FireWorks Encyclopedia

Featuring Species from the Sierra Nevada
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I am an American black bear. My brother and I were born in our mother's winter den. I was about as big as a rat when I was born. I was blind too, and I had no teeth. My brother and I grew bigger and stronger every day. When spring came, we followed our mother around and she taught us how to find food. When I turned two years old, my brother and I left our mother. When I was four years old, I started my own family. I have cubs every two or three years. Most of my cubs are twins or triplets.

I live in forests, woodlands, and shrublands. These are places that provide plenty of food. I wake up every day before sunrise to start eating. I usually take a nap in the middle of the day. Then I eat until dark. I use my sharp claws to dig up ants and grubs. In spring, I look for juicy new plants. In summer, I feast on berries. In fall, I eat fruit and acorns. In winter, my food is hidden under the snow, so I need to grow really fat before winter. Then I can sleep for months without eating or drinking. I will lose weight, but I will wake up strong and ready for spring.

I can run away from almost any fire. I will just go somewhere else to eat. I will come back after the fire to feed on beetles and other insects. The next year, I will feed on tender new wildflowers growing in burned places. A few years later, I will find the burned place loaded with juicy berries. I love places where patches of trees are mixed up with burned patches. I can feed in the openings and rest in the trees. I have everything I need!
References:

I am a fungus. I live on tree trunks and tree roots. I live INSIDE them, too. I do not get my energy directly from the sun, like plants do. Instead, I grow into the roots and trunks of trees and absorb my nutrients from their cells. People call these trees my hosts. That makes it sound like I am their guest for dinner, but really THEY are MY dinner! Most of my host trees are conifers. I live in forests throughout the United States.

Because I live mostly underground or inside my host tree, you probably will not notice me unless I have grown a conk at the base of the tree. Conks are light-colored and shaped sort of like seashells. They produce my spores, which can fly far away on the wind and start a new fungus.

My arrival in a tree begins a wonderful process: ROT. This is an important job. If no one did it, the forest would fill up with dead wood! Rot breaks wood down into tiny pieces that keep the soil healthy and provide nutrition for growing plants.

Scientists are not sure how fire affects me. Fire can kill the trees where I live, but it probably cannot make me go away. I can live for a long time in dead tree roots deep underground, where I am protected from fire’s heat.
References:

Maser, Chris; Sedell, James R. 1994. From the forest to the sea: The ecology of wood in streams, rivers, estuaries, and oceans. Delray Beach, FL: St. Lucie Press. 200 p.


Baker cypress

*(Hesperocyparis bakeri)*

I am a very rare evergreen tree. I live in only about a dozen places, and all of them are in northern California or southern Oregon. I grow in dry places in the mountains.

My sweet-smelling leaves are tiny and green. They are scaly like lizard skin, and they hang down from my branches. I like to grow in sunny places. My seedlings need sunshine to get a healthy start. Even adult trees, like me, need lots of sunlight. If I grow in the shade, I grow slowly and find it hard to make seeds.

I store my seeds in little round cones stuck to my trunk and branches. My cones are serotinous. This means that a hard, waxy coating seals them tight. The seeds cannot get out unless a fire heats them up and melts the waxy coating. That is why I love fires.

I especially like fires that burn into the treetops, like *crown fires*. They kill grown-up trees like me, because we grow in crowded patches and our bark is thin. But these fires also open our cones. Then thousands of seeds fall out into perfect habitat: bare soil with lots of sunlight. A new patch of Baker cypresses is formed!
References:


Bark beetles live in forests all over the world. I am just one kind of bark beetle, the mountain pine beetle. I am about as big as a grain of rice. I can live in lodgepole pines, ponderosa pines, sugar pines, limber pines, and whitebark pines. I especially like forests that have lots of trees growing close together.

In the middle of summer last year, my mother found a tree in the middle of a dense forest. She decided this was the perfect place to mate and lay her eggs. She bored a hole in the tree’s bark and crawled into the cambium underneath. She mated with my father. Then she began eating the cambium, making a tunnel toward the top of the tree. As she ate and climbed, she laid her eggs. I was in one of them! Two weeks later, we all hatched out. We were short, thick, soft larvae. We ate and made sideways tunnels through the cambium. Together, we created a gallery shaped like a tall, wide feather. If a tree is filled with galleries, it cannot get enough moisture and nutrition to survive and it will die. After nearly a year of eating and growing, I am now a brown, shiny beetle about as big as a grain of rice. I am ready to find a mate and a perfect tree for laying my own eggs.

Where there are conifers, there are always a few of us around. When we live in a forest with lots of trees close together, we can raise millions of young in a short time. Then we can attack thousands of trees all at once. We call this a feast! But if we kill most of the trees in the forest, you might call it an epidemic.

We love every kind of fire. Surface fires usually injure some of the trees in the forest. That makes it easier for us to get in and lay our eggs. Crown fires may kill us, but they usually start a new forest where we can feed when the trees grow up.
References:


Many animals run away from forest fires, but I head straight for them. That is because I love fires, especially crown fires! I am a plain black beetle about as big as a bean. My scientific name, *Melanophila*, means “black-loving.” That is because I lay my eggs in blackened trees burned by forest fires.

I have 2 body parts that help me find fires. I have special antennae. They can sense a tiny amount of smoke in the air. I also have heat sensors on my sides. They help me find forest fires more than 10 kilometers away!

I rush to a forest fire as soon as I sense smoke and heat. I mate right away and then lay my eggs under the burned tree bark. The trees may still be hot and smoldering when I crawl in!

My eggs rest through the winter. Then the eggs hatch into larvae, and they begin to grow. They eat the phloem under the bark of trees that are dead or dying. Most of the larvae grow into adult beetles up in one year, but some take longer.

We provide tons of food for other animals. Woodpeckers arrive in burned forests right after we get there. Black-backed woodpeckers are especially fond of us. They pry the bark away from burned trees. There they find millions of eggs and larvae. That is enough food for breakfast, lunch, and supper! After a few years, our food supply gets smaller and we go off to newer burns. The woodpeckers soon follow.
References:


A mountainside with hundreds of blackened tree skeletons reaching to the sky is a dream come true for a black-backed woodpecker like me. I like all kinds of burned areas, but a recent crown fire in a conifer forest is the perfect place for me. The burned trees are full beetle larvae, my favorite food. Where did they come from?

Adult beetles find burned places because they can sense a fire’s heat and smoke. They mate and lay their eggs under the charred tree bark. When the eggs hatch, the larvae have a limitless supply of dead wood to eat. And they are a limitless supply of food for me to eat! I can pull the bark off the tree and spear the larvae with my barbed tongue. A burned forest can will provide me with all the food I need for the next few years. My black back matches the trees where I feed, so I am safe from predators while I hunt.

I will find a mate here. The two of us will find a tree that is rotten inside. We will chisel through the hard outer wood with our sharp bills. Then we will pull out the rotten, inner wood. I will lay about 3 white eggs in our nest hole. Our young will hatch after about 12 days. In less than a month, they will be able to fly. Then they will follow us around to learn how to find their own food.

After a few years, there will be less food here for the beetles and other insects. They will move away to newer burns, and we will follow them. Burned forests are our favorite habitat.
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Ferns have been around a very long time. We were growing on the earth before the time of the dinosaurs. After those ancient ferns died, they were squeezed and pressed until they became coal and oil. You probably burn some of my ancestors in your car!

Some kinds of ferns grow much taller than people, but I my fronds can grow only 1 to 2 meters tall. I am often only as high as your knees. I live in forests and meadows throughout the United States.

Ferns are different from trees and flowering plants. Most plants create new plants by making seeds. I create new plants by making spores. Spores contain some of the ingredients to make a new plant, but they do not contain a baby plant, like seeds do. My spores are tiny, so they can fly hundreds of miles on the wind.

I can also make new plants by sprouting from my rhizomes. My rhizomes are thick and tough, and they grow deep in the soil. New fronds sprout from them. Then these fronds grow their own rhizomes. All of these rhizomes weave over and under and around each other. They make it hard for other plants to grow.

I like fire. Fire kills my fronds, but it does not kill my deep rhizomes. Soon after fire, I sprout new fronds. They grow fast because they have lots of sunshine. The wind carries my spores into burned areas. These will grow well because they like the way fires change the soil. Fire and I are great friends!
References:
If you see a big oak tree in the mountains of southern Oregon or California, it is probably a California black oak like me. We live in the mountains among the pines and fir trees. We like open, sunny places with bare soil. We do not like it when our neighbor trees get tall. They make too much shade for us. Then we grow slowly. We might even get a fungus that could kill us.

I am a deciduous tree. That means I drop my leaves each winter. I can grow to be more than 30 meters tall, and my trunk can be 8 meters around. Could you reach around me? As I get old, my bark gets rough and thick, so it can protect me from the heat of forest fires. I am likely to live at least 200 years, and I could even get to be 500. That is way older than anyone you know!

I can sprout new trees from my root crown. That is the place where my roots meet my stem. I can also reproduce from acorns. Some years I produce thousands of them. Squirrels and jays and other animals bury my acorns and come back later to eat them. They leave some acorns behind. These can grow into new trees.

**Now that I am grown, my thick bark helps me to survive surface fires.** My seedlings and saplings have thin bark, so fires usually kill them. But after the fire, I will sprout new trees from my root crown. I like to have surface fires often because they kill some of the big, shady trees that live near me. I do not manage as well if fires are hot enough to burn my crown and my root crown. These severe fires might kill me.

*California black oak* *(Quercus kelloggii)*

California black oak sprouting after a fire. Image by Michael Yager.

Miwoks burned Yosemite Valley regularly to keep the California black oaks healthy. Image by Tom Reyes.
References:

I am a California red fir. My bark is brown on the outside and dark red on the inside. That is why people call me a “red” fir. I live high in the mountains of California, Oregon, and Nevada. Winters are cold, and snow may stay on the ground in my habitat until July.

I reproduce by seeds. I grow them in long cones that stand straight up on my top branches. The cones are very sticky in the early summer. They dry out by fall. Then they fall apart, and my seeds float to the ground. They will start growing in spring. They will grow best if they have some shade and litter covering the ground.

When I was young, I grew very slowly. When I was 25 years old, I was not even as tall as you are! When I got older, some of my neighbor trees died and fell over. I got a lot more sunlight, and then I could grow really fast. Now I am almost 60 meters tall. My trunk is so thick that it would take four or five children to reach around me.

I do not like forest fires very much. When I was young, my bark was thin. I am lucky that no fires visited me then, because they would surely have killed me. **Now that I am old, my bark is thick enough to protect me from the heat of surface fires.** But many of my branches hang low to the ground, so a surface fire could climb up into my crown. **Crown fires** and fires that torch my crown would kill me. They would make sunny openings on the ground, where lots of berry bushes could grow. Fir seedlings would probably start to grow too. Eventually, there would be more big red firs just like me, but it would take a long time.
References:


Meyer, Marc D. 2013. Natural range of variation of red fir forests in the bioregional assessment area. Pacific Southwest Region. 82 p.

I am a light brown owl with white spots and stripes covering my body. My eyes are dark brown. My baby owlets are pure white. I live in the Sierra Nevada of California. Most of my relatives live in California too. They either live in the Sierra Nevada, the Cascade Mountains, or the mountains near the coast.

My favorite habitat is forests full of old trees. I like cool, shady forests, but I like variety too. I like a mixture of big trees, little trees, snags, and fallen logs. I roost and nest in big trees. I hunt near fallen logs, because that is where many of my prey animals live. I also like to have some open patches, where it is easy to hunt.

I raised my first family when I was 2 years old. I will lay eggs only in the years when I can find enough food for my young. I will defend my nest and my young fiercely. I will attack you or any other animal that gets too close.

I am nocturnal. That means that I sleep during the day and hunt at night. Two of my favorite foods are woodrats and flying squirrels. I eat other small mammals, birds, and insects too.

California spotted owls can easily fly away from fires without getting burned. But we need forests with a lot of large, old trees, so we do not like big fires or crown fires or fires that torch our crowns. We do not mind surface fires as long as they occur after our owlets are able to fly away and escape. Surface fires might even help protect our big trees from crown fires.
References:


Canyon live oak  
*(*Quercus chrysolepis*)

I live in forests, woodlands, and chaparral from Oregon to Mexico. I am most common in the Coast Ranges and the Sierra Nevada of California. I can live in dry or moist places. I can live in sunny or shady places, but my seedlings like shade the best.

In moist canyons, I may grow to be 30 meters tall. On dry hillsides, I may stay a short, shrubby plant. I am evergreen. That means I keep my leathery, shiny leaves year-round. My bark is flaky and kind of thin, even when I am full-grown.

I grow from acorns. I produce thousands of acorns in a good year, but I do not have enough energy to do that every year. Some animals bury my acorns in the ground so they can eat them later. Some of the buried acorns grow into new trees.

*Canyon live oaks have very thin bark, so *surface fires* often kill the young trees and *top-kill* adult trees. We are super sprouters though. If my root crown survives, I can *sprout soon after fire*. Don’t think a root crown actually wears a jeweled crown! It is just the place where my roots meet my stem. Because my sprouts are connected to my old, deep roots, they can get water and nutrients easily and grow very fast after fire.

Fires will kill me if my flaky bark catches fire and the flames reach into my crown, *torching* it. Luckily, I can grow new trees from the acorns that fall from surviving trees.
References:

People call me an *invasive* grass because I can *invade* new habitat. After I move in, I can ruin the habitat for native plants and animals. I have invaded many grasslands, shrublands, and ponderosa pine forests in the western United States.

I came originally from southern Europe, northern Africa, and southwestern Asia, but now you can find me almost all over the world. I can survive in areas with very little water, but I grow best where early spring rain is plentiful.

I am an annual. This means that I start from a seed, grow, produce my own seeds, and die all within one year. A single cheatgrass plant can make hundreds of seeds, and our seeds can survive in the soil or *litter* for 2 or 3 years. We begin to grow in late fall or early spring. This is before most of the native plants begin to grow. Because we get an early start, we may use most of the water in the soil before our neighbors have a chance to get it.

I am usually dead and dried out before fires burn through my home, so I do not worry about fires killing me. I can handle any kind of fire. Fires can kill my seeds, but I make so many of them that some survive and quickly grow into new plants after fire.

Before I arrived, there were open spaces between the plants that lived here. It was hard for fires to spread from plant to plant. But I grow in those open spaces. When I die, I leave a lot of fluffy, dry fuel in those spaces. I make fires spread more easily. Native plants find it hard to recover, but the fires make it even easier for me to grow the next year.

Scientists are trying to find ways to keep us from spreading. They kill us off. They plant native plants to crowd us out. They recently found a fungus that kills some of us. Its name makes it sound dangerous. It is called “the black fingers of death.”
References:


Deer brush
*(Ceanothus integerrimus)*

My name tells you who likes to eat me. Deer munch my leaves and twigs as if they were eating candy. I am a shrub with bright green leaves. I grow in chaparral and woodlands. I also grow in young conifer forests. You can find me in Washington, California, Arizona, and New Mexico.

I drop most of my leaves in the fall. In the spring, I grow bright new leaves. Then I grow white, pink, or purple flowers. Bees and butterflies pollinate my flowers. My fruits ripen in summer. Then they dry out and twist open, and my seeds fly out.

My seeds leave me in a hurry, but they are not in a hurry to germinate. That is because they have very hard seed coats. The coats have to crack open before the new plants can grow. What cracks them open? Either being crushed by something heavy or being heated by a fire.

*My seedlings love to grow on open, sunny places. They especially like places that recently burned.* Even adult plants like the sun. We do not grow well in shady places. When trees make too much shade, we gradually die out.

I can sprout from my root crown after fire, but I am not very good at it. Many of my neighbor shrubs are better sprouters. If you walk over a burned area where I live, you will probably find a few wimpy sprouts. But you will find thousands of my seedlings, even if the fire was very severe. These seedlings are starting the next generation of deer brush.
References:
I am very small, but I can run and jump like a deer. Maybe that is how I got my name. Or maybe it is because I have great big ears, just like mule deer have. I can live in hot deserts and on cool mountainsides. I can live in meadows and forests, in wild country and in farm buildings.

I was born in my mother’s burrow underground. My brothers and sisters and I were blind, and we did not have any fur. Mom had to keep us warm and feed us. But we grew up fast. When I was about 2 months old, I moved out and started my own family. I had 3 mouse pups in my first litter. I had 9 pups in another litter. That was a huge, sudden family! I had to take care of them and also search for food to feed all 10 of us.

I usually go looking for food at night. I am not picky. I like seeds, insects, caterpillars, and spiders. I also eat nuts and berries and leaves. I try to eat a lot and get fat before winter. I also like to store seeds in hollow logs and other hiding places. I can dine at these caches in the winter, when it is hard to find food under the snow.

During the day, I rest in my underground nest. I have to stay hidden because so many animals want to eat me.

**If a fire burns through my habitat, I run and hide in my underground burrow. The soil will protect me from the heat of almost any fire.** Right after the fire, I can find lots of dead insects to eat. Within a few weeks, I will find a great supply of sprouting plants and new insects to eat. The first year after fire, there are usually more deer mice in a burned place than there were before the fire.
References:


Coast Douglas-fir

(Pseudotsuga menziesii var. menziesii)

I am an evergreen tree. I live in forests from central California north into British Columbia. I can grow at sea level and also up on the mountain sides. I can grow in places with hot, dry summers. I can grow with many other kinds of trees. When I am old, I might be 75 meters tall, and my trunk might be more than 2 meters thick.

I grow from seed. My seeds germinate best on bare soil. My seedlings like to have a little shade overhead. When they get a little bigger, they like a lot of sun. If I am living in a very shady place, I have a spindly stem and I grow slowly. Dense patches of spindly trees like this are called “thickets.”

I put my seeds in light, papery cones. Each seed has a 3-pointed "wing" that peeks out from under the cone scales. These wings look like tiny mouse feet sticking out between the scales.

My seedlings grow well in burned places, but I can manage for a long time without fire. I can survive surface fires when I am old and my thick bark protects me from heat. When I am young, my bark is thin, and surface fires kill me easily. No matter how old I am, it is bad news if my branches hang close to the ground. Surface fires can use them as ladder fuels and climb into my top, torching my crown. I cannot survive crown fires.

I can begin growing from seed right after fire, but I usually grow more slowly than other kinds of trees, like pines, that grow nearby. I can live a long time. Some Douglas-firs have lived longer than 1,000 years. If you were 10 years old, that would be like 100 of your lifetimes!
References:

I look a little like the rats that people keep for pets, but I have big ears and a furry tail. I make my home in wild places that have lots of shrubs. That includes chaparral, woodlands, and forests from Oregon south into Mexico. I like to live in places with dense cover overhead. That helps me hide from predators.

I build my houses from sticks, bark, and other materials. I have many houses. I build them on the ground or up in trees. I make different rooms in my houses for resting, storing food, and pooping. I even have a special room for storing foods that have to age before I eat them. I eat mostly acorns, other seeds and nuts, fruits, green plants, and fungi.

I have a litter of babies every year. They stay with me for a few months, and then they move out to a house nearby. If I move out of a house, another woodrat will probably move in. Other animals use my houses, too. Mice, shrews, frogs, snakes, spiders, and insects use my houses for food and shelter. My houses are great places to hide in.

If a fire is small and not too severe, I can run away to another house and use that habitat for awhile. **If a fire is big, I might not be able to escape. Fires reduce our food supply, so we do not use burned places right after the fires. But we NEED fire to make good habitat.** A few years after fire, the shrubs will grow thick and the new oak trees will grow up. Then I will be able to find plenty of food, hiding places, and materials for new houses. I will move right back in.
References:


I am a small, dark brown mammal about as big as a house cat. I have a long body with short legs, rounded ears, and a bushy tail. I am called a “fisher,” but I do not eat fish. I eat porcupines, snowshoe hares, squirrels, and smaller mammals. I eat birds and insects, too. I also eat nuts and berries, but I don’t have to sneak up on them.

I live in dense, old forests. They have lots of large trees, where I can hunt for squirrels. They have logs and branches on the ground, where I can catch mice and voles. I hunt mostly at night. Sometimes I travel a long way to find my prey. It is tiring work. During the day, I rest and hide in tree cavities, logs, and other sheltered places. I will choose one of these places to make my den and have my babies.

A long time ago, there were many fishers in the forests of northern United States and California. But there are not many old forests left, so nowadays there are not many of us around. You would be very lucky to see one of us.

I do not like fire, but I can live with a few small, patchy fires once in awhile. Adult fishers like me can run away from fires into unburned places. We do not mind having small burned patches, as long as we still have a lot of big trees and logs. We do mind if a fire kills a lot of big trees and burns up the fallen logs. This kind of fire makes it hard for us to find prey and den sites. We have to move away and search for better habitat.
References:


I am small bird, not a fox. I got my name because of the reddish feathers that I wear. Sometimes our backs are red, and sometimes our wings are red. They look like the beautiful fur of the red fox.

We live all over North America. Our favorite habitat is a place with big patches of dense shrubs. That is why we like chaparral. The shrubs produce lots of fruit and seeds for us to eat. They also hide us while we scratch through the leaf litter underneath. We are looking for beetles, fly larvae, caterpillars, and other insects to eat. We like spiders and millipedes, too.

I like to nest on the ground under low shrubs. Then I lay 2 to 5 eggs. I incubate them for about 2 weeks. My mate and I take care of our chicks for about 10 days after they hatch. Then they are big enough to take care of themselves!

Fires are good for shrubs. Both surface fires and severe fires help make good habitat for me. But I cannot use burned places right away. For the first few years after fire, there is not much litter, so there are not many insects for me to eat. The shrubs may be small, so they cannot produce the fruits and seeds that I need. After a few years, the shrubs grow tall and dense. Then they produce lots of fruit and seeds. The ground will be covered with litter, and the litter will be crowded with insects. Then I will come back and make my home in the burned area.
References:


Incense-cedar  
*(Calocedrus decurrens)*

I am a tall evergreen tree. I live in the Sierra Nevada and Cascade mountains. I live in nearly every kind of forest except the hottest, driest ones and the coldest ones. I like to live with other kinds of conifer trees. I may grow to be more than 500 years old.

My leaves are green overlapping scales. Flat sprays of leaves hang from my branches. I can grow to be nearly 60 meters tall, and my trunk can be more than 1 meter thick. When I am young, my bark is thin. It gets thicker as I age. It is reddish-brown, with deep furrows.

My seeds and seedlings are not fussy about where to live. My seeds can germinate on bare soil or in duff, in sunlight or in shade. My seedlings grow slowly in deep shade, but they are patient. They can wait until a tall neighbor tree falls over and creates a sunny opening. Then they will grow very fast.

*Most of the forests where we grow are used to surface fires.* These fires used to come through every 20 years or so. Surface fires kill most of the young incense-cedars because of their thin bark. Fires can kill adult trees too, if they climb from the low branches up into the tree crowns. Many old trees, like me, can survive surface fires because we have thick bark.

Many of our forests have gone a long time now without fire. They are filled with thickets of young incense-cedars. A surface fire can easily climb up from these thickets into the tops of the big trees, *torching* their crowns. Then it may become a *crown fire* and kill nearly every tree in its path.
References:


I am an evergreen tree. I have long, graceful needles that shine in the sunlight. They grow in clusters of 3. But it is hard to tell me apart from my neighbor, the ponderosa pine. Look carefully at our cones. Both of us have prickles on our cones, but mine point IN while ponderosa’s point OUT. You can remember which tree is which by saying, “Gentle Jeffrey, prickly ponderosa.”

I grow slowly, but I can live to be more than 600 years old! I can get very tall, and my trunk may be more than 2 meters thick. When I get this big, my bark gets really thick and has scaly plates that look like puzzle pieces. Some people think it smells like vanilla or butterscotch.

I live mostly in California and places nearby. I can grow from the high mountains to the edges of dry deserts. I reproduce from seeds. My seedlings grow best in places with bright sunlight. They like places where fire has burned away the litter and duff.

Surface fires used to burn my homeland every few years. They killed the small trees that grew in my shade. They burned the dead needles and fallen branches on the ground.

Nowadays, fires burn less often. Many of my forests are crowded with seedlings of white fir and other species that like shade. These are called ladder fuels. If a fire comes through this kind of forest, it may climb from the little trees into the crowns of the big trees. It may become a crown fire, or it may burn deep into the duff, killing my roots. I cannot survive this kind of fire.
References:


“Mariposa” is the Spanish word for “butterfly.” That describes my beautiful flowers with their 3 delicate petals. There are nearly 100 different species of mariposa lilies, and we grow throughout North America. We grow in many kinds of habitat. We can live in places where other plants cannot survive. We like steep hillsides and rocky soils. We like places with hot, dry summers and cold winters.

I am a perennial. That means I can live for many years. I started out as a tiny seed.

When I was young, I looked like a plain blade of grass. I was busy underground, growing my bulb. It is made from special underground leaves, like those of an onion. I store energy in my bulb. That helps me survive cold winters, hot summers, and wildland fires.

After a few years, I was strong enough to produce flowers. My flowers produce seeds, and they will germinate in early spring, when the soil is moist.

I like any kind of fire. I do not mind if my leaves and flowers burn because my bulb is protected deep in the soil. In the first spring after fire, I sprout from my bulb. Light and nutrition is plentiful after fire, so I can produce even more flowers than before.
References:


I am the biggest wild cat in the Americas. I am about 2 meters long from nose to tail, and I weigh a lot too. Even though I am very big, I am a little bit like a house cat. I can purr, I have long claws, and I sleep a lot!

I can live in many kinds of habitat, from forests to deserts. All I need is a big area for hunting and plenty of hiding places. When I am hunting, I like to hide in the shadows and then sneak up on my prey. Then I pounce on my meal. I am a great jumper. I could easily jump right over you. I could probably get across your classroom in one leap.

Deer are my favorite food. I can eat a lot of meat in one meal. If I get full, I cover my leftovers with dry leaves or grass. This hides them from other animals, so I can finish them later.

When I was 2 years old, I had my first kittens. I raised them all by myself. I moved them often to hide them from bears and coyotes. I had to kill a deer about every 3 days to keep us all fed! When my kittens were a year and a half old, they moved out and went looking for their own place to live. We mountain lions live alone most of the time.

I can run very fast, so I can usually get away from fires. I do not like fires when I have tiny kittens though. I have to move them out of the way, and I may not be fast enough. I like to visit burned places after the fire goes out. Burned places have lots of food for deer, and that means lots of deer for me!
References:


I am an evergreen shrub. That means that I keep my leaves all winter. I am kind of short for a shrub. I will probably never get as tall as you are. My branches can grow roots wherever they touch the ground, so I often grow in big, wide patches. These patches are so dense that people cannot walk through them and trees cannot grow in them. I do not grow well in the shade.

I live in chaparral and forests from Oregon south into Mexico. I especially like dry, open areas. I grow sharp thorns at the ends of my dense, whitish branches. That is why some people call me “whitethorn.” I grow white flowers in small clusters at the ends of my branches. When my petals fall, they make the ground look like it is covered with snow, so people also call me “snow bush.”

I produce a lot of seeds, but they do not germinate right away. They have a hard covering that keeps them dormant in the soil and duff. Heat cracks the covering, which lets water in. Then the tiny plant inside can start to grow.

**I can handle any kind of fire.** If a fire is not very severe, I can sprout new stems and leaves from a big, woody growth at the top of my roots. If it is severe, the heat will open thousands of my stored seeds, and the ground will soon be covered by my seedlings. My seedlings and sprouts will grow well where it is sunny and fire has burned the litter and duff away.
References:

There are two species of yellow-legged frogs in California. We look alike and live in the same kind of habitat. We are called the Sierra Nevada yellow-legged frog and the southern mountain yellow-legged frog. Most of us live high in the mountains.

We are amphibians, so we spend part of our life in water and part on land. I never go more than a meter or two from water. I have a light brown back covered with brown spots. That is perfect camouflage for the rocks and streams where I live. I have a colorful underside though. I am decorated underneath with lots of yellow or orange. I live in or near deep lakes and slow-moving streams. I can survive there because they do not dry up in the summer or freeze in the winter. I spend winter at the bottom of a lake, waiting for warm weather.

Many things make survival hard for us, but the worst is nonnative fish! Long ago, there were no fish up high in the mountains. But people brought trout to the high mountain lakes so they could go fishing. Trout eat our food. They may even eat us! We used to be common in both California and Nevada. But now we live only in California, and there are not many of us left.

Scientists do not know for sure how fire affects us. They think we survive fires because we live in or near water. Little fires do not seem to bother us at all. Big, severe fires – like crown fires - remove the shade from around our lakes and streams. That can make the water too hot for us in summer. With the shady plants gone, floods might be more likely. That would change the streams where we live. We might not be able to live in the changed habitat.
References:


I am a mule deer. I got this name because I have long ears, almost like a mule's. I move my ears all the time, listening for danger. When I am frightened, I do not run like other deer do. Instead, I bound up and away with all 4 feet, like a pogo-stick. This trick helps me dodge predators and escape very fast. I have to get away from the mountain lions, coyotes, and other animals that want to eat me!

Mule deer live in western North America. We weigh about as much as adult humans. Males are bigger than females like me. Only the males have antlers. They shed their antlers in the winter and grow new ones each spring.

I spend most of the year with other mule deer. I go off alone to have my babies. I can have fawns every spring. I nurse my fawns and keep them hidden for a week or two. Then they join me and we eat plants together. I send them off on their own the next spring, when I am ready to have new babies.

I like many kinds of habitat. Shrublands and grasslands provide plenty of food for me. Forests provide shelter from storms and places to hide from predators. My favorite places have a mixture of openings and shelter. Surface fires help create good habitat for me, especially if they make sunny openings where shrubs will grow.

We can escape from most fires, but we can be trapped by big fires that spread very fast, like crown fires. We like to feed in burned areas after the plants begin to grow back. But we will not use them if there are no hiding places nearby.
References:

I am a big hawk, and I live in big trees. The first part of my name is pronounced “goss.” It rhymes with “toss.” I live in North America, Europe, and northern Asia. I have strong, short wings and a long tail. These help me move fast and make quick turns in the forests where I live. I need those skills to catch my prey. You cannot be slow if you are going to live on crows, rabbits, or squirrels! I hunt in forests, shrublands, and open areas – wherever my prey animals live.

I build my nests in big trees. I keep the same mate year after year. I incubate our eggs while my mate brings me food. I defend my nest fiercely. I will attack you or any other animal that gets too close. Sometimes owls and other hawks try to use my nests. They may force me out. Then I have to move away and build a new nest.

I can easily escape a fire without getting burned. **I do not mind surface fires at all.**

**I do not like crown fires because they might burn my nest trees and my nest. Some fires improve my habitat.**

If a fire creates open patches in a big forest, I will be able to find more prey animals there, and I will be able to hunt them more easily. Big, severe fires harm my habitat. Right after a big fire, the burned area may not have enough prey animals for me. Later on, the burned area may be so thick with new saplings that I cannot hunt there.
References:


I am an evergreen tree. My scientific name is *Pinus ponderosa*. *Ponderosa* is a Spanish word meaning "large, heavy, PONDEROUS." This is a good name for me because I can get very big.

I live in the western United States. I also grow in western Canada and Mexico. I like warm, dry forests. Sometimes I grow with a very similar tree, the Jeffrey pine. We look a lot alike! One way to tell us apart is by our cones. My cones are smaller than Jeffrey’s, and mine are more prickly. To help them remember, some people say, “Gentle Jeffrey, prickly ponderosa.”

I am often the tallest tree in a forest. My trunk can be more than 2 meters wide. My shiny, long needles grow in clusters of 3. I have brownish bark. It gets thick and yellowish as I get old. It also breaks apart so my trunk looks like it is covered by puzzle pieces.

I reproduce only from seed. I cannot sprout a new plant from my roots. My seeds germinate best in bare soil with a lot of sunlight. By the time my seedlings are 7 years old, they can make cones and seeds of their own.

I like fires surface fires. My thick bark is the key to my survival. It may be thick enough to protect me from a surface fire by the time I am 10 years old! Surface fires used to burn my habitat often. They killed my low branches and the small trees that grew in my shade. That made it hard for the flames to reach my crown. If my homeland does not burn for many years, lots of small trees will grow under me. That makes it easier for a fire to climb through the ladder fuels into my crown. Then it will kill even the biggest, oldest trees – including me!
References:


I am a tree with bright green leaves and a white trunk. My leaves are almost always moving. Even the lightest breeze makes them shake and make a rustling sound. I am a deciduous tree. My leaves turn bright yellow in the fall. Then they drop off, and I grow new ones in the spring.

People all over the world know about me, because I live in northern lands all around the world. I like cool, dry summers and snowy winters. I grow best in places where the soil is moist.

A single aspen tree is not really separate from other aspens growing nearby. Underground, I am connected to many of my neighbors. Most of us sprouted from the roots of other aspen trees. A few of us grew from seeds, but our seeds are very fragile. They live less than a month. Very few of them grow into new trees.

Most fires pass me by because I live in moist places. But I do like to burn once in awhile. Any kind of fire will do. Fires usually top-kill my branches and trunk, but they hardly ever harm my roots. I can grow dozens of sprouts the next year. They love to grow in the sunny openings that fires make. Within a year, they may be taller than you! They grow faster than conifer seedlings because they are attached to big, healthy roots from the top-killed tree.
References:

Ross’s sedge  
*(Carex rossii)*

I live in the western United States and Canada, from Alaska south to New Mexico. I grow mainly in dry forests and meadows. I can grow in many kinds of soil. Sunny places and light shade are great for me. I cannot live in dark, shady forests.

I look like a grass, but I am not. How can you tell? Try to roll my stem between your fingers. You cannot do it because my stems have edges on them. Grass stems are round, so you can roll them easily. My stems are also solid all the way through. Grass stems are hollow.

I grow stems and leaves from my root crown. That is the place where the stems meet the roots. Sometimes I have short underground rhizomes too.

My flowers are tiny. My seeds fall to the ground when they are ripe. I store them in the soil. They might live there for many years.

*I really like severe fires because they create open, sunny places. That is where my seedlings and sprouts will thrive.*

Fires burn off my leaves and stems, but do not worry about me. I can sprout from my root crown or rhizomes after almost any fire. I can also grow from seeds after fire. When I am living in a shady forest, I like fires that kill the trees and give me more sunlight.
**References:**


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Sierra gooseberry (Ribes roezlii)

I am a prickly shrub. My branches are covered with sharp spines. I live mostly in California, but you can also find me nearby in Oregon and Nevada. I grow best in open forests, oak woodlands, and chaparral. I love hot, dry places. I can live happily for weeks or months without rain.

I am a perennial, which means I can live for many years. Each spring I grow new green leaves. Each autumn my leaves turn red and gold, and then they fall.

My berries are spiny, but birds and mammals eat them anyway. These animals cannot digest the seeds inside. The seeds come out in their poop. It is a great way for me to get my seeds planted in new places. The animals even leave a little fertilizer with the seeds!

My seeds can survive in the soil for many years. **Fires help them germinate. Fires crack open their hard coats. That lets water in, so the seeds can start to grow. Fires also create big, sunny openings where my seedlings can thrive.**

**Fires may top-kill my branches and leaves, but my roots usually survive. Then I will probably sprout from my root crown.** That is where my stems meet my roots. My sprouts and seedlings are among the first plants to show up after fire, especially if the fire was severe enough to create big, sunny openings. Sometimes *surface fires* do not create sunny openings, and sometimes my home does not burn for a long time. Then my habitat gets too shady and other plants take my place.

I am sometimes a host for a fungus called white pine blister rust. The rust does not hurt me at all. But if its spores travel from my leaves to sugar pines or whitebark pines, the rust can kill them.
References:
There are three kinds of lodgepole pine. My name tells you where I live. I am the only kind of lodgepole pine that lives in the Sierra Nevada. Another kind lives mostly near the Pacific coast. The third kind lives mainly in the Rocky Mountains.

My needles are about 5 centimeters long and grow in bundles of two. My cones are about as long as my needles. They have small, sharp prickles on them. You may have heard that lodgepole pine cones need heat from a fire to open them. That is true for many of the lodgepole pines that live in the Rocky Mountains, but not for me.

My bark is usually too thin to protect me from the heat of fire. Surface fires may kill my cambium. Sometimes they damage my roots, too. Crown fires kill me. You may think that I do not like fires, but that is not true. I like all kinds of fire because they create the perfect places for my seedlings to grow. After a fire, my seeds float in from unburned places nearby. My seedlings will grow fast because fire has cleared away the litter and duff. If I am lucky, my seedlings can be 6 meters tall by the time they are 20 years old!

My seedlings do not grow well in shade, but the seedlings of fir trees do. If my forests do not have fire, a lot of fir seedlings may grow in my shade. The firs soon outnumber the pines, and that is not good for me! If the forest stays open and sunny, I stay healthy, and I can live to be hundreds of years old.
References:


August 1, 2016
I am a shrub. I live in the foothills and mountains of California and Oregon. I am very colorful. I have pink or white flowers, light green leaves, and red fruits. The bark on my branches is the color of cinnamon.

I am evergreen, so I keep my thick, leathery leaves year-round. I usually have a sticky coating on my leaves, flowers, and fruits. Mammals and birds love to eat my fruits. I am glad they do. They cannot digest my seeds, so the seeds come out in their droppings. These helpful animals spread my seeds far and wide!

I am a messy plant. My old leaves fall off after a few years and pile up on the ground. My bark peels off and piles up on the ground too. This litter burns very easily. My branches and even my living, green leaves burn easily too. I am a wonderful fuel for wildland fires.

When I catch on fire, I die. You might think I would not like fire, but I love it! The more severe the fire, the better I like it. You see, I need fire to continue my life cycle. I reproduce only from seed, but my seeds have very hard coats. They cannot start to grow until something breaks their coats open and lets water in. That is what fires do! My seeds germinate well in burned places, and my seedlings grow fast in the sunshine. A few years after fire, new patches of manzanita grow in the burn and produce seeds. Once the new seeds are in the ground, I am ready for the next fire.
References:
I am the world’s largest kind of pine tree. I can grow more than 60 meters tall and more than 3 meters wide. I grow slowly when I am young, so it takes me a long time to get that big.

I have long, soft needles. I live mostly in California and places nearby. I am most common at middle elevations in the Sierra Nevada.

I produce the longest cones of any conifer on earth. My cones can be longer than longer than your arm! Small mammals and birds eat my seeds. Sometimes they store my seeds in the ground to be eaten later. I like that. If those hidden seeds do not get eaten, they may grow into new trees.

When I was a young tree, my bark was too thin to protect me from surface fires. Now that I am old, my bark is thick. I can survive fires if they do not get too hot. If fires visit my habitat often, they make lots of small, sunny openings in the forest. My seedlings thrive there because they get sunshine and a little bit of shade. If fires do not visit for a long time, the forest fills with small trees and shrubs. My seedlings and saplings grow poorly in their shade. When these dense forests burn, the fires are likely to kill all of the old trees like me. They may even be huge crown fires. The burned area will probably be too sunny and hot for my seedlings.

More than 100 years ago, a fungus called “white pine blister rust” came from Romania to western North America. It has killed many sugar pines, but some of us are strong enough to resist infection. I hope I am one of them!
**References:**

Boerker, R. H. 1916. Ecological investigations upon the germination and early growth of forest trees. University Studies. XVI(1,2): 1-89 [+ plates]


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“Wavyleaf” is a good name for me, because my leaves often have wavy edges. I have white, sweet-smelling flowers that open in the evening and close in the morning. Bees visit my flowers in the evening to sip on my nectar and harvest my pollen. Moths visit my flowers at night.

The biggest part of me hides underground. My bulb can be as big as a grown-up’s fist. It is covered on the outside with thick brown fibers. Inside, it is white and starchy like a potato. People can eat it, but only after it is cooked. Eaten raw, it tastes like soap!

My roots come out from the bottom of my bulb. As they grow, they pull my bulb deeper and deeper into the soil. If a mule deer or another animal eats my leaves, I sprout new ones from my bulb.

When I am about 6 years old, I flower and make seeds for the first time. I do not make seeds every year, though. When I am growing in shade, I may not make flowers at all. I grow best in sunny places. I live in the grasslands, chaparral, woodlands, and forests of California and Oregon.

Fires almost never harm me. They may burn off my stem and leaves. That top-kills me, but it does not damage my bulb because it is buried in the soil. My roots pull my bulb deeper into the soil every year. So the older I get, the safer I am from fire.

I love the open, sunny spots that fires make. The first year after fire, I put on a big flower show, and my flowers produce a huge seed crop. The next year, the burned place will probably have more wavyleaf soap plants than it had before the fire.
References:
I am a rare and wonderful plant. There are only about 2,000 Webber’s milkvetch plants in the whole world. They are all in Plumas County, California. I grow on shrubby slopes and in forests that get a lot of sunlight. I like to grow in places with bare soil or soil that has been stirred up. I sometimes grow on the side of a road or trail.

I look a little like the pea plants that you might grow in your garden. I am covered with smooth, silvery hairs. My flowers are white or creamy yellow. My seed pods look like little balloons. They contain my tiny, hard seeds.

When the wind blows, the seeds shake around inside the pods and sound like a baby’s rattle.

When my seed pods fall off, they usually land somewhere near me. The pods rot away. That frees my seeds, but they are covered by a very hard coat. This coat keeps the seeds from getting water and starting to grow. If you rub my seeds with sandpaper, you can open them. But people do not know how our seeds get opened in their natural habitat. Does the heat from fires break them open? Can grown-up plants sprout from underground after fire? Fires make sunny openings with bare soil. Do we need fires to make our habitat perfect? Maybe you will be the scientist who finds out!
References:


You can recognize me by my gray fur and long, bushy tail. I am the largest kind of tree squirrel living in the Sierra Nevada. I do not hibernate, like ground squirrels do. Instead, I stay busy throughout the winter, just like you do. Also like you, I stay awake during the day and asleep at night.

I like all kinds of forests, but oak and pine forests are my favorites. I love to eat acorns. I also eat leaves, berries, fungi, and even insects. I eat other kinds of seeds, too. I cache some seeds to eat during the winter, when the ground will be covered with snow.

My habitat must have trees, and some of the trees must have holes in them. I hide and rest in the holes and have my babies there. When the babies get too big for the hole, I build a pile of sticks up high in a tree and move them there. I protect my home and my babies carefully. If you come too near, I might stamp my foot, flick my tail, and bark loudly to warn you away, saying, “Cha-cha-cha!!”

**Surface fires** do not usually harm me or my habitat. But fires that kill a lot of trees, like **crown fires**, force me to move away because they wipe out my food and resting places. A fire that gets very large and moves very fast could trap and kill me or my young.

Even though fires are dangerous, I like them. They create good growing conditions for the trees that produce my food, especially for oaks. After a fire, I might cache seeds in the burned area. If I leave any in the soil, they could grow into the trees of the new forest.
References:


I am a grayish-green bird about as big as a sparrow. I look just like my mate. We are very plain. Our only fancy feathers are two whitish bars on our wings. Our name comes from our song. Male bids make a harsh, buzzy “pee-eeer” song to attract us females. You may not be impressed, but I find it irresistible!

I build our nest out of grasses, lichens, spider webs, and shredded bark. I line it with fine grasses to make it soft for my babies. I usually build it in a fork in a tree branch high off the ground. I hide it well to keep predators away.

I am a great flyer because I have to catch my food in mid-air. I eat mostly flying insects. After I catch them, I perch on a tree branch to eat. That keeps me hidden from hawks and other birds who try to make prey out of me!

I spend my summers in western North America and Central America. My favorite places are forests and woodlands that have plenty of openings where I can catch food. I spend my winters in the tropical rainforests of South America.

I can live in unburned forests and in most forests burned by surface fires. I like places where fire has burned some trees and not others. That makes good habitat for the flying insects that I eat. I do not like forests where most of the trees have been killed by fire. A crown fire would destroy my nest, change my habitat, and maybe kill off much of my food.
References:


Nowadays, I am the most plentiful tree in many of the old forests of the West. I grow from Oregon south into Mexico. I can be a tall, stately tree. I grow best in the mountains of Oregon and California. I especially like crowded, shady forests.

I grew from a seed. I started making my own cones and seeds when I was about 40 years old. My cones do not fall off the tree when they are ripe. Instead, they just fall apart and drop my seeds.

My seedlings can grow in full sun and also in deep shade. They do not like the hot afternoon sun. Their favorite places are cool and a little bit shady. They grow slowly, but they are very patient. Eventually, they grow taller than other kinds of trees.

**I rule many western forests nowadays, but it was different back in the olden days, when fire was in charge.** My seedlings and saplings have very thin bark, so *surface fires* usually kill them. My bark gets thicker as I age, but surface fires can easily get into my low branches. Then they climb up these *ladder fuels* into my crown. This kind of fire kills me.

Nowadays, there are not as many surface fires, so lots of my seedlings grow up. The forest becomes full of white firs. We take moisture that our neighbor trees need, and we create a lot of ladder fuels. When fires visit our forest nowadays, they may be bigger and hotter than they used to be.
References:


I am a fungus. I am like a plant in many ways, but I reproduce with spores instead of seeds. And I do not get my energy directly from the sun, like plants do. Instead, I grow on plants and reach inside them to get my nutrition. In order to reproduce, I need 2 different kinds of “host” plants. One of them is a special kind of pine tree. I only live on the kinds of pines that attach their needles to the branches in bundles of 5. There are many kinds of “5-needle” pines in western North America: sugar pine, whitebark pine, limber pine, foxtail pine, white pine, and bristlecone pine. My other host plant can be a shrub or wildflower. Gooseberry bushes are some of my favorites. I do not hurt the shrubs and wildflowers that nourish me, but I kill most of my tree hosts.

I am native to Asia, and I have lived in Europe for hundreds of years. In 1910, I hitchhiked to North America on some pine seedlings. I have only been here for about 100 years, but I have already killed many of the 5-needle pines here. I am small, so you may not notice me until you see a tree that I have infected. Its needles and twigs will have yellow spots. It may have blisters on its trunk and branches. Eventually, it will have many dead branches and big, open wounds on its trunk.

A few of my host trees can survive my infection. They are called “resistant” trees. People search for these trees and collect their seeds. They germinate the seeds carefully. Then they plant the seedlings in places where the old trees have died. This way, they hope to grow a new generation of resistant trees.

Fires do not bother me at all. If a fire kills my host tree, of course, it will kill me. But my spores will soon arrive in the burned area. Fire helps most of my host plants grow or reproduce, so I will spread quickly. The only thing that can stop me is a resistant tree. Maybe someday there will be whole forests full of them.
References:


Yellow starthistle
*(Centaurea solstitialis)*

I hitched a ride from my homeland to North America in the 1800s, and I have been spreading ever since. That makes me a weed. I like places that have warm, dry summers and cool, wet winters. I am most common in California because it has the best weather for me.

I usually grow as an annual plant. That means that I can germinate, grow, and make flowers and seeds all in one year, and then I die. I can make more than 10,000 flowers in my short lifetime.

Many of my seeds have short bristles that stick to anything that touches them. That includes animal hair and your socks! My sticky seeds have helped me spread to nearly all of the United States. I grow really well in grasslands and along roadsides because they have lots of sunlight.

When I grow with other yellow starthistles, we can become so dense that we crowd out other plants. That is why people do not like us and call us weeds. Scientists are trying to figure out how to get rid of us. They have found one method that keeps me under control. They collected insects that feed on me in my Mediterranean home and brought them to the United States. They turned the insects loose in big fields full of yellow starthistle. The insects laid their eggs on me. When the eggs hatched, the larvae ate my flowers and seeds. This control method does not get rid of ALL yellow starthistles, but it keeps us from spreading very fast.

Yellow starthistles will stick around with fire or without it. Any kind of fire kills us, but most of our seeds on the ground survive. Besides, recently burned areas provide a lot of sunlight and bare soil. That makes perfect growing conditions for us. We like fire, and it will help us stay around for a long time.
References:
