FireWorks Encyclopedia for Younger Students

Featuring Species from the Northern Rocky Mountains and North Cascades

Grades ~3-5

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FireWorks Encyclopedia

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American Black Bear

(Ursus americanus)

Image by Terry Spivey, USDA Forest Service.

I am an American black bear. My brother and I were born in winter. We were with our mother in her den. I was about as big as a rat when I was born. I was blind, and I did not have any teeth. We stayed in the den with Mother until spring. Then we followed Mother outside. 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. During the summer, I wake up every day before sunrise to start eating. I use my sharp claws to dig up ants and grubs. In spring, I eat juicy new plants. In summer, I feast on berries. In fall, I eat pine seeds and fruit and acorns. I usually take a nap in the afternoon, and then I eat until dark.

The snows of winter hide my food, so I must grow really fat before the snow falls. Then I will sleep through most of the winter. I will not even eat or drink. When I wake up in the spring, I will be very hungry!

Black bear cubs. Image by Joy Viola, Northeastern University.

I usually run away from fires. After fires, I come back to eat beetles and other insects. The next year, I will eat the tender new wildflowers growing in burned places. A few years later, I will feast on the berries that grow there. 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!

Squirrel midden with whitebark pine cones. Photo by Ilana Abrahamson.

Reference: Ulev, Elena. 2007. Ursus americanus. In: Fire Effects Information System, [Online]. U.S. Department of Agriculture, Forest Service, Rocky Mountain Research Station, Fire Sciences Laboratory (Producer). Available: http://www.fs.usda.gov/database/feis/animals/mammal/uram/all.htm [2015, July 31].

Citation: Kurzel, Brian. 2016. American black bear. In: FireWorks encyclopedia. Fort Collins, CO: U.S. Department of Agriculture, U.S.D.A. Forest Service, Rocky Mountain Research Station. 1 p.

American Marten

(Martes Americana)

I am about as big as a cat, but I look very different. I have a pointy nose, a long, bushy tail and a flashy orange throat patch. I am an American marten.

Photo by Erwin and Peggy Bauer.

I am small, but I am fierce. I am a very good hunter. I bound along the ground, checking out rotten logs and decaying stumps. That is where I find voles, mice and shrews to eat. I also climb trees to hunt squirrels. In summer, I feast on birds' eggs and berries.

I make my home in moist forests with lots of big, old trees. I feel safe from owls and other predators in these forests. I can hide in the branches of the trees. I can hide under the small trees that grow in the shade. I can hide under the big logs and stumps on the forest floor.

Dead logs and branches are not just hiding places for me. Small mammals like to hide there too, and they are my favorite food!

When winter comes, deep snow covers the ground, so it is hard for me to find food. I tunnel through the snow and look for the red-backed voles that live under snow-covered logs. It is warmer under the snow than on top of it, so I rest there during cold snaps. When I come out, I hunt for red squirrels and snowshoe hares.

I mated last summer, and I will give birth in the spring. My young will be born helpless, so they will need lots of care. I will feed them and teach them how to hunt. In less than 2 months, they will be strong enough and smart enough to leave me and take care of themselves.

Photo by Cody Connor.

I am very fast, so I can easily escape a fire, but fires may destroy my food and shelter. If that happens, I will go looking for a new home. I will find another old, moist forest. New trees will probably grow in after the fire, and the old, fire-killed trees will fall down. After a long time, the new forest will become perfect habitat for small mammals and then for American martens.

Reference: Stone, Katharine. 2010. Martes americana, M. caurina. In: Fire Effects Information System, [Online]. U.S. Department of Agriculture, Forest Service, Rocky Mountain Research Station, Fire Sciences Laboratory (Producer). Available: www.fs.usda.gov/database/feis/animals/mammal/mart/all.html [2019, March 15].

Citation: McMurray, Nancy E. [n.d.]. American marten. In: FireWorks encyclopedia. Fort Collins, CO: U.S. Department of Agriculture, U.S.D.A. Forest Service, Rocky Mountain Research Station. 1 p.

American Three-Toed Woodpecker

(Picoides dorsalis)

Photo by Pierre Bonenfant.

I am a special woodpecker because I have 3 toes on each foot. My toes hold me steady, like a tripod. They keep me firmly in place while I move about on tree trunks, hunting for food.

I do not feed on just any tree trunk. I look for trees that have just burned. My favorite trees are in lightly-burned patches and along the edges of severe burns. I do not eat the trees, though. Instead, I find my favorite food under their bark: beetle larvae!

How did so many of these small, white, worm-like creatures get here? Right after a fire burned through this forest, thousands of insects arrived. Most of these "fire bugs" were beetles. There could be more than 40 kinds of beetles here. Some of them can find burned trees even before the fire goes out. When they sense heat and smoke, they follow it to the fire.

As soon as the beetles arrive at a fire, they burrow through the bark, mate, and lay their eggs. When the eggs hatch, the larvae stay under the bark to feed on the tree's cambium. They are safe from snow and rain and most predators, but they are not safe from me. I use my strong woodpecker bill to pry the burned bark off the trunk. Underneath, I find the larvae and slurp them up with my sticky, barbed tongue.

When spring arrives, my mate and I look for a tree to nest in. We like trees with broken tops. They have a strong outer shell and a rotten center. We excavate a cavity for our nest. We chip out an entrance hole in the hard, outer wood. Then we hollow out the rotten inside. We spread pieces of soft, rotten wood on the bottom of the cavity. This gives our eggs a soft place to rest. It takes about 2 weeks for them to hatch. Then we work really hard to feed our nestlings with beetle larvae and other insects. Our nestlings will fledge in about 25 days. Then they will follow us for several weeks to learn how to find food.

Photo by Dave Powell, USDA Forest Service, Bugwood.org.

My mate and I will stay in this burned forest for four or five years, but we will excavate a new nest cavity every year. Next year, a pair of bluebirds or swallows might make their nest in our old cavity. We cannot stay in this burned forest forever though. After a few years, there will be fewer beetles here. Once the beetles are gone, we will look for a newly burned forest. There we will make a new home.

Citation: U.S. Department of Agriculture, Forest Service. [n.d.]. American three-toed woodpecker. In: FireWorks encyclopedia. Fort Collins, CO: U.S. Department of Agriculture, U.S.D.A. Forest Service, Rocky Mountain Research Station. 1p.

Armillaria Root Fungus

(Armillaria ostoyae)

Photo by John W. Schwandt, USDA Forest Service, Bugwood.org.

I am a fungus. I look a little like a plant, but I do not get my energy from the sun, like plants do. Instead, I break down the wood of trees to get my nutrition.

If you see mushrooms growing in a forest, you might be seeing a part of me. I use mushrooms to make my spores, which are a little like seeds. But mushrooms are only a tiny part of me. Most of me grows inside trees and underground.

I grow by making long chains of cells called hyphae. My hyphae grow right into cells of tree roots to get nutrition. That is why I am a root disease. My favorite trees are Douglas-fir, grand fir, and subalpine fir. As I take more and more nutrients from a tree, it grows less and less. It makes fewer needles. Its trunk gets weak. Eventually, it falls over and becomes a home for insects and small mammals. American martens and other predators will come there to hunt.

Joseph O'Brien, USDA Forest Service, Bugwood.org.

What do I look like underground and inside trees? Many of my hyphae form thin threads. Some form thick, white mats. Some grow into long, brown strings that look like roots. I use all of these shapes to weave a huge network of hyphae through the soil. This is called a root disease center. The biggest living thing in the world may be a root disease center that lives in Oregon. Scientists think that it weighs nearly as much as 200 great blue whales!

Joseph O'Brien, USDA Forest Service, Bugwood.org.

While I get my nutrition from trees, many animals get their nutrition from me. Insects and worms eat my hyphae. Squirrels, deer, elk, bears, and people harvest my mushrooms.

I can live underground for many years, so I stay around after fires. Sometimes fires kill my favorite fir trees but leave the pine trees alive. When that happens, I wait patiently for the firs to come back. Then my hyphae invade their roots. I grow more and more hyphae until I become the biggest living thing in the neighborhood again.

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Citation: Smith, Jane Kapler. 2018. *Armillaria* root fungus. In: FireWorks encyclopedia. Fort Collins, CO: U.S. Department of Agriculture, Forest Service, Rocky Mountain Research Station. 1 p.

Arrowleaf Balsamroot

(Balsamorhiza sagittata)

I am a plant with big yellow flowers. But my name has nothing to do with my flowers. Instead, it describes my fuzzy, arrow-shaped leaves and what I grow underground – a huge stem that looks and smells like wood.

Photo by Dave Powell, USDA Forest Service, Bugwood.org.

I am native to the western part of the United States. I live in dry prairies and low-elevation forests. I really like forests of ponderosa pine.

I am a perennial plant. That means I can live for many years. I start growing from seed. Then I grow a thick root that goes straight down into the soil. I grow a woody stem at the top of the root. This underground stem eventually becomes thick and hard. It can survive the coldest winters and the hottest summers. It can even survive fires.

Photo copyright © by Lee Dittmann, used with permission.

I produce my big, daisy-like flowers in the spring. By the middle of summer, my flowers have faded and fallen to the ground. My seeds ripen. Some of them fly off in the wind. Others stick to animals that pass by. This way they get carried all over the forest. I hope they will land in sunny, open spots. Those are the best places for starting new plants.

I help different animals at different times of year. Deer, pronghorn, and bighorn sheep eat my leaves and flowers in spring. Grouse, small mammals, and insects hide under my big, shady leaves. Elk eat me in winter, and mice eat my seeds. People use me for food and medicine.

Fires burn off my leaves, but they usually cannot kill my underground stem. I sprout very soon after fire. I grow fast in the ash-covered soil and sunny spaces that fire creates. I do not grow well in shade. But even in thick forests, I sprout new leaves every spring. This way I will be ready for another fire and another chance to show off my bright yellow flowers.

Reference: McWilliams, Jack. Balsamorhiza sagittata. 2002. In: Fire Effects Information System, [Online]. U.S. Department of Agriculture, Forest Service, Rocky Mountain Research Station, Fire Sciences Laboratory (Producer). Available: https://www.fs.usda.gov/database/feis/plants/forb/balsag/all.html.

Citation: Smith, Jane Kapler. 2002. Arrowleaf balsamroot. In: FireWorks encyclopedia. Fort Collins, CO: U.S. Department of Agriculture, Forest Service, Rocky Mountain Research Station. 1 p.

Beargrass

(Xerophyllum tenax)

Photo by Chris Schnepf, University of Idaho, Bugwood.org.

"Beargrass" is my name, but I am not really a grass, and bears do not eat me. Maybe I got this name because bears sometimes use my leaves to cushion their winter dens. Other animals like me, too. Deer and elk eat my flowers and leaves. Small mammals eat my nutrition-rich seeds and hide under my leaves.

I grow in the western mountains of North America. I like places where winters are cold and the soil is dry. I can grow in forests of lodgepole pine, whitebark pine, and subalpine fir. But I make the most flowers when I grow in open, sunny places.

Photo by Chris Schnepf, University of Idaho,

My skinny leaves grow in a thick clump that looks like a bunch of grass. My leaves stay green all winter, even under heavy snow. They are long and strong, so people use them to weave beautiful baskets. My leaves are best for weaving in the first year after a fire, when they are strong but not stiff.

I might be 5 years old before I bloom. My blossoms contain hundreds of small, cream-colored flowers in a big clump. A meadow of beargrass in bloom looks like it has hundreds of snowballs floating above the ground.

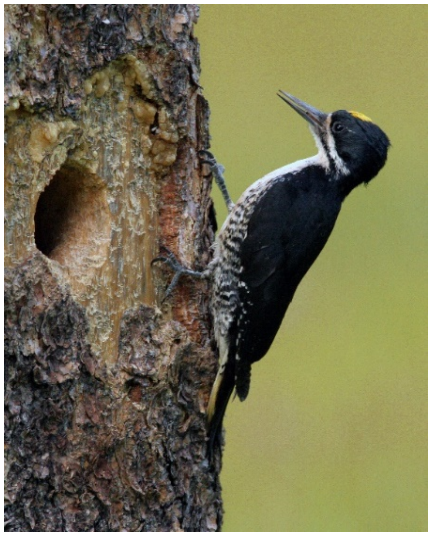
Every spring, I grow new leaves from thick, rope-like stems that lie in the top layer of soil. These stems are called rhizomes. Every year, they branch out and sprout new plants.

My rhizomes are tough enough to survive harsh weather, grazing, and trampling. They can even survive fire if it is not too severe. Luckily, fires are often patchy. One spot might be hot enough to kill my rhizomes, but a spot right next to it might only singe my leaves. I grow really fast after fire. I might grow several centimeters before the snow comes. The next year, I will sprout again and also grow from seeds.

Beargrass sprouting from a clump that was top-killed by fire. Photo by Garon Smith.

Reference: Crane, M. F. 1990. Xerophyllum tenax. In: Fire Effects Information System, [Online]. U.S. Department of Agriculture, Forest Service, Rocky Mountain Research Station, Fire Sciences Laboratory (Producer). Available: https://www.fs.usda.gov/database/feis/plants/forb/xerten/all.html.

Citation: Smith, Jane Kapler. 2000. Beargrass. In: FireWorks encyclopedia. Fort Collins, CO: U.S. Department of Agriculture, Forest Service, Rocky Mountain Research Station. 1 p.



Male black-backed woodpecker at nest hole Photo by Ron Wolf.

Black-Backed Woodpecker

(Picoides arcticus)

A mountainside with hundreds of blackened tree skeletons reaching to the sky is a dream come true for a black-backed woodpecker like me. A recent burn is the perfect place for me to live and raise a family.

I am not interested in the trees themselves. I want the plump, juicy larvae of bark beetles and wood-boring beetles. These white, worm-like creatures are delicious!

How did the larvae get here? Right after a crown fire roared across the mountain, hundreds of "fire bugs" arrived. They mated and laid their eggs under the charred bark of the trees. When the eggs hatched, the larvae found plenty of food, and they were safe from most predators. But they were not safe from me!

I use my strong bill to pry off large chips of bark. Then I slurp up the bark beetles that feed on the tree's cambium. Then I chisel deeper into the wood to find the larvae of wood-boring beetles. I spear them with my barbed tongue, pull them out, and swallow them. I spend hours working up and down the trunks of burned trees. I am safe from most predators here, because I am almost all black – the perfect camouflage!

I feed in the burn, and I also mate and raise my young here. This year, my mate and I made our nest in a western larch tree with a broken top. It died years ago and has decayed nicely since then. Its sturdy outer shell of wood surrounds a totally rotten center. We made a cavity for our nest. It was hard to chip out an entrance hole in the tough outer wood, but it was easy to hollow out the rotten inside.

When the nest was ready, I laid 3 white eggs. After they hatch, my mate and I will work very hard to feed them. They will be able to fly in a few weeks. Then they will follow us and learn our tricks for finding food.

Male black-backed woodpecker at a nest in a burned tree. Courtesy of Martin Meyers.

We will use this nest cavity for only one nesting season. After we leave, other birds or squirrels will move in. They will use it for shelter and perhaps for a nest next year.

After 5 or 6 years, this burn will have fewer and fewer beetles for me to eat. Once my food supply is gone, I will look for a more recently burned forest for my home.

Reference: Stone, Katharine R. 2011. Picoides arcticus. In: Fire Effects Information System, [Online]. U.S. Department of Agriculture, Forest Service, Rocky Mountain Research Station, Fire Sciences Laboratory (Producer). Available: www.fs.usda.gov/database/feis/animals/bird/piar/all.html.

Citation: McMurray, Nancy E. [n.d.]. Black-backed woodpecker. In: FireWorks encyclopedia. Fort Collins, CO: U.S. Department of Agriculture, Forest Service, Rocky Mountain Research Station. 1 p.

Black Cottonwood

(*Populus balsamifera* subsp. *trichocarpa*)

Cottonwood seeds ready to "fly". Photo by Bill Cook, Michigan State University, Bugwood.org.

Have you ever seen tufts of white cotton drifting through the air in summertime? These are my seed packages. They can carry my seeds far away on wind or water.

I am a big tree. I live in western North America. I usually live next to rivers and streams, but I also need lots of sunlight. If my habitat is perfect, I can grow as much as 1 meter in a single year. I might be 30 meters tall when I am grown up.

Dave Powell, USDA Forest Service, Bugwood.org.

My leaves are wide at the base and pointy at the tips. They open from thick, sticky, sweet-smelling buds in spring. They turn golden and fall from my branches in the fall.

I can reproduce in many ways. I can grow from seeds. I can sprout new plants from my roots. I can even grow from broken-off branches. A cottonwood branch stuck in the sand might become a brand-new tree!

I provide shelter for many animals. I hide the deer when they come to the river to drink. I shade the river. This keeps the water cool enough for fish. I provide high branches where song birds build nests. Other animals use me, too. Woodpeckers nest in my trunk. Beavers build dams and lodges with my branches. People use my wood for furniture, medicine, fuel, and paper.

Many animals feed on me. Large and small mammals eat my buds and twigs. Rabbits eat my cambium. Tiny animals living in the river bed eat my dead leaves. I protect the river itself by holding on to the soil with my roots.

Fires often kill my above-ground parts. But they do not kill all of my roots. After a fire, I grow new stems from my roots and from the base of my trunk. These new sprouts have plenty of sunlight, so they grow huge leaves for the first few years after fire. This makes my new stems grow really fast.

Reference: Steinberg, Peter D. 2001. Populus balsamifera subsp. trichocarpa. In: Fire Effects Information System, [Online]. U.S. Department of Agriculture, Forest Service, Rocky Mountain Research Station, Fire Sciences Laboratory (Producer). Available: https://www.fs.usda.gov /database/feis/plants/tree/popbalt/all.html.

Citation: Smith, Jane Kapler. 2003. Black cottonwood. In: FireWorks encyclopedia. Fort Collins, CO: U.S. Department of Agriculture, Forest Service, Rocky Mountain Research Station. 1 p.

Black fire beetle

(*Melanophila acuminata*)

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.

Black fire beetle. Courtesy of AG Prof. Schmitz, http://idw-online.de/pages/de/image73525

I have two body parts that help me find fires. First, I have special antennae. They can sense even a tiny amount of smoke in the air. Second, I have heat sensors on my sides. I rush to a forest fire as soon as I sense smoke and heat. The trees may still be hot when I bore through their bark and crawl in! I mate right away and then lay my eggs under the burned tree bark.

Black fire beetles may use many kinds of burned conifer trees to lay their eggs. Image by Glacier National Park Fire Management.

My eggs rest through the winter and then hatch into larvae. They eat the phloem under the bark of trees that are dead or dying. Most of the larvae grow into adult beetles in just one year.

We provide tons of food for other animals, especially woodpeckers. Black-backed woodpeckers come to burned forests right after we arrive. They pry the bark away from burned trees. There they find millions of our 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.

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Photo by Keir Morse.

Blue Huckleberry

(*Vaccinium membranaceum*)

I am a shrub native to North America. I live mostly in the northwestern United States and western Canada. I live in forests of lodgepole pine, Douglas-fir, and subalpine fir. I can grow in shade, but I grow best sunny openings.

I usually get to be about 1 meter tall, but sometimes I am much shorter. I have pink, bell-shaped flowers. I make dark blue or purple berries. They are delicious.

Photo used with permission.

I can grow from seed, and I can also sprout from underground stems. These are called rhizomes. Because my rhizomes are protected by the soil, I can sprout even if my top is killed by cold weather, browsing animals, or fire.

My leaves unfold in the spring. My flowers come out soon after. Bumblebees and honeybees drink nectar from my flowers and pollinate them. Elk and deer eat my leaves and twigs. When my berries are ripe, many animals want to eat them. My visitors include grizzly bears and black bears, red squirrels, foxes, chipmunks, skunks, grouse, and lots of songbirds.

Photo by Keir Morse.

People harvest my berries too. They have done so for thousands of years. You can eat the berries right off the bush, and you can dry them or freeze them. That way, you can enjoy little tastes of summer all winter long!

I welcome my bird and mammal visitors because they spread my seeds. They can digest the sweet, juicy part of my berries, but they cannot digest my seeds. The seeds will pass right through their digestive systems. In late summer, bears leave big piles of purple poop all over the forest!

I can live a long time in shady spots, but I like sunny openings better. That is why I welcome fires. If a fire kills my leaves and twigs, I can probably grow back from my rhizomes. If a fire kills my rhizomes, I have to start new plants from seed. In 20 or 30 years after a fire, I will produce my best berry crop ever.

Reference: Simonin, Kevin A. 2000. Vaccinium membranaceum. In: Fire Effects Information System, [Online]. U.S. Department of Agriculture, Forest Service, Rocky Mountain Research Station, Fire Sciences Laboratory (Producer). Available: www.fs.usda.gov/database/feis/plants/shrub/ vacmem/all.html.

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Clark's Nutcracker

(Nucifraga Columbiana)

Photo by Nadine Hergenrider.

In 1805, the Lewis and Clark Expedition traveled through the northern Rocky Mountains. Captain William Clark watched a flock of birds. He said that they were prying pine cones open. He was watching my ancestors! We are named after him.

This nutcracker's pouch is bulging with whitebark pine seeds. Photo by Nadine Hergenrider.

I spend a lot of the summer prying open the cones of whitebark pines. After I open a cone, I pull out the big, fatty seeds. I eat some of them, but not all. I tuck the rest into a pouch under my tongue. I can carry nearly 100 seeds in my pouch at one time! Then I must find a safe place to bury them, because this is my food supply for winter and spring. It also is the food for next summer's chicks.

I look carefully for good places to bury my seeds. I like to bury 3 seeds or more in each "cache." My favorite spots for caches are openings in forests high in the mountains. Ridge tops are great because the wind blows the snow away in winter. Recent burns are great because the snow melts quickly in the spring.

A lot has changed in the 200 years since Captain Clark came through. White pine blister came to North America from Europe in 1910. This fungus has killed many whitebark pines. That makes it harder for me to find my favorite food.

I am a strong flyer, so I can easily escape fires. Fires are good for my habitat. I like to cache seeds in burned places because it is easy for me to find them again. If I do not eat all of the seeds in my caches, they can grow into a new whitebark pine forest.

My life is hard now that white pine blister rust has killed so many trees. If a fire kills the remaining trees, I may not find enough whitebark pine seeds for next winter. I may have to eat the seeds of limber pines and ponderosa pines in order to survive.

Whitebark pine seedlings growing from nutcracker caches in a burned forest. Photo by Ilana Abrahamson.

Reference: McMurray, Nancy E. 2008. Nucifraga columbiana. In: Fire Effects Information System, [Online]. U.S. Department of Agriculture, Forest Service, Rocky Mountain Research Station, Fire Sciences Laboratory (Producer). Available: www.fs.usda.gov/database/feis/animals/bird/nuco/all.html.

Citation: McMurray, Nancy E. 2008. Clark's nutcracker. In: FireWorks encyclopedia. Fort Collins, CO: U.S. Department of Agriculture, Forest Service, Rocky Mountain Research Station. 1 p.

Douglas-Fir

(Pseudotsuga menziesii var. *glauca)*

Photo by Walter Siegmund.

I am native to the mountains of the western United States. I grow especially well in the northwestern states. I like warm places at low elevations, so you can find me growing with ponderosa pine. I can also grow in cool places, so you can find me with lodgepole pines.

Paul Wray, Iowa State University, Bugwood.org.

I get really big. I can be more than 30 meters tall and live for hundreds of years. My trunk can be more than a meter thick. My needles are flat and short. The buds at the tips of my twigs are brown and have sharp tips.

I begin life as a seed. My seedlings can grow in bare soil and also in litter and duff. Sometimes hundreds of seedlings grow in a "thicket."

When I am young, my bark is thin and my branches grow close to the ground. If a surface fire comes by, my low branches act like ladders. They can let a fire climb into the treetops. But I can grow from seed right away after a fire.

Thicket of Douglas-fir seedlings. Dave Powell, USDA Forest Service, Bugwood.org.

I grow really fast if I have lots of sunlight, and my bark gets thick. Then I can survive surface fires unless they are so hot that they cook my roots and kill them.

Mary Ellen (Mel) Harte, Bugwood.org.

I place my seeds in light brown cones. I attach each seed to a 3-pointed "wing." That helps the seeds float on the wind when they fall. The little wings look like mouse feet and tails, where the mouse is trying to hide but cannot quite fit inside.

I provide food and shelter for many kinds of animals. Red squirrels cut the cones from my branches and save them for winter food. Chipmunks, mice, and many kinds of birds eat my seeds. Insects do too. In some years, insects eat a third of my seeds! Beetles eat my cambium. Moth larvae eat my needles. Fungi get their nutrition from my roots and wood, and dwarf mistletoe plants get their nutrition from my branches. Deer and elk eat my needles in winter, when other food is scarce. People use my long, straight trunks to build homes and many other things.

Reference: Steinberg, Peter D. 2002. Pseudotsuga menziesii var. glauca. In: Fire Effects Information System, [Online]. U.S. Department of Agriculture, Forest Service, Rocky Mountain Research Station, Fire Sciences Laboratory (Producer). Available: https://www.fs.usda.gov /database/feis/plants/tree/psemeng/all.html.

Citation: Smith, Jane Kapler. 2000. Douglas-fir. In: FireWorks encyclopedia. Fort Collins, CO: U.S. Department of Agriculture, Forest Service, Rocky Mountain Research Station. 1 p.

Douglas-Fir Dwarf Mistletoe

(Arceuthobium douglasii)

I am a tiny, tiny shrub. I grow very small flowers, and I have no leaves at all. Compare my size to the length of the Douglas-fir needles in this photo.

Oscar Dooling, USDA Forest Service, Bugwood.org.

I do not live on the ground. Instead, I live on the branches of Douglas-fir trees. I get a little of my energy from sunlight, like most plants do. But I get most of my energy from the trees that I live on.

It is hard to see me unless you climb into the crown of my host tree. But you can tell that I am here just by looking at the tree. Look for a big bunch of branches growing in a clump. This is called a witches'-broom. If you see one, you will know I am growing in there somewhere. I am stealing water and nutrition from my host tree and crippling its branches. Eventually, I will kill the tree.

Look for the witches'-broom at the bottom of the tree crown. Photo by Oscar Dooling, USDA Forest Service, Bugwood.org.

I started life from a tiny seed stuck to a tree branch. I needed to get nutrition, so I grew some roots. My roots tunneled through the branch's bark and into its cambium. That is where I got my food. Because I get nutrition from another plant, I am called a parasite.

At first, I grew very slowly. Now that I am 4 years old, I am big enough to produce flowers and seeds. I will grow them at the tips of my branches. I will grow a little water rocket under each seed. When the seed is ripe, the rocket will pop open and fling the seed out into the air. I hope it lands on a Douglas-fir branch, where it can grow big and strong like me.

You might think I am useless because I kill trees. But many insects and birds eat my stems and flowers. Birds and squirrels hide in my witches'-brooms. But they must be careful, because a predator might be there. Hawks and owls nest in witches'-brooms, and American martens rest there.

Fires do not bother me unless they kill my host tree, so I do not usually mind surface fires or ground fires. But crown fires are very bad for me. They kill all of the mistletoe plants in the neighborhood, and they kill our host trees too. We cannot return until a new forest of Douglas-fir trees grows here.

Citation: Smith, Jane Kapler. 2000. Douglas-fir dwarf mistletoe. In: FireWorks encyclopedia. Fort Collins, CO: U.S. Department of Agriculture, Forest Service, Rocky Mountain Research Station. 1 p.

Elk

(Cervus elaphus)

Bull elk in fall. Photo by Terry L. Spivey, Terry Spivey Photography, Bugwood.org.

I am a mammal. I weigh nearly 300 kilograms, and I am as tall as a grown-up human. I have a brown coat and a white rump. I am a male, so I grow a new set of antlers every year. Now that I am grown-up, my antlers are really big. They are more than a meter wide, they have six "points" on each side, and they weigh nearly 20 kilograms.

Bull elk browsing in late winter. USDA Forest Service, Northern and Intermountain Region, USDA Forest Service, Bugwood.org.

Elk are mammals. That means, as babies, we drink our mothers' milk. But we learn very soon to live on plants. My favorite plants are grasses. During the summer, I graze in mountain meadows and forest openings. In winter, deep snow in the mountains buries my food, so I migrate downhill. In the forests, I can hide from hunters and find shelter from storms. In the valleys, I can find grass and shrubs to eat. Every spring, I follow the melting snow back up into the mountains. I love to graze on the tender grasses and wildflowers as they begin to grow. These foods are especially plentiful and nutritious after a fire has gone through.

When I am eating out in the open, I have to make sure that no one eats me! Bears, coyotes, mountain lions, and wolves prey on us if we are young or weak or injured, so we have to be alert all the time. Bull elk like me are so big that predators do not usually bother us. It is safe for us to spend a lot of time alone. But most elk live in big groups. That is safer than living alone. A herd of elk has lots of eyes and ears watching and listening for predators. It is very hard for a predator to sneak up on a big herd. Someone almost always notices and lets everyone know it is time to run away.

A herd of elk needs a lot of food, so we use many kinds of habitat. Fires are good at creating this variety. Where fuels are heavy, fires burn hot and create openings — some big, some small. Where fuels are sparse, fires spread slowly and leave patches of forest and meadow unburned. We use almost every kind of habitat you can find in the Rocky Mountains and North Cascades.

Elk band grazing in old burn. Photo by Terry Spivey, USDA Forest Service, Bugwood.org.

Reference: Innes, Robin J. 2011. Cervus elaphus. In: Fire Effects Information System, [Online]. U.S. Department of Agriculture, Forest Service, Rocky Mountain Research Station, Fire Sciences Laboratory (Producer). Available: www.fs.usda.gov/database/feis/mammal/ceel/all.html.

Citation: McMurray, Nancy E. [n.d.]. Elk. In: FireWorks encyclopedia. Fort Collins, CO: U.S. Department of Agriculture, Forest Service, Rocky Mountain Research Station. 1 p.

Engelmann Spruce

(Picea engelmannii)

Photo by Dave Powell, USDA Forest Service, Bugwood.org.

I am a plant. That means I get my energy from sunlight. I like to live in places where there is a lot of moisture. I do not mind cold weather at all, so I can grow high in the mountains. I often grow in shady spots near streams. Sometimes my neighborhood is crowded with spruce trees and other moisture-loving plants.

My needles are bluish-green. They have sharp, pointy tips that will poke you if you grab them. People call me "sticky spruce."

Photo by Dave Powell, USDA Forest Service, Bugwood.org.

I am a conifer, so I put my seeds in cones. When my seeds are ripe, they fall from my cones. Then they spend the winter under snow. They begin to grow right after the snow melts. They can grow almost anywhere, but they like bare ground best. That is why they grow well after fires, as long as they can get enough moisture.

I grow slowly. When I turned 5 years old, I was only 7 centimeters tall. The 5-year-old lodgepole pines nearby towered over me. When I turned 100, I was finally taller than most humans. But I kept on growing and, when I turned 400, I was 40 meters tall.

Birds, insects, and small mammals eat my seeds. Deer, elk, bears, and other big animals rest in my shade hot summer days. They hide under my branches during winter storms.

Trunk of fire-killed Engelmann spruce. Photo by Dave Powell, USDA Forest Service, Bugwood.org.

Fires usually kill Engelmann spruces because our bark is thin and our roots are shallow. Even low-severity fires kill our cambium. Fires can easily climb from the ground through our branches, into our crowns.

I do not like it when fires kill grown-up Engelmann spruces, but I love what fire does to our habitat. Our seedlings grow well in burned places. Other trees grow faster, but they do not live as long as we do. After our fast-growing neighbors die, we have lots of space for ourselves.

Reference: Uchytil, Ronald J. 1991. Picea engelmannii. In: Fire Effects Information System, [Online]. U.S. Department of Agriculture, Forest Service, Rocky Mountain Research Station, Fire Sciences Laboratory (Producer). Available: https://www.fs.usda.gov/database/feis/plants/tree/piceng/all.html.

Citation: Smith, Jane Kapler. 2000. Engelmann spruce. In: FireWorks encyclopedia. Fort Collins, CO: U.S. Department of Agriculture, Forest Service, Rocky Mountain Research Station. 1 p.

Fireweed

(Chamerion angustifolium)

Fireweed flowering. Photo by Terry Spivey, USDA Forest Service, Bugwood.org.

I am a plant. That means I get my energy from sunlight. I am a perennial. That means I can live for many years. I live in forests and in open places. I like forests with lodgepole pine and subalpine fir because they are cool and sometimes moist. I also like openings like burned areas and roadsides.

I grow about 1 meter tall. On my tall stem, I grow 10 to 20 bright pink flowers. Each flower makes hundreds of seeds. Every seed is attached to a fuzzy little parachute, so it can fly far away on the wind. Some people say my buds look like matches, my flowers look like flames, and my seeds look like smoke.

Seedling fireweed plants the summer after a fire. Photo by Garon Smith.

In my first summer of life, I keep my leaves close to the ground. That makes me look a little bit like a dandelion plant. I also grow lots of strong roots and underground stems, which are called rhizomes. My roots and rhizomes grow deep in the soil, so they stay safe from winter's cold, summer's heat, and fires. New plants can sprout from my rhizomes, so one plant can develop into a great big patch of fireweed!

Fireweed seeds. Photo by Snežana Trifunović.

Moose, elk, deer, muskrats, bighorn sheep, and mountain goats all eat my leaves and stems. Chipmunks and pikas eat my seeds. Hummingbirds and butterflies drink my nectar, and butterflies eat my pollen. People use my young stems and roots for food, my petals for jelly, and my leaves for tea.

Fires burn off my stems and leaves. They do not hurt my rhizomes, so I can sprout right away after fire. My seeds can fly all over a burned area on their downy parachutes. The year after a fire, I cover the soil with hundreds of seedlings. In the next few years, my flowers can make a burned hillside look like it is covered by a pink cloud. As the years go by, my habitat gets shady. I make fewer flowers, but I am ready to grow after the next fire.

Reference: Pavek, Diane S. 1992. Chamerion angustifolium. In: Fire Effects Information System, [Online]. U.S. Department of Agriculture, Forest Service, Rocky Mountain Research Station, Fire Sciences Laboratory (Producer). Available: https://www.fs.usda.gov/database/feis/plants/forb/chaang/all.html.

Citation: Smith, Jane Kapler. 2000. Fireweed. In: FireWorks encyclopedia. Fort Collins, CO: U.S. Department of Agriculture, Forest Service, Rocky Mountain Research Station. 1 p.

Flammulated Owl

(Psiloscops flammeolus)

Photo by Michael Woodruff.

I am an animal – an owl. I do not eat meat, like other owls do. Instead, I eat insects. I sleep during the day and hunt at night, so I only eat insects that are active at night. My favorite foods are moths and grasshoppers.

I spend my summers in the dry forests of the Rocky Mountains and northern Cascade Range. I nest in big ponderosa pines and Douglas-fir trees. I cannot make my own nest cavity, so I use old nest holes made by pileated woodpeckers.

Photo by Dave Menke.

Dry forests of ponderosa pine and Douglas-fir have many grassy openings, with lots of grasshoppers. My young learn to hunt by perching on the low branches of trees and then pouncing on grasshoppers. As they grow up, they learn to catch moths and other insects right out of the air.

Most owls eat mice and small birds, so they can find food all winter. But I cannot find insects in the winter, so I migrate south to Mexico and Guatemala in the fall. I migrate back north in the spring, when the snow has melted and the insects begin to hatch.

Photo by Michael Woodruff.

Surface fires used to burn through my habitat every few years. These fires killed many of the small trees, so my habitat had lots of grassy openings and many kinds of insects. The large trees survived fire because of their thick bark and high branches. If my habitat does not burn for a long time, young trees fill the openings. That makes it hard for my young to hunt for food, so we have to look for a new home.

Reference: Wright, Vita. 1996. Multi-scale analysis of flammulated owl habitat use: Owl distribution, habitat management, and conservation. Missoula, MT: The University of Montana. 91 p. Thesis.

Citation: McMurray, Nancy E. 2000. Flammulated owl. In: FireWorks encyclopedia. Fort Collins, CO: U.S. Department of Agriculture, Forest Service, Rocky Mountain Research Station. 1 p.

Glacier Lily

(Erythronium grandiflorum)

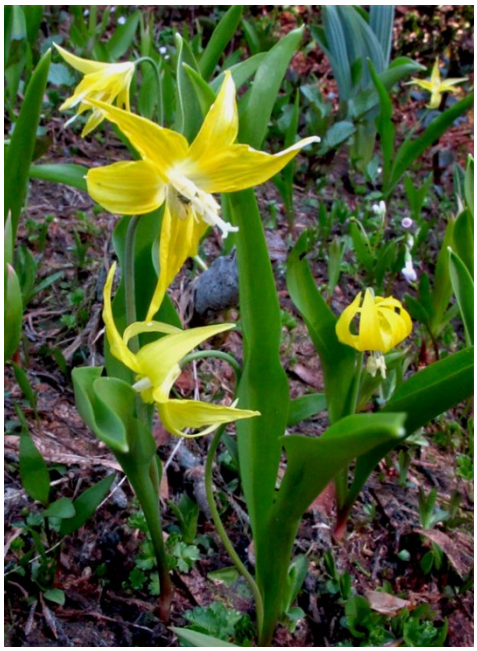

Photo by Vernon Smith.

I am a plant, which means I get my energy from sunlight. I am a perennial, which means I can grow for many years. I grow a stem about 30 centimeters high. I have two long, wide, smooth leaves. I begin to grow early in the spring.

Right after my leaves come up, I produce my sunny yellow flowers. They droop from the top of my stem. It seems like they are looking for something on the ground.

I like cool, moist places, especially where the snow stays late in the spring. I like many kinds of forest. I can live with Douglas-fir trees, lodgepole pines, subalpine firs, Engelmann spruces, and aspens. I can grow in shady places, but I produce my best flowers in moist openings with lots of sunlight.

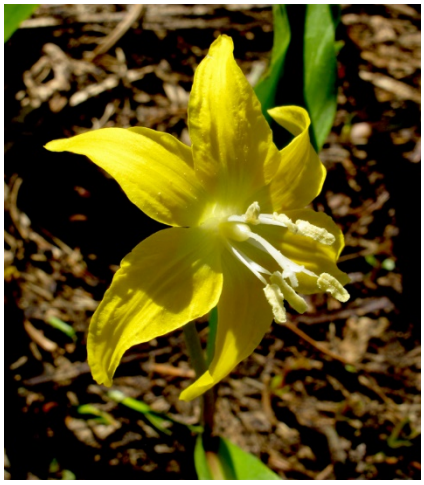

Photo by Vernon Smith.

I start growing from seed.
Soon I develop a round underground stem called a corm. I produce lots of sugar energy in the summer and store it in my corm. In the spring, I use that energy to sprout up from the ground even while I am still covered with snow! I produce my leaves, flowers, and seeds in a month or two. Then my leaves and flowers die, and I hide underground the rest of the summer.

My corm grows deep in the soil. It is not easily killed by winter's cold, summer's heat, grazers that bite off my leaves and flowers, or forest fires.

Bees and hummingbirds eat my pollen and drink my nectar. Elk and deer eat my leaves. Grizzly bears dig up my corms for food. It takes a lot of corms to feed a hungry bear! People can eat every part of me. They can also use my crushed roots to treat wounds.

Fires usually come to the mountains where I live in late summer. I have finished making flowers and seeds, and I have already stored energy for next spring in my corm. My dead, dry leaves will burn, but my corm will be safe underground, ready to sprout in the spring. I thrive in the forests that develop after severe fires because the soil has lots of nutrients and my leaves get lots of sunshine.

Reference: Williams, T. Y. 1990. Erythronium grandiflorum. In: Fire Effects Information System, [Online]. U.S. Department of Agriculture, Forest Service, Rocky Mountain Research Station, Fire Sciences Laboratory (Producer). Available: https://www.fs.usda.gov/database/feis/plants/forb/erygra/all.html.

Citation: Smith, Jane Kapler. 2000. Glacier lily. In: FireWorks encyclopedia. Fort Collins, CO: U.S. Department of Agriculture, Forest Service, Rocky Mountain Research Station. 1 p.

Grand Fir

(Abies grandis)

Crown of a grand fir. Chris Schnepf, University of Idaho, Bugwood.org.

I am a tree. That means I am a plant, and I get my energy from sunlight. In many places, I am the biggest kind of fir that can be found. That is why I am called the "grand" fir. I live in the northwestern United States. I like the warm, moist air that flows in from the ocean. I am not fussy about my habitat, though. I can survive droughts better than many other fir trees.

Grand fir foliage. ©2008 Timothy D. Ives. Used with permission.

When I am grown up, I am more than 40 meters tall. I have soft, shiny, flat green needles with rounded tips.

My cones are bright green or purple. They grow only in my crown. They stand straight up from my branches, like they are reaching for the sky.

When my cones first form, they are sticky with sap. As my seeds ripen inside, the cones dry out. By September, they are so dry that they fall apart on the tree, so my seeds are free. Then they float to the ground.

Grand fir cones. Dave Powell, USDA Forest Service, Bugwood.org.

Moose like my forests. So do two rare birds of the Pacific Northwest— the Northern spotted owl and the Marbled murrelet. Deer and elk hide under me. Grouse eat my buds and needles. People use me too. My wood makes great paper. People collect pitch from my branches to use in medicines. They also heat up the pitch and use it for varnish.

I can survive wind and drought, but I cannot survive fires. Fires cook my cambium, heat my roots, and burn through my low branches up into my crown. Even if a fire injures me just a little, it lets fungi in, and they kill me.

My seedlings grow well after fire, but they do best with a little shade. Then they can grow fast. After many years, they can be the "grandest" trees in the forest.

Reference: Howard, Janet L.; Aleksoff, Keith C. 2000. Abies grandis. In: Fire Effects Information System, [Online]. U.S. Department of Agriculture, Forest Service, Rocky Mountain Research Station, Fire Sciences Laboratory (Producer). Available: https://www.fs.usda.gov /database/feis/plants/tree/abigra/all.html.

Citation: Smith, Jane Kapler. 2000. Grand fir. In: FireWorks encyclopedia. Fort Collins, CO: U.S. Department of Agriculture, Forest Service, Rocky Mountain Research Station. 1 p.

Grizzly Bear

(Ursus arctos horribilis)

Photo by Terry L. Spivey, Bugwood.org.

I was born in my mother's winter den, high in the mountains. I was about as big as a rat when I was born, and I was helpless. When spring came and the snow began to melt, my brother and I were big enough to leave our winter home. We followed our mother, searching for food.

We stayed with our mother through two winters. This spring, when our third summer came, our mother sent us off on our own. She will mate again and start a new family.

Grizzly sow and cubs. Courtesy of Glacier National Park.

I weigh 150 kilograms now. I need to get bigger and stronger before I can start my own family. I also need to be able to make my own den. I will be ready to mate when I am about 6 years old.

I am an animal – an omnivore. That means I will eat almost anything. I like to eat insects, plants, and other animals – dead or alive. Most of the time, I eat plants. In the spring, I feed in wet meadows with juicy grasses and wildflowers. In the summer, I roam the mountainsides, eating berries. In the fall, I eat the fat-filled seeds of the whitebark pines high in the mountains. Many of my foods grow best after fires.

Grizzly bear resting. Photo by Terry Spivey, USDA Forest Service, Bugwood.org.

I need lots of food to fuel my big, muscular body. I also need to put on a lot of fat in the summer so I can survive the winter. That is when I hibernate. My body changes fat into the energy I need to stay alive.

My home territory covers many square kilometers. If one area burns this summer, I will just go to an area that has not burned. I will return to the burn in a few years, when the grasses and wildflowers are plentiful. In twenty years or so, I will come back for my favorite food – huckleberries!

Reference: Snyder, S. A. 1991. Ursus arctos horribilis. In: Fire Effects Information System, [Online]. U.S. Department of Agriculture, Forest Service, Rocky Mountain Research Station, Fire Sciences Laboratory (Producer). Available: www.fs.usda.gov/database/feis/animals/mammal/urach/all.html.

Citation: McMurray, Nancy E. 2000. Grizzly bear. In: FireWorks encyclopedia. Fort Collins, CO: U.S. Department of Agriculture, Forest Service, Rocky Mountain Research Station. 1 p.

Grouse Whortleberry

(Vaccinium scoparium)

I am a perennial plant. I get my energy from sunlight, and I grow for many years. I am a small shrub. I get only about 20 centimeters tall.

I have bright green leaves. In the fall, they turn scarlet.

My flowers dangle from my stems like little pink bells. My berries are bright red. They are tiny and sweet.

I am native to high-elevation forests in the western United States and Canada. I can live in dry places. Most other shrubs cannot live here. I like forests of whitebark pine, lodgepole pine, and subalpine fir.

Flowers. by Dave Powell, USDA Forest Service, Bugwood.org.

I can reproduce from seed, and I can also sprout from underground stems. These stems are called rhizomes. They grow near the top of the soil, so sometimes fire kill them.

Mountain goats, elk, and moose eat my leaves and stems. On summer days, grizzly bears and elk rest in the high, cool mountain forests and openings where I cover the ground.

Lots of animals eat my berries—chipmunks, red squirrels, foxes, skunks, grouse, bluebirds, thrushes, and people! My berries are an important winter food for ptarmigans. These are birds that live in the high country year-round. They change their feathers to match the seasons – brown in summer and white in winter.

Berries. Dave Powell, USDA Forest Service, Bugwood.org.

Fires top-kill my leaves and stems. Surface fires do not usually kill my rhizomes, so I can sprout right after fire. Some crown fires are severe enough to kill my rhizomes. But crown fires are usually patchy in the high mountain forests where I live, so they leave many patches unburned. I grow well there, in the bright sunshine after fire.

Reference: Johnson, Kathleen A. 2001. Vaccinium scoparium. In: Fire Effects Information System, [Online]. U.S. Department of Agriculture, Forest Service, Rocky Mountain Research Station, Fire Sciences Laboratory (Producer). Available: https://www.fs.usda.gov/database/feis/plants/shrub/vacsco/all.html.

Citation: McMurray, Nancy E. 2000. Grouse whortleberry. In: FireWorks encyclopedia. Fort Collins, CO: U.S. Department of Agriculture, Forest Service, Rocky Mountain Research Station. 1 p.

Photo by Dave Powell, USDA Forest Service, Bugwood.org.

Heartleaf Arnica

(Arnica cordifolia)

I am a perennial flowering plant. I get my energy from sunlight, and I can live for many years. I am named for the shape of my leaves. They are like little green valentines! I grow bright yellow flowers. They are shaped like daisies.

I am native to the western mountains of North America. I grow especially well where the soil is a little bit dry. I like open areas without many trees, but I can also grow under pine and fir trees.

Flowers and leaves. Photo by Mary Ellen (Mel) Harte, Bugwood.org.

I began life as a seed blown on the wind. The next summer I grew my first leaves and flowers. At the same time, I grew long, tough underground stems. They are called rhizomes. My rhizomes grew deep in the soil. Some were nearly half a meter underground!

My rhizomes can sprout new plants, so after a few years I grew into a big patch of leaves and stems. Every spring, we carpet the ground with green leaves and yellow flowers.

I flower early in the summer. Then I form hundreds of seeds. I attach each seed to a little parachute of white, feathery hairs. That way, my seeds can fly away in the wind.

Seeds. Photo by Keir Morse.

Deer, elk, birds, and many small mammals eat my leaves in the summer. People use my flowers and roots for medicines.

I can sprout back right after fire unless my rhizomes are killed. The wind scatters thousands of my seeds into burned areas too. So you can usually find me in a burned area the first year after fire. I grow well there because I have plenty of sunlight and nutrients. I produce lots of seeds, which grow into new plants, which produce lots more seeds. One or two years after a fire, I can cover the ground with my yellow flowers.

Heartleaf arnica 1 year after fire. Photo by Garon Smith.

Reference: Reed, William R. 1993. Arnica cordifolia. In: Fire Effects Information System, [Online]. U.S. Department of Agriculture, Forest Service, Rocky Mountain Research Station, Fire Sciences Laboratory (Producer). Available: https://www.fs.usda.gov/database/feis/plants/forb/arncor/all.html.

Citation: Smith, Jane Kapler. 2000. Heartleaf arnica. In: FireWorks encyclopedia. Fort Collins, CO: U.S. Department of Agriculture, Forest Service, Rocky Mountain Research Station. 1 p.

Lodgepole Pine

(Pinus contorta var. *latifolia)*

Dave Powell, USDA Forest Service, Bugwood.org.

I am a tree. I get my energy from sunlight. I live in the Rocky Mountains and the North Cascades. I like COLD habitat. I can grow in frosty places where most other trees cannot survive. The only tree in my homeland that handles cold better than me is the whitebark pine.

Needles and spring cone. By fall, cone will be brown. USDA Forest Service - Forest Health Protection Intermountain Region - Ogden, UT. USDA Forest Service, Bugwood.org.

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

I started growing from seed the spring after a crown fire. I was not alone. Millions of other lodgepole pines started growing at the same time. You could not walk through our baby forest without stepping on some of us. Because my home was sunny and the soil was warm in summer, I grew very fast. When I was 10, I was taller than most humans. Eventually, I will be more than 20 meters tall.

I am a conifer. That means I put my seeds in cones. I began making cones when I was about 5 years old. My cones are smaller than your fist, and they have little prickles all over them. Some of my cones are serotinous. That means they are sealed tight by resin. They will not open unless they are heated. If a fire burns through my crown, it will kill me, but it will open these cones and free millions of seeds. Then the seeds will start a new forest. It will be crowded with lodgepole pines, just like the forest I live in now.

I provide food for many animals. Insects eat my cambium. Birds eat my needles. Squirrels eat my seeds. Mistletoe plants live on my branches. Deer, moose, elk, and bears rest and hide under my branches. People use me for tipis, houses, and furniture. They also use my sap for medicine.

When I get old, I will not grow very fast. Firs and spruces will grow up under my crown, so it will be hard for me to get enough moisture. Then mountain pine beetles might tunnel through my bark and lay eggs in my cambium. When the eggs hatch, the larvae will feed on my cambium, and that will kill me.

Fires might kill me too, although I could survive a surface fire. If a fire kills me, I will still help many animals. Black fire beetles will find me when my bark is still hot. They will lay their eggs in my burned wood. Black-backed woodpeckers and northern three-toed woodpeckers will follow to eat the insects, and they will nest in my burned trunk. Many other birds will nest in the cavities made by woodpeckers.

Reference: Anderson, Michelle D. 2003. Pinus contorta var. latifolia. In: Fire Effects Information System, [Online]. U.S. Department of Agriculture, Forest Service, Rocky Mountain Research Station, Fire Sciences Laboratory (Producer). Available: https://www.fs.usda.gov /database/feis/plants/tree/pinconl/all.html.

Citation: Smith, Jane Kapler. 2003. Lodgepole pine. In: FireWorks encyclopedia. Fort Collins, CO: U.S. Department of Agriculture, Forest Service, Rocky Mountain Research Station. 1 p.

Mountain Pine Beetle

(Dendroctonus ponderosae)

Larva. Scott Tunnock, USDA Forest Service, Bugwood.org.

I am an insect. I am native to western North America. I love pine trees. My favorites are lodgepole pines. They often grow close together in forests that started after crown fires. This is perfect habitat for mountain pine beetles.

I began life as an egg. It was the middle of summer, just last year. My mother found an old lodgepole pine. She bored a hole through the tree's bark. Then she mated with my father. Then she chewed a tunnel upward toward the treetop. Every centimeter or so, she laid a pearl-white egg. One of them was me!

I hatched 2 weeks later. I was a short, thick, soft larva. As soon as I hatched, I started to eat the tree's cambium. I chewed a tunnel sideways under the bark. During the winter, I sat still when it was cold and ate when it was warm. In the spring, all I did was eat. By summer, my siblings and I had eaten lots of sideways tunnels. We had plenty of food, but the tree did not. Our tunnels kept the tree from moving water and nutrients through its trunk. Our tree began to die.

Adult. Ron Long, Simon Fraser University, Bugwood.org.

When I was 8 months old, I became an adult beetle. Now I am dark brown and shiny. I am about as big as a grain of rice. I have stiff wings and a small head. Today I chewed my way out through the tree's bark and saw daylight for the first time. I am ready to fly off, find a mate, and lay eggs in my own perfect pine tree.

If millions of beetles lay millions of eggs in the forest this year, our larvae may kill most of the trees. Then the forest will look red instead of green. It will take many years to grow a new forest with trees just the right size for mountain pine beetles again.

My life is full of dangers. Woodpeckers love to eat mountain pine beetles. Worms eat our eggs. Wasps lay eggs in our larvae so **their** larvae can eat them. We support many other animals!

Surface fires sometimes injure our host trees. That makes it easy for us to bore through the bark and lay our eggs. Crown fires kill us when they kill our host trees. But crown fires also start new pine forests, where our descendants will find perfect trees in the years to come.

Under a tree's bark. USDA Forest Service - Ogden Archive, USDA Forest Service, Bugwood.org.

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U.S.D.A. Forest Service. 2016. Bark beetles: A natural and dramatic forest disturbance, [Online]. Fort Collins, CO: U.S. Department of Agriculture, Forest Service, Rocky Mountain Research Station (Producer). Available: http://www.fs.usda.gov/rmrs/projects/bark-beetles-natural-and-dramatic-forest-disturbance [2016, July 18].

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Northern Flicker

(*Colaptes auratus*)

Male northern flicker. Photo by Dave Herr.

I am an animal – a woodpecker. I am bigger than a robin and smaller than a crow. I have a red "moustache," a black-spotted belly, and bright reddish feathers under my wings and tail. I live in the western United States. My relatives in the eastern states have bright yellow feathers under their wings and tails.

I get my name because my loud call sounds a little like "flick, flick, flick" or "flick-errr." Some people think I sound like I am in a hurry, calling "quick-quick-quick-quick-errr."

Ants are my favorite food. I eat ants that are crawling on the ground. I eat ants that are crawling on trees. I pull bark away from tree trunks to find ants. I chisel dead logs apart to find ants.

If I cannot find ants, I will eat other insects. Sometimes I eat berries too. I can digest the sweet, juicy part of a berry, but I cannot digest the seeds. When I eat berries, I distribute their seeds in my poop wherever I go.

I can live almost anywhere, as long as it has trees. I can even live in cities and towns. My favorite trees are big, old, and rotten inside. I can pull the rotten wood apart with my powerful beak and strong neck muscles. I can hold tight to the tree with my claws and brace myself with my tail feathers. They are stiff and very strong. Rotten trees are the best places for my nest cavity.

My mate and I make a new nest cavity every year. She lays 3 to 12 eggs there. We take turns incubating the eggs. They hatch after about two weeks. Then we are very busy, because we have to feed our nestlings for about a month. After that, they are big and strong enough to fly away and hunt for their own food.

Photo by Dave Menke.

After our young are gone, we move out of our nest cavity, and other animals move in. You might find small owls, chickadees, bluebirds, or flying squirrels raising their families here next year.

I do not worry about fires. If I am living in a cottonwood tree by a river, it is probably too moist to burn. If I am living in a big old ponderosa pine, a fire will probably stay in the grass and shrubs on the ground. I can just stay safe in the treetop or in my nest cavity. If I am living in a lodgepole pine forest and a crown fire begins, I will just fly away. I will come back after the fire to eat the many ants and beetles that live in the dead trees. If the trees become rotten inside, that is even better. I can chisel out a nest cavity and stay there for many years.

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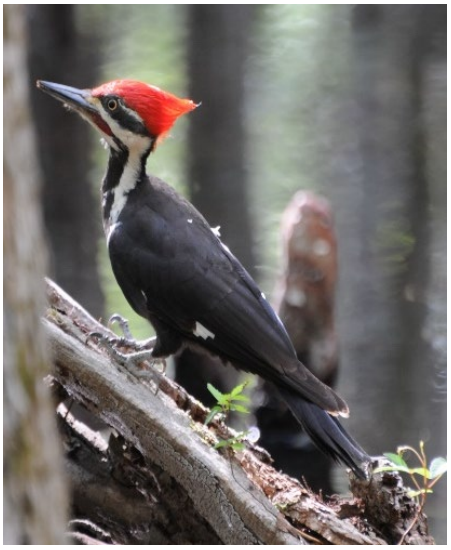
Pileated Woodpecker

(*Dryocopus pileatus*)



Male pileated woodpecker. Steven Katovich, USDA Forest Service, Bugwood.org.

I am an animal. I am the largest woodpecker in the western United States. I have a bright red crest and a black back. My bill is black, too. I have flashy white markings on my face and wings.

I like big trees. In the western states, my favorite trees are ponderosa pines, western larches, and cottonwoods. I like aspen trees too, because they are often rotten inside.

Rotten wood provides my favorite food – carpenter ants. They are huge. Some of them are more than 2 centimeters long. Thousands of carpenter ants live together inside rotten trees and fallen logs.

Tunnels made by carpenter ants in rotten wood. R. Werner, USDA Forest Service, Bugwood.org.

I use a special trick to find ants. First, I give a log or tree trunk a few taps with my strong, chisel-shaped bill. Then I listen. Hundreds of scared ants can make a lot of noise! If I hear them moving through their wooden tunnels, I know that I have found dinner. I chisel through the tree's bark and hard outer wood and then lick the ants up with my long, sticky tongue.

Rotten trees are perfect for my nest cavities, too. I do not care if a tree is alive or dead, as long as it is rotten. My mate and I peck a big, round hole in the hard outer wood. Then we pull out the rotten insides to make a shelter for our eggs and young. It takes more than a month to make our nest cavity. We will use it for about 6 weeks, until our babies are able to fly. Then we will move out, but the cavity will not stay empty. Flying squirrels, small owls, or other kinds of birds will soon move in.

Nest holes excavated by pileated woodpeckers. Joseph O'Brien, USDA Forest Service, Bugwood.org.

Surface fires are good for my habitat. They do not usually damage big ponderosa pines and larches, because these trees have thick bark and high branches. They do kill the smaller trees, which lets the big trees grow even bigger. But crown fires are not good for my habitat. They kill even the big trees. If a crown fire visits my home, I will have to move away and find a better place to live.

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Citation: McMurray, Nancy E. 2000. Pileated woodpecker. In: FireWorks encyclopedia. Fort Collins, CO: U.S. Department of Agriculture, Forest Service, Rocky Mountain Research Station. 1 p.

Pinegrass

(*Calamagrostis rubescens*)

Pinegrass with seeds growing by burned log. Dave Powell, USDA Forest Service, Bugwood.org.

I am a grass plant. That means I get my energy from sunlight. I am a perennial. That means I can live for many years. I am native to the western United States. I can grow in many kinds of places—at low elevations and high elevations, in moist soils and dry soils, in shade and in sunny openings.

I can get to be 50 centimeters tall. I have shiny green leaves. I grow tiny flowers in a spike at the top of my stem. My flowers produce seeds that are golden-brown. But I cannot produce many seeds if I am growing under shade. I need a lot of sunlight to flower.

Pinegrass bunches. Dave Powell, USDA Forest Service, Bugwood.org.

My seeds are ready to grow as soon as they drop to the soil. They will begin growing in the fall if the weather is rainy. But not many of my seedlings can survive. Luckily, I can also sprout new plants from my tough underground stems, which are called rhizomes. I like to grow a whole bunch of stems close together, year after year. In fact, people call me a "bunchgrass."

I support lots of animals. Birds love to eat my seeds. Mice and shrews feed on nearly every part of me. So do deer, elk, mountain goats, cattle, and sheep.

Most fires just burn off my leaves. Then I sprout back from my rhizomes. In the first years after fire, I grow fast and produce lots of seed. I stay in the new forest as it grows up. But as the forest gets more and more shady, I produce fewer and fewer seeds. Sometimes land managers use prescribed fires to make sure I can stay healthy and produce food for the many animals that need me.

Pinegrass bunches with seeds. Dave Powell, USDA Forest Service, Bugwood.org.

Reference: Matthews, Robin F. 2000. Calamagrostis rubescens. In: Fire Effects Information System, [Online]. U.S. Department of Agriculture, Forest Service, Rocky Mountain Research Station, Fire Sciences Laboratory (Producer). Available: https://www.fs.usda.gov /database/feis/plants/graminoid/calrub/all.html.

Citation: Smith, Jane Kapler. 2000. Pinegrass. In: FireWorks encyclopedia. Fort Collins, CO: U.S. Department of Agriculture, Forest Service, Rocky Mountain Research Station. 1 p.

Ponderosa pine

(*Pinus ponderosa* var. *scopulorum*)

Photo by Scott Roberts, Mississippi State University, Bugwood.org.

I am a plant. That means I get my energy from sunlight. I am a conifer. That means that I am the kind of tree that puts my seeds in cones. I can live for hundreds of years and grow to be more than 30 meters tall.

I like warm, dry forests. In the southwestern United States, I grow high in the mountains because the valley is too hot. In the northern United States, I grow in the valleys and on hillsides because the mountaintops are too cold.

In sunny places, I grow very fast. I grow especially well in burned places because the soil is warm and full of nutrients. By the time I am 10 years old, I am taller than most humans and I can make cones and seeds. My cones are big and woody, with sharp prickles. I have long needles that grow in clusters of three. I have yellowish bark with deep, dark furrows. Some people think my bark looks like puzzle pieces. My bark is so thick that it can protect me from surface fires by the time I am 6 years old!

I provide food for many insects. Mountain pine beetles tunnel through my bark to lay their eggs. When the larvae hatch, they feast on my cambium. Sometimes there are so many larvae that they kill me. Squirrels and birds eat my seeds. Elk and deer hide and rest in my shade. If they get very hungry during the winter, they might eat the buds from my seedlings. When my heartwood gets rotten, woodpeckers make their nests in my trunk. After they move out, other birds and small mammals move in.

Fire scars at base of a ponderosa pine. USDA FS photo by Emily Heyerdahl.

When I was young, a few hundred years ago, surface fires burned my habitat every 10 years or so. They killed my lower branches and the small trees that grew in my shade. They burned the dead needles on the ground and left scars on my trunk. But they could not reach my crown, so I survived.

Now my habitat has not burned in more than 100 years. Many small Douglas-fir trees are growing beneath my branches. They are using the moisture and nutrients that I need. Now a fire could easily climb into my crown and kill me. Maybe land managers will clear out the little trees soon. Maybe they will use a prescribed fire to get me growing again.

Photo by Ilana Abrahamson.

Reference: Howard, Janet L. 2003. Pinus ponderosa var. brachyptera, P. p. var. scopulorum. In: Fire Effects Information System, [Online]. U.S. Department of Agriculture, Forest Service, Rocky Mountain Research Station, Fire Sciences Laboratory (Producer). Available: https://www.fs.usda.gov /database/feis/plants/tree/pinpons/all.html.

Citation: Smith, Jane Kapler. 2003. Ponderosa pine. In: FireWorks encyclopedia. Fort Collins, CO: U.S. Department of Agriculture, Forest Service, Rocky Mountain Research Station. 1 p.

Quaking Aspen

(*Populus tremuloides*)

Paul Wray, Iowa State University, Bugwood.org.

I am a plant. That means I get my energy from sunlight. I am a slender tree with smooth, white bark. When old branches break off from my trunk, they leave round, gray scars that look like eyes. As I grow old, my bark turns rough and gray.

My light green leaves are almost always moving. That is why people call me "trembling" or "quaking" aspen. In the fall, my leaves turn gold and fall to the ground.

Terry Spivey, USDA Forest Service, Bugwood.org.

I live in the northern hemisphere all around the world. I like cool summers and snowy winters. I need to have moisture near my roots.

Aspen trees never live alone. We live in big patches, where all of the trees have sprouted from one huge network of roots. A new aspen growing from roots is called a sucker. If a fire or avalanche comes by, our trunks may break off or look dead, but the next year our roots will produce thousands of suckers. Every sucker has the same genes as the parent tree. You have probably heard of identical twins. We are "thousandtuplets." A group of identical trees like ours is called a clone.

Aspens in fall. Terry Spivey, USDA Forest Service, Bugwood.org.

Aspens sprouting after fire. Robert F. Wittwer, Oklahoma State University, Bugwood.org.

Although we can sprout new trees from our roots, we also make millions of seeds every spring. We produce long catkins that hold tiny flowers. After the flowers are pollinated and grow seeds, the wind carries them off in little, cottony packages.

Beaver, deer, elk, and grouse eat our leaves, buds, and even bark. Birds nest in our trunks and branches. We are so important to wildlife that managers use prescribed fires to get more of us. We provide people with medicines and with wood for furniture, paper, and fuel.

Most fires pass us by because we live in moist places. When fires do visit, they kill our stems but do not usually harm our roots. We can sprout hundreds of new suckers the very next year.

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Citation: Smith, Jane Kapler. 2000. Quaking aspen. In: FireWorks encyclopedia. Fort Collins, CO: U.S. Department of Agriculture, Forest Service, Rocky Mountain Research Station. 1 p.

Red Squirrel

(*Tamiasciurus hudsonicus*)

Photo by Michael Mengak, University of Georgia, Bugwood.org.

I am an animal – the smallest squirrel living in the northern Rocky Mountains and the North Cascades. I live in forests with lots of trees, the bigger the better. Big, healthy trees make lots of cones with lots of seeds, and those are my favorite food.

I am an omnivore, so I eat many things besides seeds. In summer, I eat lichens, mushrooms, and berries. I also eat birds' eggs, young birds, small mammals, and insects. But the most important part of my food supply is a huge, deep pile of cones stored in a cool, shady spot in the forest. This is my midden. It is my main food supply from late fall until spring. In the fall, I spend every day collecting cones and burying them in my midden. Last fall, I collected more than 15,000 cones! My favorites came from whitebark pines, because their seeds are big and nutritious.

During the long winter, I spend almost every day in my midden or on a tree branch above it. I tear my stored cones apart and eat the seeds. I never clean up after a meal. That would be bad for my food supply, because this deep pile of garbage keeps my midden cool and my food fresh even on hot summer days. I did not create this huge midden all by myself. My ancestors from past generations did a wonderful job of NOT taking out the trash!

Red squirrel midden. Photo by Velma Hudson, via Eileen Schuh's website.

My midden hides my food from most hungry animals, but not from bears. They can raid my refrigerator whenever they want to, and I cannot stop them. I can only sit in the branches above and scold. If I come down and fight, I might become part of their dinner!

I get my food from trees that are big and strong and old enough to produce a lot of cones. Because I do not need young forests, you might think that I do not need fire. But remember that many kinds of trees - especially the pines – need fire to stay healthy and create good places for their seedlings to grow. Since my favorite trees need fire, then I need it too!

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Photo by Zbyszek Boratynski.

Red-Backed Vole

(*Myodes rutilus*)

I am a very small animal. I look like a plump sausage with fur. I resemble my larger cousin, the mouse, but my tail is much shorter, and I have a reddish-brown streak down my back.

I am always on the go, day and night, year-round. The rhythm of my life is always the same. I wake up, eat, and sleep. Then I wake up, eat, and go back to sleep again.

I am always watching and listening for predators, because almost every meat eater in the forest would like to eat me. I am a favorite food for American martens and weasels.

Speaking of food, I need a lot of it, and I will eat almost anything. That makes me an omnivore. I dine on leaves, seeds, and berries. I eat insects and lichens, too. My favorite foods are fungi, especially the truffles that grow underground. I love their flavor and nutrition, but I cannot digest their tiny spores. I leave thousands of spores in my poop. The spores will grow up into truffles. I might come back to eat them!

Good habitat for red-backed vole. Dave Powell, USDA Forest Service (retired), Bugwood.org.

I hide from predators by traveling and feeding under old, rotten logs and along their edges. My forest is so old that lots of trees have died and fallen over. The rotting logs create a maze. I can travel from log to log without ever being seen from above. I can also dig tunnels and burrows under the soft, rotten wood.

I will only live a year or two, but I will have many babies during my short lifetime. From late winter until early fall, I will give birth to 4 to 6 babies every 3 weeks. I might have 40 babies in a single year! There are so many of us that there will always be some voles around in old forests, even in when food is hard to find.

Our old, moist forests do not burn very often. If a fire does come, we will run into our burrows to get away from the heat. We might survive the fire there, but the fire will probably burn many of our big, rotten logs. Then we will have no place to hide and no truffles to eat. After the fire, we will probably have to find another old forest to live in.

Reference: Tesky, Julie L. 1994. Myodes rutilus. In: Fire Effects Information System, [Online]. U.S. Department of Agriculture, Forest Service, Rocky Mountain Research Station, Fire Sciences Laboratory (Producer). Available: www.fs.usda.gov/database/feis/animals/mammal/muni/all.html.

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Terry Spivey, USDA Forest Service, Bugwood.org

Saskatoon Serviceberry

(*Amelanchier alnifolia*)

I am a plant – a tall shrub. I get my energy from sunlight. I am native to western North America. You can find me in all but the highest, coldest forests of the northern Rocky Mountains and the North Cascades. I grow best in sunny places with dry soils.

I am a perennial. That means I can grow for many years. When I am full-grown, I can be taller than most humans. I have woody stems and oval leaves with little points along the edges. My white flowers grow in clusters near the ends of my branches. I grow lots of blue berries.

I grew up from seed, but most serviceberry plants begin as sprouts. I can grow sprouts from the base of my stem. I can also grow them from underground stems called rhizomes.

I provide food for lots of animals. Bears, deer, elk, bighorn sheep, mountain goats, and moose feed on my branches during the winter. Bison, cattle, and sheep eat my twigs and branches.

Photo by Mary Ellen (Mel) Harte, Bugwood.org.

Birds love my sweet, blue berries. These animals cannot digest the seeds inside my berries. They poop the seeds out, planting for me as they travel.

Photo by Chris Evans, River to River CWMA, Bugwood.org.

People love my berries too. I am one of the most important vegetable foods in the traditional way of life for the Blackfeet people. In early summer, when my berries are fresh and ripe, the people visit their favorite locations for picking. They make the berries into a sweet soup and jam. When the Blackfeet were a migratory people, they used lots of serviceberries in pemmican. They dried the fruit in the hot summer sun. Then they traded it for other supplies. They also used my strong, flexible wood for arrows, spears, and digging sticks.

Fires usually kill the buds on my branches, but I can grow back from my root crown. If a fire kills my root crown, I can sprout from my rhizomes instead. I grow well in the years after fire. As the forest grows back and covers me with shade, my growth slows down. I produce fewer berries, and I will slowly die. I will need another fire!

Reference: Fryer, Janet L. 1997. Amelanchier alnifolia. In: Fire Effects Information System, [Online]. U.S. Department of Agriculture, Forest Service, Rocky Mountain Research Station, Fire Sciences Laboratory (Producer). Available: https://www.fs.usda.gov/database/feis/plants/shrub/amealn/all.html.

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Smooth Woodrush

(*Luzula glabrata* var. *hitchcockii*)

Photo by Keir Morse.

I am a plant. That means I get my energy from the sun. I am a perennial. That means I can live for many years.

I look like a grass, but my flowers and stems are just a bit different. I live in high, moist forests in the Rocky Mountains, the Pacific Northwest, and western Canada. You can find me in forests of subalpine fir, whitebark pine, and Engelmann spruce. In my habitat, the winter snow stays late and returns early.

I began life as a seedling. Soon I grew strong underground stems called rhizomes. Every spring, I sprout from my rhizomes. I can sprout whole new plants from them, too. You might find 5 or 10 of us all growing in a line. If you could look underground, you would see that we are all growing from the same long, straight rhizome!

Photo by Keir Morse.

Summer is very short in my high-mountain habitat, so I am in a hurry to produce seeds. As soon as the snow melts, I unfurl my shiny green leaves. Soon after, I produce tiny flowers, and they make tiny dark seeds.

When my seeds are ripe, the little capsules holding them flare open. The seeds look like they are sitting in little teacups. They will wait there until raindrops come and splash them out onto the ground. There they can grow into new plants.

When my seeds are ripe, my work is done for the year. My leaves gradually turn rusty brown. By fall, my little meadow will look like it is covered by a rust-colored carpet.

I am small, but I am important to life in the high country. Bears eat my flowers, leaves, and stems. Sometimes they dig up my roots to eat. During summer and fall, elk feed and rest in the cool places where I grow. They like the high country because there are fewer biting flies here than in the low country.

The cool, moist places where I live do not burn often. When fires do come through, they are patchy. I can live a long time without being burned. When a fire does visit, it burns my leaves and stems, but it does not usually kill my rhizomes. They live underground, so the soil protects them from the heat of fires. The next summer, I will sprout from my rhizome, just as if the fire never happened. I like the sunny openings and dark soils that fires leave behind. They help me grow extra-fast and sprout lots of new plants for a few years after fire.

Reference: Habeck, R. J. 1992. Luzula glabrata var. hitchcockii. In: Fire Effects Information System, [Online]. U.S. Department of Agriculture, Forest Service, Rocky Mountain Research Station, Fire Sciences Laboratory (Producer). Available: https://www.fs.usda.gov/database/feis/plants/graminoid/luzglah/all.html.

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Snowbrush *Ceanothus*

(*Ceanothus velutinus*)

Dave Powell, USDA Forest Service, Bugwood.org.

I am a plant. That means I get my energy from sunlight. I am a short, bushy shrub. You can probably see over me, but my branches grow so thick together that you cannot walk between them!

I am native to western North America. I like warm, dry places. I grow in valleys and way up on hillsides, but I do not grow high in the mountains. It is too cold for me there. I can grow under trees, but I cannot live long in their shade. I like burned places much better because they are sunny and hot in summer.

Dave Powell, USDA Forest Service, Bugwood.org.

Snowbrush sprouting 1 year after fire. Photo by Garon Smith.

I have bright, shiny green leaves. I do not let them drop off in the fall. Instead, I keep them green all winter. In the spring, I grow big clusters of sweet-smelling white flowers. They make me look like I am covered with handfuls of snow. That is why I am called "snowbrush."

Seedling 1 year after fire. Leaves are 1-2 centimeters long. Photo by Garon Smith.

I produce thousands of seeds every year, but they will not grow right away. They are covered with a hard, waterproof coat that must be heated in order to break open. Only fire will do the job! My seeds can wait as long as a hundred years for a fire. After fire, the ground will be covered with thousands of my little green seedlings. They will grow very fast in the hot, sunny burn, where the soil is warm and covered with nutrient-filled ashes.

When a fire comes, it will probably kill my leaves and stems. But my growing points at the top of my roots will probably survive, so I can sprout new stems and leaves the next year.

Elk, deer, and moose eat my leaves and branches, especially in winter. Chipmunks, birds, and ants feed on my seeds. Some animals bury my seeds in the ground for their winter food supply. They are like little planters for me – as long as they do not come back to eat the seeds! People can use my flowers and leaves to make soap. With help from a tiny bacterium, I enrich the soil with nitrogen. That is good for me, for the animals that eat my leaves and branches, and for the other plants that grow here.

Reference: Anderson, Michelle D. 2001. Ceanothus velutinus. In: Fire Effects Information System, [Online]. U.S. Department of Agriculture, Forest Service, Rocky Mountain Research Station, Fire Sciences Laboratory (Producer). Available: https://www.fs.usda.gov/database/feis/plants/shrub/ceavel/all.html.

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Subalpine Fir

(*Abies lasiocarpa*)

Mary Ellen (Mel) Harte, Bugwood.org.

I am a plant – an evergreen tree. That means I get my energy from sunlight. I am native to the western mountains of North America. I like cold forests at high elevations.

My needles are 2 to 3 centimeters long. They look a little like spruce needles, but they are much softer.

I am a conifer, which means I put my seeds in cones. My cones grow on my top branches. They point straight up, so they look like little candles. They are purple, and they drip with sap. As they ripen, they dry out and begin to fall apart, letting the seeds float down to the ground.

Cones, late summer. Photo by Dave Powell, USDA Forest Service, Bugwood.org.

I grow slowly. I am 15 years old now and only 30 centimeters tall. If I were living in a shady creek bottom, I could grow another 30 meters. Then I would have a pointy top and branches all the way to the ground. My shape would help me shed snow in the winter. But I am living on a cold, windy ridge. The icy wind shears my top off every winter, so I grow most of my branches near the ground. It looks like I am wearing a skirt of branches. Where they touch the ground, they can form roots and sprout new trees. I could live 200 years and never get taller than you.

I provide shelter for snowshoe hares, flying squirrels, red squirrels, chipmunks, grouse, and other birds. Nearly all of these animals eat my seeds too. Insects eat my needles. If I get big, I can provide shelter for deer, moose, mountain goats, and bears. People can make medicines from my needles and sap, and they use my sap for a special glue in glasses and microscopes!

Fire is not my friend. Any kind of fire is likely to kill me. My bark is thin, so it will not protect my cambium from heat. My branches grow low to the ground, so they will catch fire easily. My roots are shallow, so fire will kill them too. After a fire, my seedlings will begin to grow right away. You might not notice them, since fast-growing trees like lodgepole pine will tower over them. But my seedlings will be patient. The pines will die off after a hundred years or so, and my seedlings will still be growing strong.

Reference: Uchytil, Ronald J. 1991. Abies lasiocarpa. In: Fire Effects Information System, [Online]. U.S. Department of Agriculture, Forest Service, Rocky Mountain Research Station, Fire Sciences Laboratory (Producer). Available: https://www.fs.usda.gov/database/feis/plants/tree/abilas/all.html.

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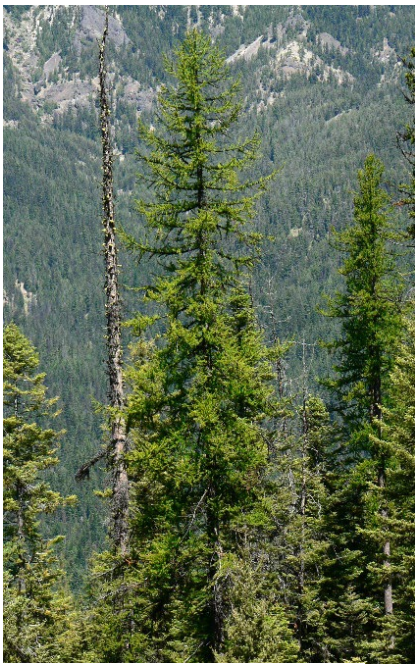
Western Larch

(Larix occidentalis)



Walter Siegmund.

Chris Schnepf, University of Idaho, Bugwood.org.

I am a plant. That means I get my energy from sunshine. I am an unusual tree. I bear cones just like other conifers do. But my short, green needles turn gold and fall off in the fall, just like the leaves of cottonwoods and aspens do.

I live in the northwestern United States. I like places where the soil is moist but not wet. My favorite places are hillsides that face north and east. They are cooler and more moist than hillsides that face south and west.

A hundred years ago, I started growing from a tiny seed. The seed had a little papery wing. That made it easy for the wind to carry it into the middle of a big burned area. I grew very fast. By the time I was 5 years old, I was as tall as most grown-ups. Now that I am 100, I am taller than most of the other trees in my forest. As I grow taller, I let my low branches fall off. That way, fires can burn below and around me but cannot reach my crown. I will keep growing for another 400 or 500 years.

Because I am so tall, my top sticks out above the rest of the forest. Sometime, it will probably get struck by lightning or broken off by wind. Then the rain will get into my wood, and it will begin to rot. Then I will provide a perfect home for woodpeckers. They will make nest holes in me. They will use each hole for only one year. Then owls, flying squirrels, bluebirds, and other animals will move in.

Many animals depend on me. Small mammals eat my seeds and seedlings. Squirrels store my cones in middens, where they can feed all winter. Bears eat my sap in spring when it is filled with sugar. Elk eat my small branches. People use my wood for lots of things like houses, furniture, medicines, paint, and campfires!

It is hard for fire to harm me. My bark is 10 centimeters thick and getting thicker every year. My roots grow deep underground. My lower trunk is free of branches. A fire might leave a scar on my trunk, but it will probably not kill me. If it does, it will create perfect habitat for my seeds to grow in. Then they will create the next forest of western larch.

Leaves in fall. Photo by Garon Smith.

Reference: Scher, Janette S. 2002. Larix occidentalis. In: Fire Effects Information System, [Online]. U.S. Department of Agriculture, Forest Service, Rocky Mountain Research Station, Fire Sciences Laboratory (Producer). Available: https://www.fs.usda.gov/database/feis/plants/tree/larlya/all.html.

Citation: Smith, Jane Kapler. 2003. Western larch. In: FireWorks encyclopedia. Fort Collins, CO: U.S. Department of Agriculture, Forest Service, Rocky Mountain Research Station. 1 p.

Western redcedar

(*Thuja plicata*)

I am a tall evergreen tree. I am a plant, so I get my energy from the sun. I live in warm, moist forests west of the Continental Divide. Sometimes the soil around my roots is very wet, so I grow my roots in the duff - close to the surface. They spread out from my trunk in every direction.

I am almost 700 years old now. I am more than 60 meters tall, and my trunk is 2 meters thick. I could live hundreds of years longer.

Like pines and firs, I am a conifer, but my leaves are not needles. They are tiny overlapping scales that grow in flat, fern-like sprays. When I was young, my bark was thin, but now it is thicker than your arm. It is reddish-gray and has deep furrows. Loose strips of bark hang from my trunk.

Opened cones at the tips of branches. Richard Webb, Bugwood.org.

I grow small brown cones at the tips of my twigs. When the cones dry out and open at the end of summer, they look like stiff brown flowers. My seeds can sprout almost anywhere – in soil or duff, even on dead stumps.

Seeds are not the only way I reproduce. I can sprout new trees wherever my lower branches touch the ground. If my roots lose their grip on the soil, I will fall over, but then I will sprout new trees from my fallen trunk.

I am important to lots of living things, including people. Insects eat my leaves in summer. Deer and elk eat my leaves in winter. Bears strip off my bark to eat the cambium underneath. Birds nest in my branches and trunk. Birds and mammals, big and small, rest in my shade. My wood lasts a long time, so people use it for homes, canoes, furniture, and storage containers. They soften the fibers in my bark to make cloth.

Sometimes fires visit my habitat. They smolder in rotten logs and spread slowly through the duff, and they leave scars on big trees like me. Crown fires are unusual in my habitat, but they can occur during hot, windy weather. A crown fire could kill me, but cedar trees will grow back again. Very few other trees can grow in these wet soils.

Fire smoldering in a grove of western redcedars. Photo courtesy of Rick Trembath.

Reference: Tesky, Julie L. 1992. Thuja plicata. In: Fire Effects Information System, [Online]. U.S. Department of Agriculture, Forest Service, Rocky Mountain Research Station, Fire Sciences Laboratory (Producer). Available: https://www.fs.usda.gov/database/feis/plants/tree/thupli/all.html.

Citation: Smith, Jane Kapler. 2015. Western redcedar. In: FireWorks encyclopedia. Fort Collins, CO: U.S. Department of Agriculture, Forest Service, Rocky Mountain Research Station. 1 p.

White Pine Blister Rust

(Cronartium ribicola)

Blister rust infection on whitebark pine branches. Photo by H. J. Larsen, Bugwood.org.

I am a fungus. I am like a plant in many ways, but I do not get my energy from the sun, like plants do. Instead, I get my nutrition from "host" plants. One of my favorite hosts is the whitebark pine. I am not good for the tree, but the tree is good for me.

Here is a picture of my host tree. You cannot see me because I am inside. I am a network of thread-like hyphae living under the bark. You can tell that I am inside because the branch is swollen and its bark has broken open. The openings are releasing millions of spores. I use spores to reproduce.

There are other ways to tell if I have infected a tree. If a tree has lots of red needles, I might be inside. If the tree's top branches are all dead, I might be working my way down from the top, killing branches as I go. If the tree has a big, sappy wound on its trunk, I might have caused it.

I am native to Asia. I have only been in North America for about 100 years, but my infections have killed lots of whitebark pines. I am also deadly for other kinds of "five-needled" pines. Those are pines that grow their needles in bunches of five. If you look closely at the picture above, you can count the needles in some of the bunches on the tree.

Five-needled pines are not my only host plants. I also live on some shrubs and wildflowers. Here is a picture of my spores on the underside of a currant leaf. These are **not** the same kind of spores as the ones on the tree! My spores are very specialized. The ones that grow on a tree can **only** infect a shrub or wildflower. The ones that grow on a shrub like this can **only** infect a tree. You see, I need **both kinds of plants** to reproduce!

Mike Schomaker, Colorado State Forest Service, Bugwood.org.

While I am not good for whitebark pines, I am useful to some kinds of animals. Many insects eat my spores. Red squirrels love the sweet liquid that seeps from wounded trees.

In places where I am native, the five-needled pines have ways to survive blister rust. But here in North America, only a few five-needled pines can survive my infection. If these trees reproduce, the next generation might survive too. Scientists and managers are raising some of these "rust resistant" trees and planting them in the mountains. Maybe they can establish healthy whitebark forests again.

If a fire kills my host plant, it will kill me. But blister rust will return to the burn as soon as the host plants sprout back. I hope whitebark pine trees will grow back too, so I can live in them again.

Citation: Smith, Jane Kapler. 2000. White pine blister rust. In: FireWorks encyclopedia. Fort Collins, CO: U.S. Department of Agriculture, Forest Service, Rocky Mountain Research Station. 1 p.

Whitebark Pine

(Pinus albicaulis)

Paul Bolstad, University of Minnesota, Bugwood.org.

I am a tree. That means I get my energy from sunlight. I am native to the northern Rocky Mountains, the North Cascades, and the Sierra Nevada. I live in a high-elevation forest on a dry, rocky hillside. Winters are long and cold here, and summers are short.

I am nearly 400 years old now, and I am about 20 meters tall. I am lucky to be growing in a place without much wind. If I were on a ridge top, winter's icy wind would break my top off every year. I might be shorter than you!

I am an evergreen tree. My needles grow in bunches of 5. My crown is full and round. My branches bend upward. That makes it easy for Clark's nutcrackers to find my cones. Every summer, these birds pull the seeds out of my cones and cache them all over the mountainsides. That is their winter food supply. But they do not come back to every cache. The ones they leave behind can grow into new trees. Like most whitebarks, I am growing right next to a couple of other trees. That is because we all grew out of the same seed cache. Our seedlings grow well in open, sunny places with bare ground, like burned areas.

Seedlings. Photo by Anna Schoettle, U.S. Department of Agriculture, Forest Service.

Nutcrackers do not get all of my cones. Red squirrels cut them from my branches and carry them to their middens. These deep piles of cones are their winter food supply. Many other animals eat my big, nutritious seeds – including people. I provide food for mountain pine beetles too, but they might eat so much of my cambium that I will die.

I have many problems besides mountain pine beetles. White pine blister rust is one. This fungus came to North America from Europe, and not many of us whitebarks can survive it. I hope I am one of them! The changing climate is another problem. My habitat is getting warmer. That helps other kinds of trees grow in places where whitebarks used to be the only ones. These new neighbors take a lot of water from the soil. Fires can help us get rid of them, but fires can kill us too. Luckily, the forest where I live is open and the trees are far apart. That means a fire here will probably stay on the surface. It will not spread through the tree crowns.

Squirrel midden. Photo by Ilana Abrahamson.

Reference: Fryer, Janet L. 2002. Pinus albicaulis. In: Fire Effects Information System, [Online]. U.S. Department of Agriculture, Forest Service, Rocky Mountain Research Station, Fire Sciences Laboratory (Producer). Available: https://www.fs.usda.gov/database/feis/plants/tree/pinalb/all.html.

Citation: Smith, Jane Kapler. 2003. Whitebark pine. In: FireWorks encyclopedia. Fort Collins, CO: U.S. Department of Agriculture, Forest Service, Rocky Mountain Research Station. 1 p.

Wild Onion

(*Allium* species)

If you are walking outdoors and you suddenly think you smell someone cooking spaghetti, you have probably found me. I am a wild onion, a perennial plant. I get my energy from sunlight, and I can live for many years.

Photo by Mrs. W. D. Bransford.

About 50 species of wild onions grow in the Rocky Mountains, and there are nearly 300 species in the world. Some of us like shady, moist places. Others like dry, sunny spots. We can be found in prairies and in forests. Some of us live in wet meadows or next to running water.

All of the species of wild onions grow from bulbs. Bulbs live underground, but they are not roots. A bulb is a clump of **very special leaves**. These leaves are thick and moist. They are white, not green like aboveground leaves. They do not capture sunlight and turn it into nutrients. They **store** nutrients instead.

With all of that stored energy, wild onions can begin growing early in the spring. We can also sprout from underground after a hungry animal eats all of our leaves. We can sprout even after a fire burns off our tops. Our bulbs can also produce tiny new bulbs. These will grow into whole new onion plants.

I start to grow early in the spring. I produce big clusters of flowers at the top of my stem. They soon make seeds. When my seeds are ripe, my year's work is done. By August, my leaves and stem dry up. They might even disappear. Like an underground treasure, my bulb waits underground for spring.

Andy and Sally Wasowski.

Everyone likes to eat me. The people of North America have cooked with wild onions for thousands of years. Bears and ground squirrels eat my bulbs. In early spring, elk and deer graze on my leaves. Bees eat my pollen and spread it to other onion flowers.

Wild onions can easily survive fires that just burn our stems and leaves. We just grow new leaves and flowers the next year. But if a fire cooks our bulbs, we will not survive.

Citation: Smith, Jane Kapler. 2000. Wild onion. In: FireWorks encyclopedia. Fort Collins, CO: U.S. Department of Agriculture, Forest Service, Rocky Mountain Research Station. 1 p.