easily without letting them see me.

You may also find me in ponderosa pine forests, or where cottonwood and aspen trees grow.

To eat…and to get eaten: I love to eat acorns and nuts. That is why I love oak woodlands so much. But I am not picky; I will eat lots of different kinds of food. I eat seeds and berries, grasses and leaves, insects, and even salamanders and snakes! Sometimes I search for food up in the trees, but I usually scratch along the ground to find my dinner. Being able to eat so many different kinds of meals has helped us survive in the many places where humans have placed us.

As you may guess, lots of animals would love to eat me—and that includes humans. Now that I am an adult, I mostly worry about large predators like coyotes and humans. But when I was young, it seemed like everyone was out to get me! I had to hide from squirrels, chipmunks, snakes, hawks, owls, and eagles, just to name a few.

Family guy…not quite: I can be a bit of a show off— that is how I start a family. In late winter and early spring, the other males and I start gobbling to attract female turkeys, who are called hens. When a hen shows up, I strut around her to show what a great catch I am. I make myself look very handsome with my tail feathers fanned straight up in the air, my wingtips dragging on the ground, and my chest puffed out. I make the red, white, and blue colors of the skin on my neck and face very bright. I dance around, spit, and make special "booming" and "drumming" sounds that I know will win her over. I work hard to look bigger and more handsome than any of the other males around here. If my looks and my strutting, spitting, and drumming pay off, the hen will let me mate with her.

When the hen is ready to lay her eggs, she will find a protected area under a tree or shrub and build a nest by scratching out a shallow depression in the ground. She will lay

an egg nearly every day until there are about 12 eggs in the nest. After all of my showing off, I don't stick around to help care for the eggs or raise the baby turkeys, which are called poults. In fact, I am busy strutting and trying to mate with other hens!

Hens incubate their eggs for about 28 days before they hatch. Luckily for the hens, they aren't a lot of work after they hatch. Poults learn to walk and eat on their own within a few days of hatching, and they can fly by the time they are 2 weeks old.

Wild turkeys are very social animals. After hatching, I remained with my mother and siblings until I became as big as my mom. In the early winter, I left my mom and joined a group of 10 other males. My sisters remained with Mom, and in late summer and fall, their little band joined other bands of females, so their winter flock had more than 200 hens. Can you imagine seeing that many turkeys in one place? When winter ended, the bands broke into smaller groups, and my sisters left my mother's care.

Fire and me: Now that I am old enough to fly, I don't worry about fires. When fires burn across my homeland, I just fly away. But the hens sometimes worry. When fires burn our home in the spring, they can burn up our nests and eggs. They can also kill newly hatched poults before they learn to fly.

I usually love to spend time in areas that have recently burned. In the first few years after a fire, there is often a tasty supply of new plants, seeds, and lots of insects for me to eat. The delicious new growth of the grasses and the new crop of seeds and berries are perfect for me. I also love it when fires kill some of the trees and shrubs and keep my woodlands and forests from getting too crowded. It is much easier for me to fly in open places than in deep forests, and it's also easier to find my favorite acorns and nuts.

People and wild turkeys: It seems like people have always loved wild turkeys. Wild turkeys were an important food for Native Americans and early settlers from Europe. As settlers explored and settled all over North America, they hunted the turkeys and also cleared the forests and savannas so they could farm. Turkeys needed these trees for food and hiding places. They became very scarce, and they even went extinct in several states. Eventually they were protected by conservation laws. Trees and forests grew back, providing food and shelter, and turkeys became more plentiful. People captured some of these birds and released them in places where there were no turkeys—in their original habitat and in many other places as well. Populations of turkeys flourished, and today, wild turkeys live in every state except Alaska.

Wild Onion

If you're walking through the woods or across a prairie and suddenly think you've walked into the kitchen and someone is cooking spaghetti, you may be in a patch of wild onions. My whole plant smells just like the onions you use in cooking. My genus name is *Allium*, which really means "garlic." The garlic used in cooking is a close relative of mine.

BOTANICAL FACT: The plant world has many kinds of onions. About 50 species of wild onions grow just in the Rocky Mountains. There are nearly 300 species in the world!

Where do I live? I can grow in lots of different places. Some species of wild onion like shady, moist homes; some like it dry and sunny. Some like the prairies. Some grow in forests. A lot of us like moist places; we are very happy living near running streams and wet meadows.

Growing Points: I have growing points in my *bulb* and in my roots. Some species of wild onions have growing points on underground stems called *rhizomes* too.

BOTANICAL FACT: A bulb grows underground, just like a root. But it's not really a root. It's a cluster of leaves—*very special* leaves. Bulb leaves are thick and moist, and they're white, not green! Green leaves capture sunlight and turn it into nutrients for plants. The white leaves of a bulb *store* nutrients, especially through the long winter. With all that stored energy, bulbs can begin growing early in spring and sprout from under ground even if someone has picked all the flowers and leaves on the plant.

Growing Up: I can start growing from seed, but I can also make new onions without using flowers or seeds at all! That's because, at the end of summer, my bulb starts growing little *bulblets* at its base. Those are new bulbs, and

they'll grow into new wild onion plants!

My calendar: I start to grow in spring. My flowers open in late spring or summer. I make seeds right away. After the seeds are ripe, my year's work is done. By August, my stem and leaves may dry up and disappear. Like an underground treasure, my bulb will wait underground for spring to come.

Am I useful? Everyone likes to cook with onions. Native Americans have always used them. Lewis and Clark cooked with wild onions as they traveled through the West 200 years ago. Bears and ground squirrels eat my bulbs. In early spring, elk and deer graze on my leaves.

Even though I'm delicious and nutritious, you'd better keep your cows away from me unless you like onion-flavored milk!

What does fire do to me? I can't handle a fire that's so hot it roasts my bulbs! But I can survive fires that just burn my stems and leaves. Don't let the soil wash away after the fire, though. If erosion uncovers my bulb, I'll probably die.

Life After Fire: If my top burns off, it's no big deal to me. I can grow new leaves and flowers the next year. I don't go crazy with flowers after fire like show-off fireweed does, though. I just grow slowly and steadily, making a few new plants every year. Come on out to the woods and see if you can find me!

Willows

We are members of a huge family of woody plants that live all around the world—the willows. More than a hundred willow species live in the United States.

Willows seldom grow alone. We like to form thickets, where many of us grow very close together. Some thickets hold a mixture of different willow species and other shrubs as well. There may be patches of forest, meadow, and prairie between willow thickets, or patches of willow may line the edges of rivers and ponds.

Most willows look somewhat alike. Watch for a tall shrub with narrow leaves and many stems sprouting from the base. We usually grow 2 to 3 m tall, but sometimes we grow to tree size. You can't see our stems very well in summer, but in winter you might notice how colorful they are—bright yellow to brown, purplish to dark red, green, or shiny gray.

Moisture marker: A few kinds of willow grow on dry hillsides, but most of us need moist soil to survive. If you see a willow thicket at the edge of a forest, you're likely to find a lake or beaver pond on the other side. If you spot a line of willows winding through a prairie, you'll probably find a creek or river bed next to them. Even if no water is visible, our roots have probably found moisture deep in the soil—just enough to keep us growing through the summer.

We like moisture so much that we actually like floods! High water loosens the soil, so big trees, like cottonwoods, fall over. That provides lots of sunlight, which we need for growing. Wherever the flood water deposits soil, it forms a perfect place for us to grow from seed. Even better, if the flood water deposits broken willow stems along with the soil, these can take root and grow rapidly into strong, new plants.

We grow quickly when sunlight and moisture are plentiful. We might grow 30 cm in a single summer. It takes only a few years for a willow to grow big enough to produce flowers. These come out from our branches in long clusters called *catkins.*

We produce millions of tiny seeds every year. Each seed is attached to a tuft of soft fibers that can carry it a long way on wind or water. Our seeds live only a week or so; if they don't land on sunny, moist soil in that time, they cannot survive to produce a new willow plant.

Super sprouter: Animals can eat us or trample us, people can cut us down, fires can burn us, and winter's cold can freeze us, but it's very hard to kill us because of our many growing points. We can sprout from the base of our stems. Many of us can also sprout from our roots, and some can grow a new plant from a branch lying on moist soil. A long line of

sprouts leading away from a willow plant usually shows where a single, long root is growing underground.

DIAMOND WILLOW: Some willow branches are especially beautiful. Called "diamond willow," these have diamond-shaped patterns on their trunks and branches. The patterns are not limited to one species or one location; they occur in many places and seem to be caused by a fungus, although scientists are not sure of this. People collect diamond willow stems and make them into walking sticks, furniture, and other items.

Useful? Of course we are! Wild animals love the way patches of willow mix with patches of wetland, grassland, and forest. We provide the moose's favorite habitat. Beaver use us for food and building material. Elk, deer, and snowshoe hares browse on our branches, especially in winter. Small birds and mammals eat our buds and catkins, nest in our crowns, and live in the shade and litter under our branches. Where we grow over the edges of ponds and streams, we provide shade and shelter for ducks and fish.

Willows are very important for people too. For thousands of years, people have used us to make baskets, arrow shafts, scoops, fish traps, and backrests. People also plant us to keep the soil in place on river banks and along streams. Several willow species produce a chemical called *salicin*, which is a good painkiller and is used in making aspirin. People can use willow bark and leaves to relieve fever, toothaches, headaches, and other pain.

Fire: We usually grow in places that have more moisture than the prairies and hillsides nearby. That means we stay green throughout the summer, so we don't burn as often as the plant communities around us. Sometimes a fire spreads right up to the edge of a willow thicket and then stops.

We are not fireproof, though. When the weather is hot, dry, and windy, fire can burn right through a patch of willows. It may go through so quickly that it leaves our roots completely unharmed. Because we are such great sprouters, fires like this don't cause much damage. We sprout from our roots and root crowns; within a few years, we'll be as tall and thick as we were before the fire. Sometimes a fire burns slowly through a willow thicket, consuming all of the fuel and heating the soil underneath. These fires may kill our roots, leaving us unable to sprout. Within a few months, seeds and stems of other plants will find their way to the bare soil and begin to grow. Some of these may be willows, which will eventually form a thicket, protecting the soil and providing food and cover for animals in years to come.

So many uses: Willow twigs can be steeped in boiling water to make a medicine to cure fever and relieve pain. Branches can be used to make backrests and to build the frame for a sweat lodge or a bull boat. They can even be used as lodge poles for small hunting tipis. In spring, buds harvested from the pussy willow can be used to make a red dye.

Appendix A. Photo Credits

Ants

Ant on flower. David Cappaert, Michigan State University, Bugwood.org. Available: http://www.forestryimages.org/browse/detail.cfm?imgnum=2133016 [2012, June 6].

Ant tending aphids. David Cappaert, Michigan State University, Bugwood.org. Available: http://www.forestryimages.org/browse/detail.cfm?imgnum=5343046. [2012, June 6].

Ant mound. Howard Ensign Evans, Colorado State University, Bugwood.org. Available: http://www.forestryimages.org/browse/detail.cfm?imgnum=1491020. [2012, June 6].

Arrowleaf balsamroot

Arrowleaf balsamroot flower, close-up. Copyright (c) Lee Dittmann. Image used with permission. Available: http://calphotos.berkeley.edu/cgi/img_query?enlarge=0000+0000+0310+0398. [2012, June 6].

Arrowleaf balsamroot plant. Dave Powell, USDA Forest Service, Bugwood.org. Available: http://www.forestryimages.org/browse/detail.cfm?imgnum=1359085. [2012, June 6].

Bald eagle

Bald eagle flying. Caleb Slemmons, University of Maine, Bugwood.org. Available: http://www.forestryimages.org/browse/detail.cfm?imgnum=5416319. [2012, June 6].

Bald eagle on nest. Paul Bolstad, University of Minnesota, Bugwood.org. Available: http://www.forestryimages.org/browse/detail.cfm?imgnum=5189032. [2012, June 6].

Bald eagle head. Terry L Spivey, Terry Spivey Photography, Bugwood.org. Available: http://www.forestryimages.org/browse/detail.cfm?imgnum=5363096. [2012, June 6].

Bison

Bison range. Ryan Hagerty, USFWS, U.S. Fish and Wildlife Service's National Digital Library. Available: http://digitalmedia.fws.gov/FullRes/natdiglib/bison_Hagerty_10-03_872_102.1.03.jpg. [2012, June 6].

Bison cow and calf. Jesse Achtenberg, USFWS, U.S. Fish and Wildlife Service's National Digital Library. Available: http://digitalmedia.fws.gov/FullRes/natdiglib/0BCDBEBF-0B4A-4EDE-8F2CCC5044304E10.jpg. [2012, June 6].

Bison wallow. Paul Bolstad, University of Minnesota, Bugwood.org. Available: http://www.forestryimages.org/browse/detail.cfm?imgnum=5189025. [2012, June 6].

Bison male. Alfred Viola, Northeastern University, Bugwood.org. Available: http://www.forestryimages.org/browse/detail.cfm?imgnum=1566055 [2012, June 6].

Black bear

Black bear. Terry Spivey, USDA Forest Service, Bugwood.org. Available: http://www.forestryimages.org/search/action.cfm?q=1374241 [2012, June 6].

Midden. Ilana Abrahamson, USDA Forest Service. Image used with permission.

Black-tailed prairie dog

Prairie dogs kissing. TheBrockenInaGlory, Wikipedia, the free encyclopedia. Available: http://en.wikipedia.org/wiki/File:Kissing_Prairie_dog_edit_3.jpg [2012, June 6].

Prairie dog standing. Alfred Viola, Northeastern University, Bugwood.org. Available: http://www.forestryimages.org/browse/detail.cfm?imgnum=1566002 [2012, June 6].

Prairie dog town. Joy Viola, Northeastern University, Bugwood.org. Available: http://www.forestryimages.org/browse/detail.cfm?imgnum=1566004 [2012, June 6].

Black-eyed susan

Black-eyed susan flower. Chris Evans, River to River CWMA, Bugwood.org. Available: http://www.forestryimages.org/browse/detail.cfm?imgnum=2119003 [2012, June 6.]

Black-eyed susan field. Wendy VanDyk Evans, Bugwood.org. Available: http://www.forestryimages.org/browse/detail.cfm?imgnum=2118095 [2012, June 6].

Black-eyed susan with wasp. Fitz Clarke, Bugwood.org. Available: http://www.forestryimages.org/browse/detail.cfm?imgnum=5444137 [2012, June 6].

Black-eyed susan with karner blue butterfly. Catherine Herms, The Ohio State University, Bugwood.org. Available: http://www.forestryimages.org/browse/detail.cfm?imgnum=1561151 [2012, June 6].

Bur oak

Bur oak acorn. Paul Wray, Iowa State University, Bugwood.org. Available: http://www.forestryimages.org/browse/detail.cfm?imgnum=0008232 [2012, June 6].

Bur oak bark. Paul Wray, Iowa State University, Bugwood.org. Available: http://www.forestryimages.org/browse/detail.cfm?imgnum=0008029 [2012, June 6]

Bur oak tree. Joseph O'Brien, USDA Forest Service, Bugwood.org. Available: http://www.forestryimages.org/browse/detail.cfm?imgnum=5049045 [2012, June 6].

Chokecherry

Chokecherry plant. Dave Powell, USDA Forest Service, Bugwood.org. Available: http://www.forestryimages.org/browse/detail.cfm?imgnum=1208061 [2012, June 6].

Choke cherry fruit. Paul Wray, Iowa State University, Bugwood.org. Available: http://www.forestryimages.org/browse/detail.cfm?imgnum=0008188 [2012, June 6].

Chokecherry flowers. Sheri Hagwood @ USDA-NRCS PLANTS Database. Available: http://plants.usda.gov/java/profile?symbol=PRVI&photoID=prvi_010_ahp.jpg [2012, June 6].

Clark's nutcracker

Clark's nutcracker with distended pouch. Nadine Hergenrider. Available: https://fsplaces.fs.fed.us/fsfiles/unit/wo/wfrp/find_a_photo.nsf/findphoto.nsf/photo/8F383867D416B869852573400051450C?OpenDocument [2012, June 6].

Two Clark's nutcrackers. Nadine Hergenrider. Available: https://fsplaces.fs.fed.us/fsfiles/unit/wo/wfrp/find_a_photo.nsf/findphoto.nsf/photo/90FAE54DA7EEBF9B8525734000522CE7?OpenDocument [2012, June 6].

Cottonwoods

Cottonwood tree. "Chris Evans, River to River CWMA, Bugwood.org. Available: http://www.forestryimages.org/browse/detail.cfm?imgnum=1380093 [2012, June 6].

Seeds. Bill Cook, Michigan State University, Bugwood.org. Available: http://www.forestryimages.org/requests/LightboxAdd.cfm?imgnum=1219166&size=5 [2012, June 6].

Cottonwood leaves. Paul Wray, Iowa State University, Bugwood.org. Available: http://www.forestryimages.org/browse/detail.cfm?imgnum=0008317 [2012, June 6].

Coyote

Coyote in snow. Terry L Spivey, Terry Spivey Photography, Bugwood.org. Available: http://www.forestryimages.org/browse/detail.cfm?imgnum=5358041 [2012, June 6].

Coyote with kill. Rick Roseman, Bugwood.org. Available: http://www.forestryimages.org/browse/detail.cfm?imgnum=5443588 [2012, June 6].

Deer mouse

Deer mouse. David Cappaert, Michigan State University, Bugwood.org. Available: http://www.forestryimages.org/browse/detail.cfm?imgnum=2133024 [2012, June 6].

Dee mouse whole body. David Cappaert, Michigan State University, Bugwood.org. Available: http://www.forestryimages.org/browse/detail.cfm?imgnum=2133025 [2012, June 6].

Limber pine

Limber pine stand. Dave Powell, USDA Forest Service, Bugwood.org. Available: http://www.forestryimages.org/browse/detail.cfm?imgnum=0806050 [2012, June 6].

Limber pine cones. Dave Powell, USDA Forest Service, Bugwood.org. Available: http://www.forestryimages.org/browse/detail.cfm?imgnum=0806051 [2012, June 6].

Limber pine tree. Charles Webber © California Academy of Sciences. Image used with permission. Available: http://calphotos.berkeley.edu/cgi/img_query?enlarge=0024+3291+1997+0020 [2012, June 6].

Lodgepole pine

Lodgepole pine stand. Dave Powell, USDA Forest Service, Bugwood.org. Available: http://www.forestryimages.org/browse/detail.cfm?imgnum=0976011 [2012, June 6].

Lodgepole pine saplings. Dave Powell, USDA Forest Service, Bugwood.org. Available: http://www.forestryimages.org/browse/detail.cfm?imgnum=1213042 [2012, June 6].

Lodgepole pine fire. USDA Forest Service - Region 2 - Rocky Mountain Region Archive, USDA Forest Service, Bugwood.org. Available: http://www.forestryimages.org/browse/detail.cfm?imgnum=1442074 [2012, June 6].

Northern flicker

Northern flicker. Dave Herr. Available: https://fsplaces.fs.fed.us/fsfiles/unit/wo/wfrp/find_a_photo.nsf/findphoto.nsf/photo/F24F1E9B8B02F96C8825711100755C53?OpenDocument [2012, June 6].

Northern flicker cavity. Menke, Dave, USFWS, U.S. Fish and Wildlife Service's National Digital Library. Available: http://digitalmedia.fws.gov/FullRes/natdiglib/Northern-Flicker-7445-0.jpg [2012, June 6].

Plains prickly pear

Plains prickly pear. Mary Ellen (Mel) Harte, Bugwood.org. Available: http://www.forestryimages.org/browse/detail.cfm?imgnum=5099026 [2012, June 6].

Plains prickly pear fruit. Paul S. Drobot, Robert W. Freckmann Herbarium, University of Wisconsin-Stevens Point. Image used with permission. Available: http://wisplants.uwsp.edu/scripts/detail.asp?SpCode=OPUPOL [2012, June 6].

Ponderosa pine

Ponderosa pine. Scott Roberts, Mississippi State University, Bugwood.org. Available: http://www.forestryimages.org/browse/detail.cfm?imgnum=4799017 [2012, June 6].

Ponderosa pine surface fire. Ilana Abrahamson, USDA Forest Service. Image used with permission.

Ponderosa pine peeling bark. Jane Kapler Smith, USDA Forest Service. Image used with permission.

Prairie grasses

Prairie landscape. NPS photo, Wind Cave National Park.

Buffalo grass flowers. Jim Pisarowicz, National Park Service, Wind Cave National Park.

Blue grama flowers. Jim Pisarowicz, National Park Service, Wind Cave National Park.

Buffalo grass stolons. North Carolina State University, TurfFiles, Center for Turfgrass Environmental Research & Education (CENTERE). Available: http://www.turffiles.ncsu.edu/turfgrasses/Buffalograss.aspx [2012, June 6].

Big bluestem with black-eyed susans. Hancock Seed Company, Dade City, FL.

Western wheatgrass. Sally and Andy Wasowski, Lady Bird Johnson Wildflower Center. Available: http://www.wildflower.org/plants/result.php?id_plant=PASM [2012, June 6].

Needle-and thread seeds. Richard Old, XID Services, Inc., Bugwood.org. Available: http://www.forestryimages.org/search/action.cfm?q=5246089 [2012, June 6].

Sweet grass braids. Prairie Moon Nursery, Winona, MN.

Fire in shortgrass prairie. Rick Trembath.

Prairie turnip

Prairie turnip. Peter M. Dziuk, MinnesotaWildflowers.info. Image used with permission. Available: http://www.minnesotawildflowers.info/flower/prairie-turnip [2012, June 6].

Prairie turnip root. Ann, Prairie Smoke Notes blog. Image used with permission. Available: http://prairiesmokenotes.wordpress.com/2009/06/23/prairie-turnip/ [2012, June 6].

Pronhorn

Pronghorn. Terry Spivey Photography. Available: http://www.forestryimages.org/browse/detail.cfm?imgnum=5356584 [2012, June 6].

Pronghorn fawn. Dick Kettlewell. Image used with permission. Available: http://www.outdoorphotoworkshops.com/zen-cart/one-on-one-photo-workshops/pronghorn-antelope-fawns-photography-workshop [2012, June 6].

Quaking aspen

Quaking aspen leaves. Paul Wray, Iowa State University, Bugwood.org. Available: http://www.forestryimages.org/browse/detail.cfm?imgnum=0008295 [2012, June 6].

Quaking aspen sprouting. Robert F. Wittwer, Oklahoma State University, Bugwood.org. Available: http://www.forestryimages.org/browse/detail.cfm?imgnum=4800032 [2012, June 6].

Quaking aspen trunk. Terry Spivey, USDA Forest Service, Bugwood.org. Available: http://www.forestryimages.org/browse/detail.cfm?imgnum=1375331 [2012, June 6].

Quaking aspen fall colors. Terry Spivey, USDA Forest Service, Bugwood.org. Available: http://www.forestryimages.org/browse/detail.cfm?imgnum=1375340 [2012, June 6].

Saskatoon serviceberry

Saskatoon serviceberry flowers. Terry Spivey, USDA Forest Service, Bugwood.org. Available: http://www.forestryimages.org/browse/detail.cfm?imgnum=1374818 [2012, June 6].

Saskatoon serviceberry fruit. Chris Evans, River to River CWMA, Bugwood.org. Available: http://www.forestryimages.org/browse/detail.cfm?imgnum=2190069 [2012, June 6].

Saskatoon serviceberry. Mary Ellen (Mel) Harte, Bugwood.org. Available: http://www.forestryimages.org/browse/detail.cfm?imgnum=2123037 [2012, June 6].

Sharp-tailed grouse

Sharp-tailed grouse. Dave Menke, USFWS, U.S. Fish and Wildlife Service's National Digital Library. Available: http://digitalmedia.fws.gov/cdm4/item_viewer.php?CISOROOT=/natdiglib&CISOPTR=7360&CISOBOX=1&REC=2 [2012, June 6].

Sharp-tailed grouse displaying. Paul Bolstad, University of Minnesota, Bugwood.org. Available: http://www.forestryimages.org/browse/detail.cfm?imgnum=5189061 [2012, June 6].

Sharp-tailed grouse displaying to another. Paul Bolstad, University of Minnesota, Bugwood.org. Available: http://www.forestryimages.org/browse/detail.cfm?imgnum=5189063 [2012, June 6].

Western snowberry

Western snowberry. Chris Evans, River to River CWMA, Bugwood.org. Available: http://www.forestryimages.org/browse/detail.cfm?imgnum=2153009 [2012, June 6].

Western snowberry flowers. Chris Evans, River to River CWMA, Bugwood.org. Available: http://www.forestryimages.org/browse/detail.cfm?imgnum=2153011 [2012, June 6].

Western snowberry fruit. Robert Vidéki, Doronicum Kft., Bugwood.org. Available: http://www.forestryimages.org/browse/detail.cfm?imgnum=5396949 [2012, June 6].

Western yarrow

Western yarrow. John Cardina, The Ohio State University, Bugwood.org. Available: http://www.forestryimages.org/browse/detail.cfm?imgnum=1560203 [2012, June 6].

Western yarrow leaves. Steve Dewey, Utah State University, Bugwood.org. Available: http://www.forestryimages.org/browse/detail.cfm?imgnum=1459883 [2012, June 6].

Wild onion

Wild onion flowers. Andy and Sally Wasowski, Lady Bird Johnson Wildflower Center. Image used with permission. Available: http://www.wildflower.org/gallery/result.php?id_image=21208 [2012, June 6].

Wild onion. Mrs. W. D. Bransford, Lady Bird Johnson Wildflower Center. Image used with permission. Available: http://www.wildflower.org/gallery/result.php?id_image=4459 [2012, June 6].

Wild turkey

Female wild turkeys. Henry Zeman, National Wild Turkey Federation. Available: http://www.nwtf.org/nwtf_newsroom/photos1/turkeys.html [2012, June 6].

Wild turkeys strutting. Dave Herr. Available: https://fsplaces.fs.fed.us/fsfiles/unit/wo/wfrp/find_a_photo.nsf/findphoto.nsf/photo/366B918D58AAF865882571060053C93C?OpenDocument [2012, June 6].

Wild turkey. Dean Elson. Available: https://fsplaces.fs.fed.us/fsfiles/unit/wo/wfrp/find_a_photo.nsf/findphoto.nsf/photo/0268C43EF6F5123E882571AE00717281?OpenDocument [2012, June 6].

Willows

Willows leaves. Paul Wray, Iowa State University, Bugwood.org. Available: http://www.forestryimages.org/browse/detail.cfm?imgnum=0008452 [2012, June 6].

Willows flowers. Paul Wray, Iowa State University, Bugwood.org. Available: http://www.forestryimages.org/browse/detail.cfm?imgnum=0008153 [2012, June 6].

Willows in riparian site. Robert Vidéki, Doronicum Kft., Bugwood.org. Available: http://www.forestryimages.org/browse/detail.cfm?imgnum=5398702 [2012, June 6].