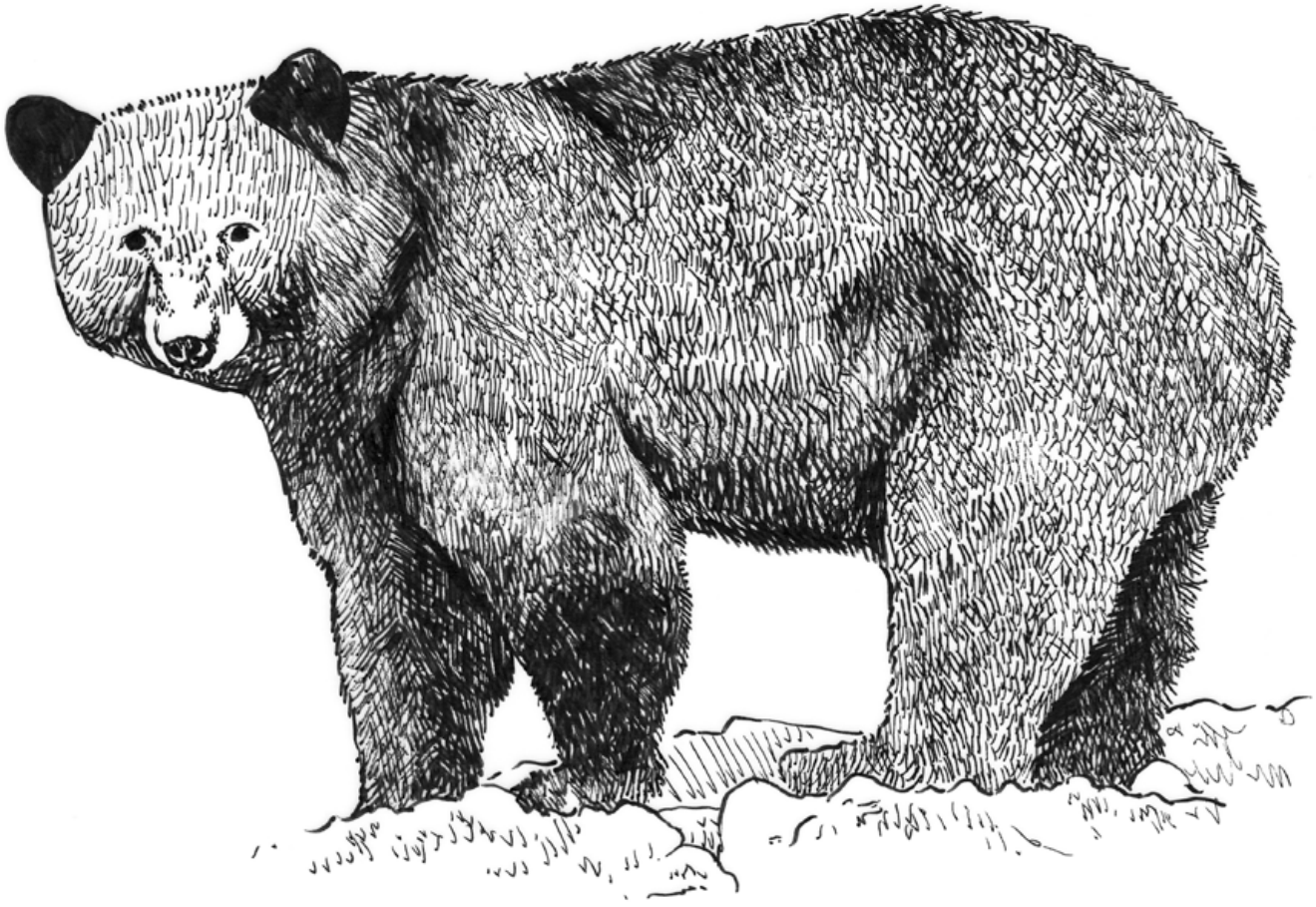
# Forest Essays



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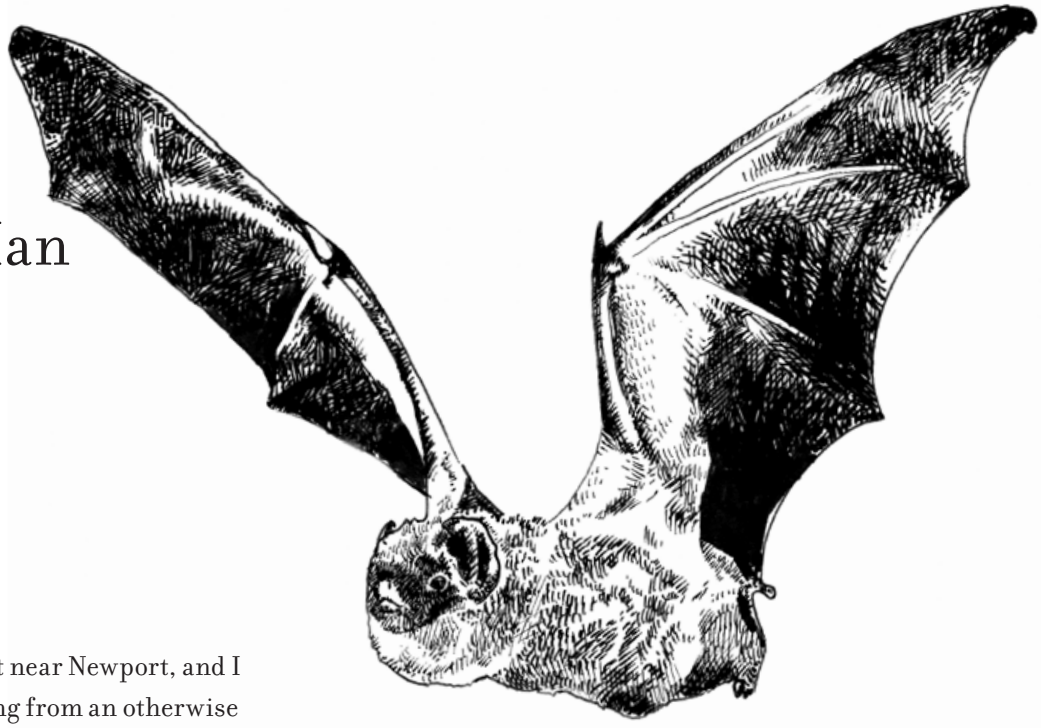
# Man Finds Hoary Bat, Becomes Bat Man



One day I was hiking in the forest near Newport, and I heard a loud hissing sound coming from an otherwise ordinary Douglas-fir tree. I went up to the tree and looked closely at it. I was surprised to notice that the rough bark on the tree trunk was actually hiding a big bat! I quickly snapped a photo of it. Once I was home, I did some research and identified the creature I'd seen as a hoary bat.

I decided to find a book about bats. Several hours into my reading, I was hooked. I learned that bats are the only mammals that can fly, and they're smart and very useful to people. That was the day I decided to become a biologist. Today I research bats at an Oregon university.

The hoary bat is the biggest bat in Oregon. It has a wingspan of nearly 16 inches. It has dark fur tipped with white, a dark face and an orange neck. It lives in the coniferous forests of Oregon. Amazingly, in short bursts it can fly 60 miles per hour.

The hoary bat is just one of more than 1,250 kinds of bats in the world. There are so many bats that they make up about one-fifth of all mammal species.

Most bats eat insects. Smaller bats eat small insects; big ones like the hoary bat eat moths, beetles, flies, crickets and other large insects. It's amazing how much food a bat can eat. In a single meal the hoary bat can eat up to 40 percent of its weight in insects — which would be like a 100-pound human eating 40 pounds of food!

Bats go out at night to feed, so they need some way to keep from running into things in the dark. They send out sound waves from their mouths or noses, and when the sound hits an object, an echo comes back to the bat. This is called echolocation. A bat can identify an object by the sound of the echo. It can also tell the size, shape and texture of a tiny insect from its echo.

There are a lot of good reasons to be glad our forests have so many bats. A single little brown bat — a species common in Oregon — can catch one thousand mosquitoes in an hour. A colony of 150 big brown bats can help farmers by eating 18 million or more crop-destroying rootworms in a summer.

Bats are also useful in other ways. The bacteria in bat guano is used as fertilizer. It's also been used to produce antibiotics and soap. Latin American vampire bats (yes, there really are bats that eat blood!) have a chemical in their saliva that dissolves blood clots in people. It's used to treat people who have strokes. And thanks to bats, we know about sonar, a method that uses sound waves to locate things underwater.

Ever since the day I heard the hissing of a hoary bat, I've been fascinated by bats. I hope you'll join me in learning about these helpful and interesting flying mammals.

**Key Ideas and Details Questions (multiple choice)**

1. To help them find their way in the dark, bats have developed a navigation system called _____.

   a. Radar

   b. Echolocation

   c. Ultrasound

   d. Lidar

2. How many different kinds of bats are there in the world?

   a. 100

   b. 500

   c. 1,000

   d. 1,250

**Integration of Knowledge and Ideas Question (short answer)**

3. How are bats useful to humans? Please list at least two ways, using the story as reference.

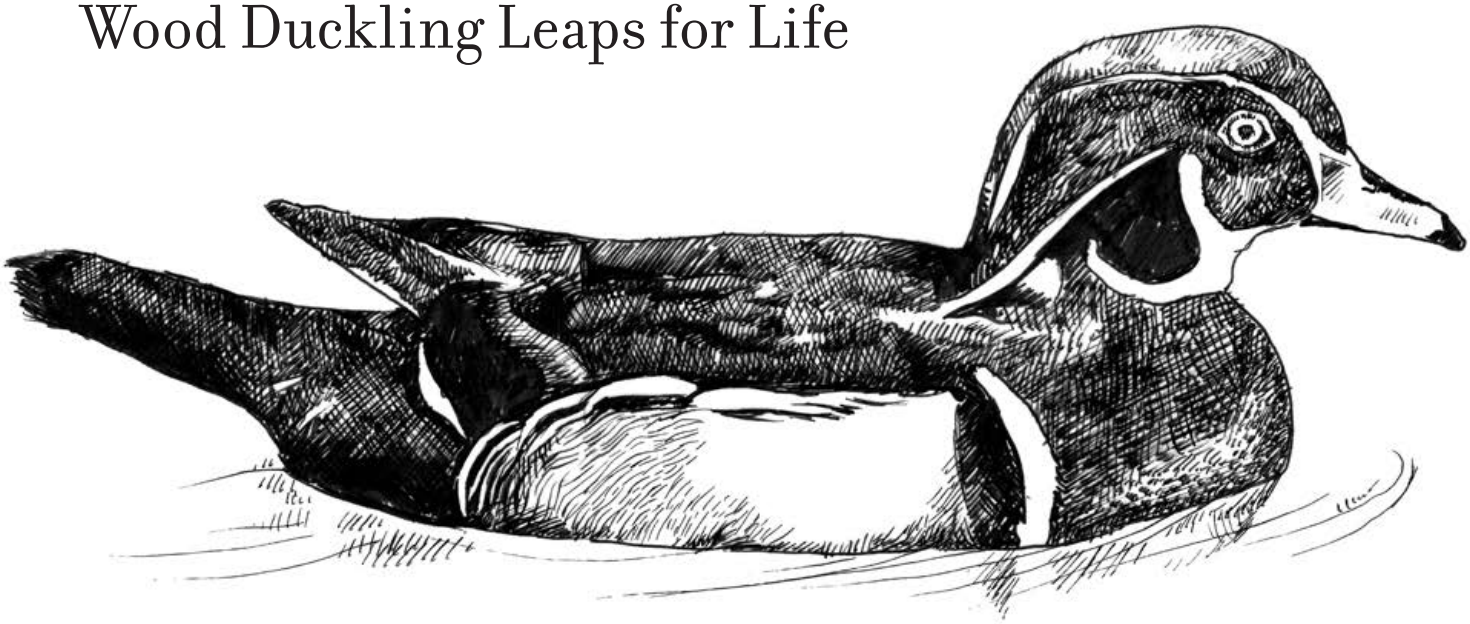
_____

_____

_____

_____

# Wood Duckling Leaps for Life



A 2-day-old wood duckling looks out the doorway of her home, far up in a tree that grows near the water. She can't fly. She only has a full coat of downy feathers and little stubs that will become wings. She can see the ground far below. Her mother is there, calling her to come down.

Obediently, she jumps. Down, down, down, 100 feet and more she falls, feet first, bumping into leaves as she goes. Surely she won't make it alive!

But because she weighs less than an ounce, she almost floats down. She lands softly and safely in the leaf litter below. Her mother comes to get her, and her life as a duck on the water begins.

Biologists don't know very much about wood ducks. No one knows why they nest in trees, or why their nests are so high above the ground. But whatever the reason, these ducks are amazing to watch! Biologists have filmed wood duckling behavior many times, and report that ducklings can jump and land unharmed from as high as 280 feet.

Wood ducks are the only ducks that nest in trees. You'll find them in Oregon's riparian forests — forests of alder, willow, maple and conifer trees that line either side of the water along rivers, streams and marshes. They build their nests in tree cavities. They don't make these cavities themselves, but find natural cavities or borrow those left behind by woodpeckers.

The female wood duck lines her nest with her feathers and lays between six and 15 eggs. She sits on them for 25 to 37 days. The ducklings hatch with just the beginnings of feathers.

As soon as they hatch, the ducklings need to get out of their high-flying nests and down to the water to get away from owls, hawks and other predators. To get them to come down, the mother goes to the base of the tree and calls to the ducklings above. The ducklings don't hesitate: They jump and then make their way to the water. They grow quickly, and learn to fly when they're 8 to 10 weeks old.

Wood ducks were nearly hunted out of existence at the beginning of the 20th century, and in many places newly built houses and businesses have destroyed their habitats. Thankfully, measures are being taken to protect and restore wood duck habitats. New laws limit hunting, and artificial nesting boxes help fill gaps in natural habitats. Beavers, which build wetlands in the forest, have also helped provide natural habitats.

Many local groups are working to build nesting boxes and restore wood duck habitats. To learn how you can help, go to the nearest National Wildlife Refuge and ask about wood ducks. Maybe you'll be lucky enough to see a wood duckling make its first leap into life!

**Key Ideas and Details Questions (multiple choice)**

1. What is a riparian forest?

    a. A forest with fir trees and other conifers

    b. A forest along the water, with alder and willow trees

    c. A forest of trees with fruit that ripens in summer

    d. A newly planted forest

2. When does the wood duckling jump from its nest?

    a. Whenever it wants to — it jumps randomly

    b. When it can fly down safely

    c. When the mother pushes it out of the nest

    d. When it's still very lightweight, and called by its mother

**Integration of Knowledge and Ideas Question (short answer)**

3. How does the wood duckling survive the 100-to-280-foot fall from the nest? Please take your answer from the reading.

# A Day in the Life of a Girl Flunkey

"Rise and shine, sunshine!" her father said. "We have a lot of hungry loggers to feed before morning light."

Katie groaned and burrowed deeper under her quilt. It was only 4 a.m. She wanted to sleep until the sun came up, like the other girls in her eighth-grade class.

Forcing herself from the warm bed, Katie saw that her father had rekindled the stove. It was still very cold and dark in the small cabin she shared with her family. Her mother and brother were already up and dressed. Shivering, she quickly put her clothes on over her night shift, starting with her leggings, then an underskirt, skirt, apron and boots, and stumbled out into the dark to the outhouse.

The year was 1948. Katie's father was the cook at a logging camp, and he was proud of his job. He knew that the best way to keep good men working hard in a lumber camp was to feed them well. If the food was not plentiful and tasty, they might go looking for another job in a camp with a better cook. Her mother taught school in a railroad car at the camp.

When Katie got to the cook shack, her brother, Jack, was already hard at work greasing pans and frying hotcakes, which loggers called flapjacks. He worked as an assistant cook, called "cookees" in logging camps. Katie was one of several people called "flunkeys," who helped in the kitchen and served in the dining room. She hoped to work her way up to cookee soon.

After washing her hands at the sink by the door, Katie started the oatmeal and added a one-gallon can of stewed prunes. Fresh fruit was often scarce in logging camps, so prunes were offered at every meal, earning them the nickname "logging berries." The place was full of the sounds and smells of frying bacon and hotcakes and steaming coffee.

When everything was ready, her father rang the bell. About 100 loggers streamed in and sat at long tables. Katie set large serving platters piled high with biscuits, bread, flapjacks, bacon, eggs and beans at several places along each table. It was her job to keep the serving platters full.

Katie dashed back and forth between the dining area and the kitchen to fill empty serving platters. The only sound was the clink of silverware and an occasional "Pass the flapjacks!"as the loggers ate as much as they could to fuel their hard work in the woods.

In less than an hour everyone was fed and ready to go. Katie stood by the door to pass out lunch pails that the loggers would take into the woods with them. She had packed the lunches last night after dinner. Each one included three full sandwiches, two with meat and the other with butter and jam, plus a huge slice of her father's famous apple pie.

An hour later Katie wiped the last breakfast dish with a hand that was red and swollen from the strong lye soap and water. If she hurried she might make it to school before story time. If she worked hard she might finish her lessons before it was time to get supper ready.

**Key Ideas and Details Questions (multiple choice)**

1. What was an assistant cook called in a logging camp?

    a. Cook's assistant

    b. Cookee

    c. Cookie

    d. Flunkey

2. What were prunes called in a logging camp?

    a. Dried plums

    b. Sunsweet

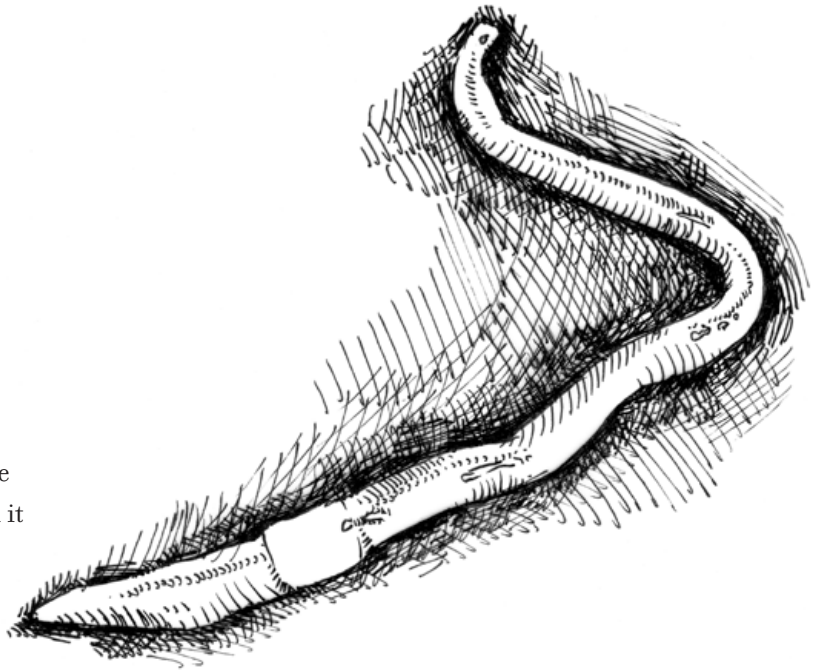
    c. Logging berries

    d. Winter fruit

**Integration of Knowledge and Ideas Question (short answer)**

3. Why was the quality of the cooking important in a logging camp? Use details from the reading to support your answer.

# Learning about Worms from the Inside Out



The woman bent over her kitchen table, a small surgeon's scalpel in her hand. She sliced through the smooth skin of the earthworm and carefully pinned it open. A boy stood near her, watching.

The woman is an oligochaetologist (olli-GOK-a-tol-o-gist) — a scientist who studies earthworms. Her name is Dorothy McKey-Fender. Now well into her 90s, she has been collecting and dissecting worms since 1929. For many of those years her son, William Fender, learned by her side.

Dorothy handed her son a small magnifying lens. "See how the earthworm's body is joined together in segments? Each segment has stiff little hairs that help it move. It also makes a slimy mucus that helps it slide through the soil."

She pointed to the worm's rounded end. "Here's the front of the worm, where its mouth is," she said. She explained how it eats bits of dirt and dead and decaying plant material — mostly leaves, but also tiny roots and shoots. Its digestive system is a straight tube that extends from its mouth to its flattened rear end.

"Behind the mouth are a primitive brain and several hearts," she continued.

"It has more than one heart?" William asked.

"Yes, but its hearts don't have chambers and valves like ours do," she explained. "Instead it has pairs of muscular rings that pump blood through its body." She smiled and looked at the boy. "It doesn't have lungs either."

"How does it breathe?" he asked.

"It absorbs oxygen through its skin."

The boy watched as she poked and prodded at the dead worm. She explained that cutting the worm apart and looking inside helps us understand more about worms. Very few people study worms, yet there are hundreds of different kinds of worms out there to learn about.

William was curious. "But why should we learn about worms?" he asked.

"Worms are a very important part of nature," his mother said. She told him that many different kinds of animals depend on worms for food, including birds, other worms, turtles and small burrowing mammals like moles. Worms also help fertilize soil so people can grow plants for food. When they eat tiny bits of dirt and dead plants and deposit them in the soil, they recycle nutrients that living plants need to grow. Without good soil, humans would not have many of the plants we eat.

All William's questions paid off, and he began to appreciate how important and interesting earthworms are — and he grew up to become a Northwest earthworm expert himself!

**Key Ideas and Details Questions (multiple choice)**

1. What is an oligochaetologist?

   a. Scientist who studies insects

   b. Scientist who studies worms

   c. Scientist who studies dirt

   d. Scientist who studies fish

2. How does an earthworm breathe?

   a. Through its nose

   b. Through its dorsal side

   c. Through its skin

   d. Through its ventral side

**Integration of Knowledge and Ideas Question (short answer)**

3. Why is the scientist dissecting the worm? Use details from the reading to support your answer.

# Water Journeys from Forest to Faucet

High in the mountains, a drop of water falls on the forest. Soon a steady rain soaks the soil. Some of the rain evaporates back into the atmosphere, forming low clouds that blanket the mountains. Trees and other plants take up some of the water. The rest seeps through porous rock into underground storage areas called aquifers.

The rain continues and the soil becomes saturated, or unable to hold any more. Water begins to trickle over the ground, spilling into streams and rivers, and rushing down steep slopes with a roar. As these rivers leave the forest, they pass through farmlands, towns and cities.

Chances are, the water that flows from your faucet came from a forest. Most of Oregon's drinking water begins in a forest watershed. A watershed is an area of land that collects rain and snow and drains it through a network of streams into rivers, lakes and oceans.

Mountains and high ridges define watersheds by directing which way water flows. The high peaks of the Cascades divide the waters that flow west from those that flow east. In some ways, a watershed works like a bathtub. The sides of the tub are the mountains and ridges that contain the water that flows from the shower head and goes down the drain.

Healthy forest watersheds help keep fresh water clean. Forests act as a natural filtration system, helping absorb, filter and slowly release rainwater and snow melt. Tree roots and other plants hold the soil in place, keeping this vital water-cleaning system intact.

Because so much of its water flows through forests, Oregon has some of the cleanest water in the country. Water quality is such an important issue that several Oregon laws have been passed to protect and improve our water supply. These include the Oregon Forest Practices Act, the Clean Water Act and the Oregon Plan for Salmon and Watersheds. These laws help make sure our forests stay healthy so our water stays clean.

**Key Ideas and Details Question (multiple choice)**

1. What happens to rain that falls on a forest?

    a. It gets sucked up by tree roots

    b. It soaks through the soil into underground aquifers

    c. It runs off into streams and rivers

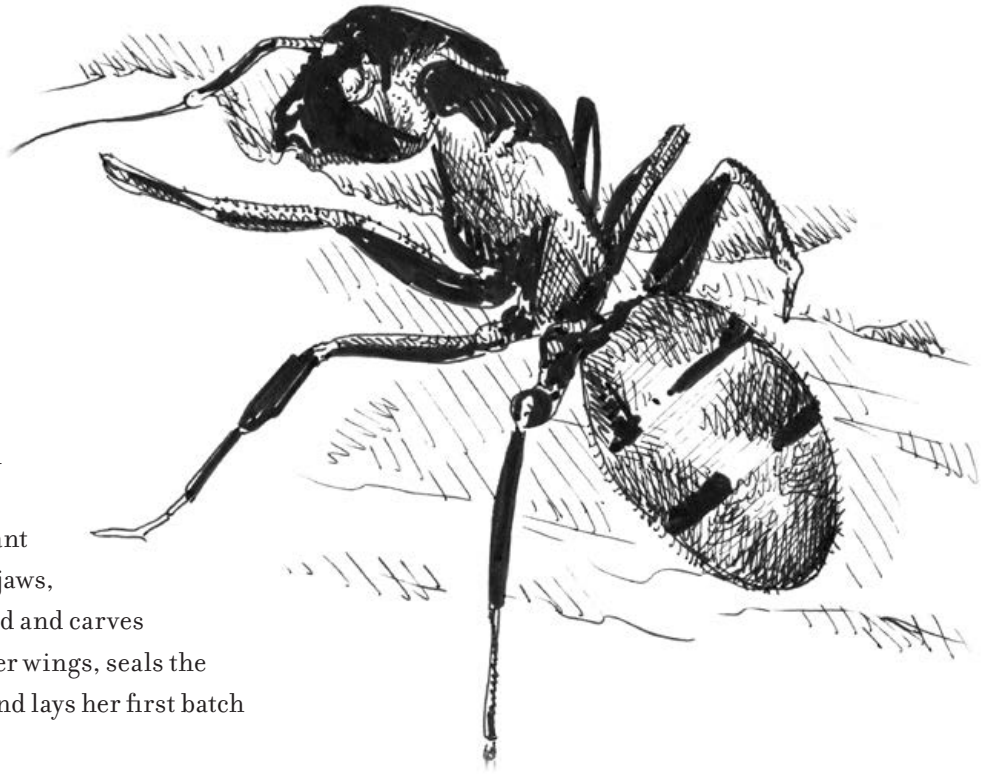
    d. All the above

**Integration of Knowledge and Ideas Questions (short answer)**

2. What is a watershed? Use details from the reading to support your answer.

3. Why does Oregon have some of the cleanest water in the country? Use details from the reading to support your answer.

# Young Ant Queen Begins Her Reign



The winged queen lands on a tree stump deep in the forest. Its wood is damp and soft with decay — the perfect place to start a carpenter ant colony. With her strong, saw-like jaws, she cuts a tunnel through the wood and carves out a small room. She chews off her wings, seals the chamber with sawdust and spit, and lays her first batch of eggs — about a dozen in all.

For two months the queen doesn't eat, drink or leave the brood chamber. When her eggs hatch, she cares for her helpless, grub-like larvae, grooming and feeding them with fluid secreted from her mouth.

After a few weeks the larvae spin cocoons and metamorphose, or change physical form, into worker ants. These workers are all female, and they are all sterile, meaning they are unable to reproduce. When they grow strong enough, the worker ants take over the care and feeding of the larvae and the queen. They gather food and enlarge the nest while the queen lays more eggs, which is now her only task.

As the colony grows larger, it starts producing two different sizes of worker ants. The larger ants guard the nest, battle intruders, explore the surrounding area and forage for food. The smaller ones take care of the nest, the queen and her young.

A carpenter ant eats dead and living insects, tree sap, fruit and honeydew, the sugary waste excreted by plant-sucking insects. Forager ants leave the nest to find food, and then return to feed the other ants by regurgitating, or throwing up, food for the queen and the larvae.

When a foraging ant finds food, she leaves a scent trail. Once back at the colony, she wiggles her body to let other workers know about her discovery. They follow her trail to the food source.

In a few years there will be thousands of ants in the colony. When the colony grows too big for its present location, it will start to produce ants that are fertile, or able to procreate. These males and females will fly off in a breeding swarm. After mating, the males will die and the females will look for new places to lay their eggs and become the queens of their own new colonies.

**Key Ideas and Details Question (multiple choice)**

1. What does metamorphose mean?

    a. Change physical form

    b. Lay eggs

    c. Search for food

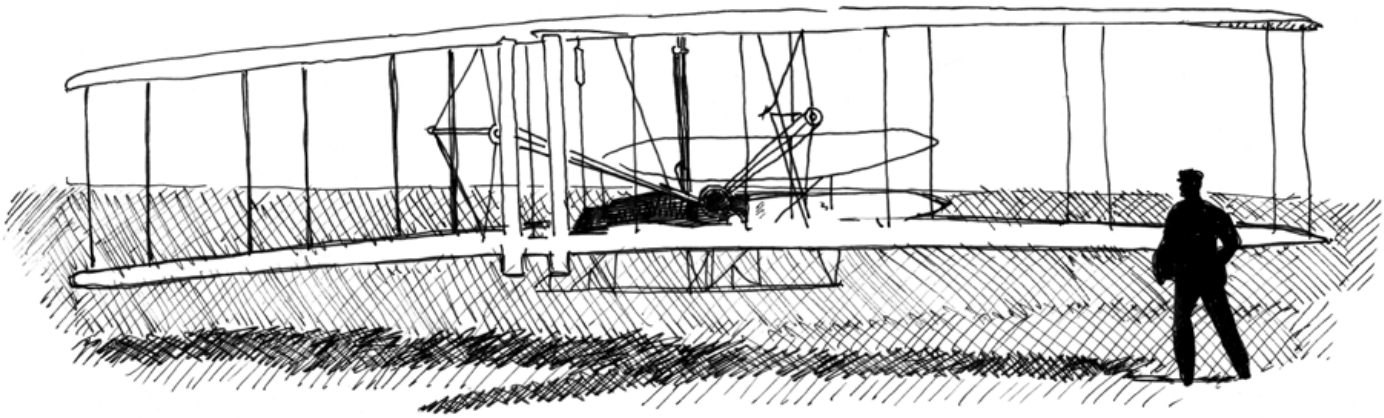
    d. Reproduce

**Integration of Knowledge and Ideas Questions (short answer)**

2. How do forager ants feed the colony? Use examples from the text to support your answer.

3. What happens when an ant colony grows too large? Use examples from the text to support your answer.

# Not Just a Pretty Face: The Useful Sitka Spruce Tree



When you visit the Oregon Coast, you might see some very large conifers called Sitka spruce. These trees can grow up to 230 feet high and 27 feet around the base of the trunk. But Sitka spruce aren't just big, beautiful trees. Their wood is stronger by weight than the wood of any other tree in the West. For that reason, it's used to build all kinds of interesting things.

Airplanes top the list. The Wright Brothers built the first-ever successful airplane out of lightweight Sitka spruce. World War I and World War II airplane frames, wing spars and propellers were also built of this useful wood. Just before World War II, Howard Hughes used laminated birch and Sitka spruce to build the "Hughes Flying Boat" — now known as the "Spruce Goose." This enormous airplane had a wingspan wider than the length of a football field. It was designed to carry 700 soldiers.

Sitka spruce wood isn't just lightweight and strong; it also has wonderful resonance. It's used to create sounding boards for pianos, harps, violins, guitars and other stringed instruments. Ninety percent of the steel-string guitar bodies in America are made of it. Some of the most famous jazz and classical musicians in the world play instruments made with Sitka spruce.

Sitka spruce is also used for home-building and papermaking. It's used to make both boats and the oars we use to row them. Native peoples have woven baskets out of its roots for centuries. Like them, you can chew spruce gum for fun or to make a sore throat feel better. Not only that — the newly grown tips of Sitka spruce branches are used to flavor spruce beer and boiled to make syrup.

Today's Sitka spruce forests make up the coastal rainforests of the Pacific Northwest. They grow along the West Coast from Northern California all the way up to Alaska. They thrive on cold, moist air. If strong winds blow around them, they can grow into strange shapes.

Near Seaside you can check out a very old Sitka spruce tree called the "Klootchy Creek Giant." This once-huge tree with several trunks sprouted from a seed on the forest floor in about 1200 A.D. It once stood 200 feet high, but its top broke and came down during a huge storm known as the Great Coastal Gale of 2007.

If you'd like to see some famous uses of Sitka spruce, go out to the Evergreen Aviation and Space Museum in McMinnville to see the Spruce Goose and a replica of the Wright Brothers' first airplane. Or go to a guitar or piano store and ask the owners how many of their instruments have sounding boards made of Sitka spruce. Be creative! You might be surprised at just how many uses of this wood you can find.

**Key Ideas and Details Question (multiple choice)**

1. When did the top of the once-tall Klootchy Creek Giant break?

   a. 1969

   b. 1980

   c. 2007

   d. 2001

**Integration of Knowledge and Ideas Questions (short answer)**

2. Why is Sitka spruce wood used to make airplanes? Find your answer in the story.

3. Why are musical instruments made out of Sitka spruce? Find your answer in the story.

# Life at the Top

Can you imagine living at the top of a tree your whole life? If you were a red tree vole, that's exactly what you'd do.

Voles are small, mouse-like rodents that usually live on the forest floor. About 70 vole species have been found throughout the world. The red tree vole is unique among them because it has adapted to live at the top of a tree. But not just any tree — Douglas-fir trees are the center of life for red tree voles.

Red tree voles live where old Douglas-fir trees do: in humid forests near the Oregon coast and the western Cascades. They get all their food and all their water from Douglas-fir needles. They lick rain and fog water off the needles to quench their thirst. To satisfy their hunger, they first remove all the tiny resin ducts, which look like coarse hairs, from the needles, and then they eat what's left.

Douglas-fir needles aren't exactly easy to digest. Juvenile red tree voles have to eat adult tree vole excrement, or poop, because it contains gut bacteria the young voles can't yet produce for themselves. This bacteria helps them digest the needles they eat. Now that's a parent-child interaction to write home about!

This shy mammal builds its nest up to 100 feet above the forest floor. Believe it or not, each nest has a "bathroom" — a place where all the excrement goes — and, at the top of the nest, a place to eat. At the bottom of the nest is an escape route to the trunk, in case the vole family needs to make a quick getaway.

After building a nest, a red tree vole will pass it down to its young. Each generation builds more onto the original nest, until eventually it's very large and complex. These nests are easily damaged by storms, so the original nest-builder seeks out the largest, sturdiest, oldest Douglas-fir tree in its home area.

Red tree voles are hunted by several kinds of wildlife that depend on the mature Douglas-fir forest. The endangered northern spotted owl, which also lives mainly in these forests, eats red tree voles. This makes the red tree vole an indicator species — a species that indicates whether the old-growth Douglas-fir forest is healthy for wildlife or not.

Why do these voles choose to live in Douglas-fir trees? How many young do they have each year? How do they choose a mate? Because red tree voles live so far off the forest floor and are hard to spot, not much is known about them. The answers to many of these questions still need to be discovered by wildlife biologists.

Red tree voles are a fascinating species to study. And who knows? If you ever become a wildlife biologist, you could be the one who discovers more about them.

**Key Ideas and Details Questions (multiple choice)**

1. How does a young red tree vole manage to eat Douglas-fir needles?

    a. Its parents chew them up so it can digest them more easily

    b. It doesn't eat needles until it's grown up

    c. It eats its parents' poop to get the bacteria that helps break down the needles

    d. It sucks out the juice

2. How many species of voles have scientists discovered?

    a. 25

    b. 60

    c. 70

    d. 124

**Integration of Knowledge and Ideas Question (short answer)**

3. What three features does a red tree vole nest include? Please find your answers in the story.

# Black Coffee, Two Sugars — Hold the Rough-Skinned Newt

In the early 1960s three men went hunting in an Oregon forest. They didn't come back when they planned to, and their families called the police. The police found the men slumped around a burned-out campfire. All three of them were dead.

The men weren't injured, and nothing had been stolen. There weren't even any extra footprints. The police only found one odd thing: Inside the coffee pot was a dead rough-skinned newt.

The rough-skinned newt is a common Oregon newt with smooth, brown skin and a bright-orange belly. It lives in moist forests all over the state.

Why was the newt in the coffee pot? The police wondered about this. It must have crawled in, they concluded, but this didn't seem very important. Surely, they thought, a newt couldn't have had anything to do with the deaths.

A biologist named Butch Brodie read the story of the deaths in the newspaper, and the strange detail about the rough-skinned newt intrigued him. He started doing research.

He learned that the skin of rough-skinned newts secretes a toxic, or poisonous, chemical to keep them from getting eaten by snakes and other enemies. When an animal takes a bite out of a rough-skinned newt, the toxic chemical shuts down its nervous system and kills the animal. Other salamanders also use poison to protect themselves from predators. But Brodie discovered that these newts have a lot more poison in their skin than they need.

Brodie went back to the forest to find out why. There he learned that only the common garter snake stays alive after eating a rough-skinned newt. Cells in a garter snake's body have developed a way to keep it from dying when it eats this type of newt.

Here's where the story gets interesting: The bodies of rough-skinned newts and the bodies of garter snakes are fighting a kind of chemical war. Because the garter snake isn't killed by the newt's poison, the newt has to produce even more poison to keep from getting eaten. With every new generation of rough-skinned newts, the toxic chemical gets stronger, and garter snakes adapt to it. Biologists call this interaction "co-evolution" — each animal is evolving in response to the other.

So why did those hunters die? According to Brodie's research, the most likely answer is that the boiling coffee killed the rough-skinned newt, and its poison got into the coffee. The poison in that one newt was strong enough to kill three full-grown people!

**Key Ideas and Details Questions (multiple choice)**

1. What is a toxin?

    a. A poisonous chemical

    b. A plant

    c. A medicine

    d. What garter snakes eat

2. How are rough-skinned newts different from other newts?

    a. They have orange bellies

    b. They live in the forest

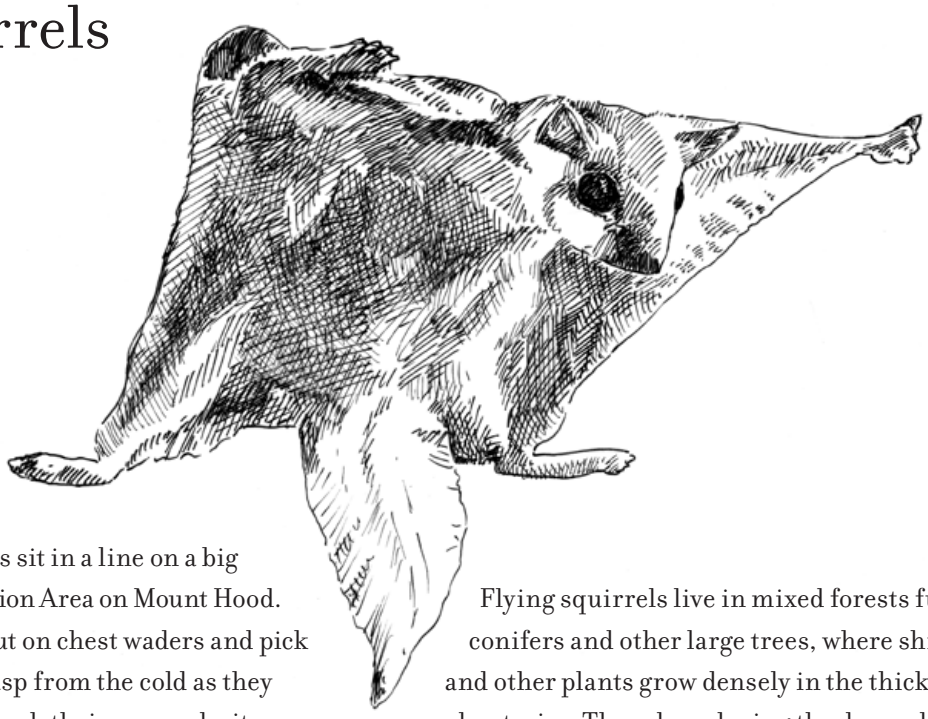
    c. Their skin is poisonous

    d. They need moisture to survive

**Integration of Knowledge and Ideas Question (short answer)**

3. How important was research to solving the mystery of the dead hunters? Use details from the story to support your answer.

# High School Students Become Experts on Flying Squirrels



Fifteen high school students sit in a line on a big log in the Wildwood Recreation Area on Mount Hood. They take off their shoes, put on chest waders and pick up their backpacks. They gasp from the cold as they cross the Salmon River to reach their research sites on the other side. Once they get there, they break into small groups, each led by a teacher or a biologist.

One group will take conifer core samples and measure how tall the trees are, so they can estimate how old the forest is. Another group will look for lichen and truffles. A third group will count and record all the plant and animal species it can find. The fourth group will use a GPS grid to lay out spots for humane traps. The students will load these traps with balls of peanut butter and seeds, hoping to capture some live flying squirrels.

What do lichen and truffles have to do with flying squirrels? And why measure forest age and record other wildlife?

First, the students have learned that northern flying squirrels don't really fly — but they can glide as far as the length of a football field. They have furry, stretchy folds of skin between their front feet and their back feet on both sides of their bodies. When they stretch out their legs, this skin acts like a parachute. From branches high up in the treetops, they jump and then glide, using their flat tails like a rudder on a boat to change directions.

Flying squirrels live in mixed forests full of conifers and other large trees, where shrubs and other plants grow densely in the thick understories. They sleep during the day and come out to eat at night. They eat a wide variety of foods, including bird eggs, insects, nuts, lichen, fungi and acorns. But their favorite food is the truffle. These aren't chocolate truffles; they're fungi — mushrooms that grow underground near trees.

Here's why studying truffles is important: The students have discovered that the squirrels' preference for truffles makes them important to forest health. As they glide all over the forest, the squirrels' scat, or poop, scatters digested truffle spores on the forest floor. The fungi use the sugar from Douglas-fir and other conifer tree roots to grow, and this causes the roots to swell up and take in more water and nutrients.

As they measured the height of the trees, the students found that they grow faster and are healthier when they're exposed to the fungi. Fast-growing, healthy conifers are vital for spotted owls, which nest in them.

Back in the classroom, the high school students analyze all the data they've collected in the Wildwood Recreation Area. The project has taken them three years, and scientists are taking their report seriously. It will add important information to their ongoing study of the flying squirrel and the spotted owl.

**Key Ideas and Details Questions (multiple choice)**

1. What is a truffle?

    a. A chocolate confection

    b. A kind of fungus similar to a mushroom

    c. A ridged potato chip

    d. A plant enjoyed by flying squirrels

2. How do northern flying squirrels move from tree to tree?

    a. They flap their back and front paws like a bird

    b. They leap from branch to branch

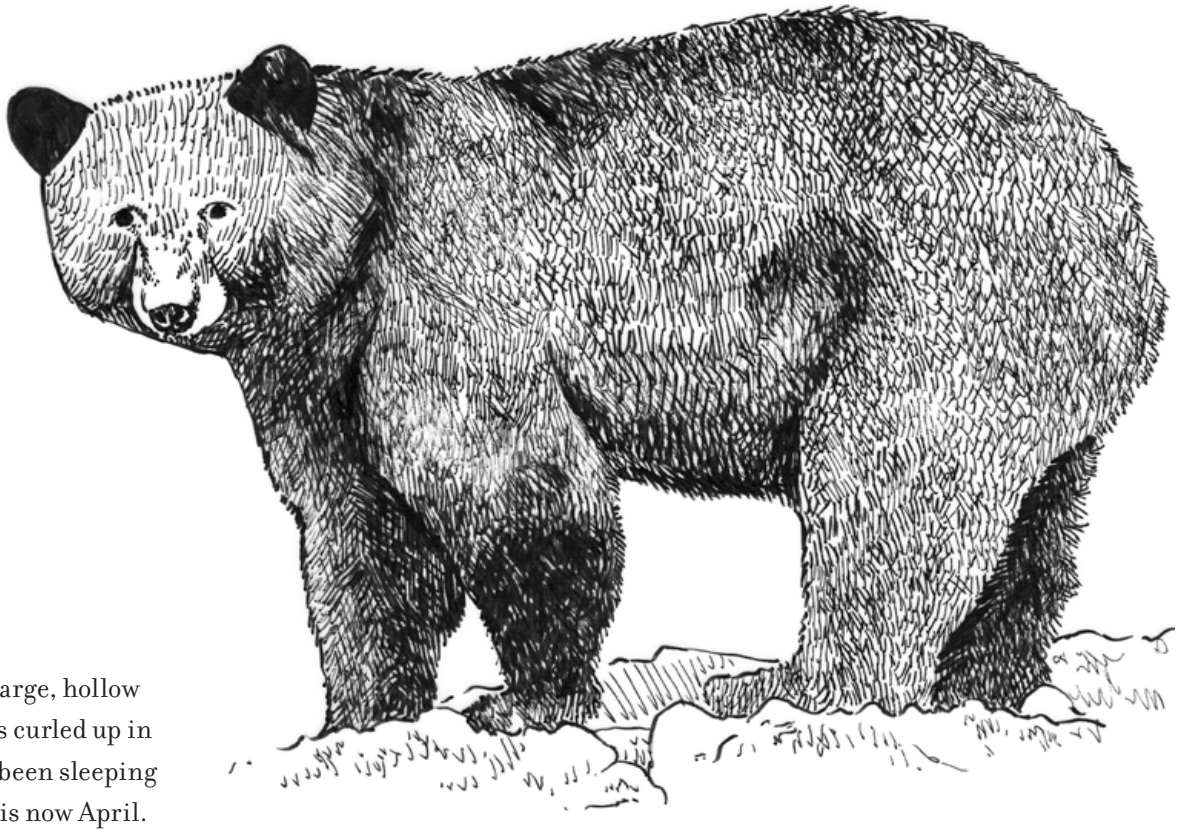
    c. They stretch out their legs and glide, using a furry fold of skin like a parachute

    d. They scamper down one tree and up another, like regular squirrels

**Integration of Knowledge and Ideas Question (short answer)**

3. How does the flying squirrel's preference for truffles help both the forest and the spotted owl? Find your answers in the story.

# Hibernating Bear Wakes Up Hungry



In a den beneath a large, hollow log, a black bear lies curled up in a tight ball. He has been sleeping since December. It is now April.

The bear stretches and yawns, showing a row of large, pointed teeth. He then rolls over and goes back to sleep. Waking up is hard when you've been sleeping for months!

The black bear is an efficient hibernator. To conserve energy, his breathing and heart rate slow and his body temperature drops. He can go up to 100 days without eating, drinking, urinating or defecating. He lives off stored fat and reabsorbs vital nutrients to build enough protein to maintain muscles and organs.

Driven by a gnawing hunger, the black bear finally rouses himself and crawls from the den. He hasn't eaten in months, and his dark fur coat hangs loose around his large frame. He has lost almost half his body weight while hibernating.

Hunger makes the bear bold. He sniffs the air for food. He prefers to eat green plants, nuts, berries, salmon and insects, but he will eat the sweet inner bark of trees if he can't find anything else. He will travel more than 100 miles in search of food.

The black bear will spend summer and fall regaining the weight he lost while hibernating. He will need a 100-pound layer of fat to get him through next winter. Gorging on high-energy nuts, berries and other foods, he will gain as much as 30 pounds per week, growing from 150 to 300 pounds. When the weather turns cold and food is hard to find, he will return to his den for another long winter's nap.

If you live in bear country, make sure there's nothing outside your home that will attract a bear. Secure garbage cans and remove birdseed and pet food. A bear that becomes dependent on human food it finds at campsites, cabins or homes often becomes dangerous and has to be killed. Keeping human food away from bears helps make sure they eat what they're supposed to — and that they live long lives in the wild, where they belong.

**Key Ideas and Details Questions (multiple choice)**

1. How many pounds does a black bear need to gain before hibernating?

   a. None

   b. 10 pounds

   c. 50 pounds

   d. 100 pounds

2. What percentage of its body weight does a black bear lose during hibernation?

   a. None

   b. Up to 10 percent

   c. Up to 50 percent

   d. Up to 75 percent

**Integration of Knowledge and Ideas Question (short answer)**

3. How does the black bear survive without eating and drinking for months? Use details from the reading to support your answer.

# Putting Dead Trees Back Where They Belong


It's just another day at the office for Nadine Meyers. She is dressed for success in a hard hat, bright-orange safety vest and steel-toed shoes, her long, dark hair tied neatly in a braid.

Meyers, an inspector for Portland's Bureau of Environmental Services, works outside every day. She specializes in stream restoration and fish habitat, and her job is to make sure restoration projects meet all state and federal requirements, including the Oregon Plan for Salmon and Watersheds and the Oregon Forest Practices Act.

"I love my job. I love working outdoors and restoring natural areas. A bad day in the field beats a good day at the office!" Meyers says with a smile.

For two years Meyers worked on a floodplain restoration project on Johnson Creek, a tributary of the Willamette River. One of the last free-flowing streams in the Portland area, Johnson Creek provides important habitat for coho and Chinook salmon, steelhead and cutthroat trout.

Today Johnson Creek runs through a variety of natural and human-built habitat, including forests, farms, parks, industrial areas and neighborhoods. As people settled along its banks, they removed streamside plants, cut trees and filled adjacent wetlands. They also altered the Johnson Creek watershed in an attempt to protect their homes and businesses from flooding. These activities changed and reduced fish habitat in Johnson Creek.

"In the 1930s the Works Progress Administration widened, deepened and lined parts of the creek with rock to prevent flooding," Meyers explains. "But all it did was create a flushing effect, which destroyed a lot of fish and wildlife habitat."

The long-term survival of Johnson Creek salmon, steelhead and trout depends on our ability to restore habitat and improve water quality. Portland's floodplain restoration project took a natural approach to reducing flood damage to roads and neighborhoods by simultaneously improving fish and wildlife habitat.

To stabilize stream banks and reduce erosion, crews removed invasive plants and replaced them with native trees, shrubs, grasses and wetland plants in the floodplain. Live trees and other plants along stream banks help cool streams to the temperatures salmon require to survive.

They also added rocks and dead trees to the stream channel to enhance fish habitat. These logs and rocks create shallow pools and gravel beds where salmon can rest, breed and find insects and other food to eat.

"People often ask why we put dead trees in the stream," Meyers says. "They don't realize how important they are to salmon and other fish."

So what have the results of this project been so far?

"Today we are seeing significant runs of native salmon returning to Johnson Creek," Meyers says. "That is all the job satisfaction I need!"

**Key Ideas and Details Question (multiple choice)**

1. Johnson Creek provides habitat for which species of fish?

   a. Coho salmon

   b. Chinook salmon

   c. Steelhead trout

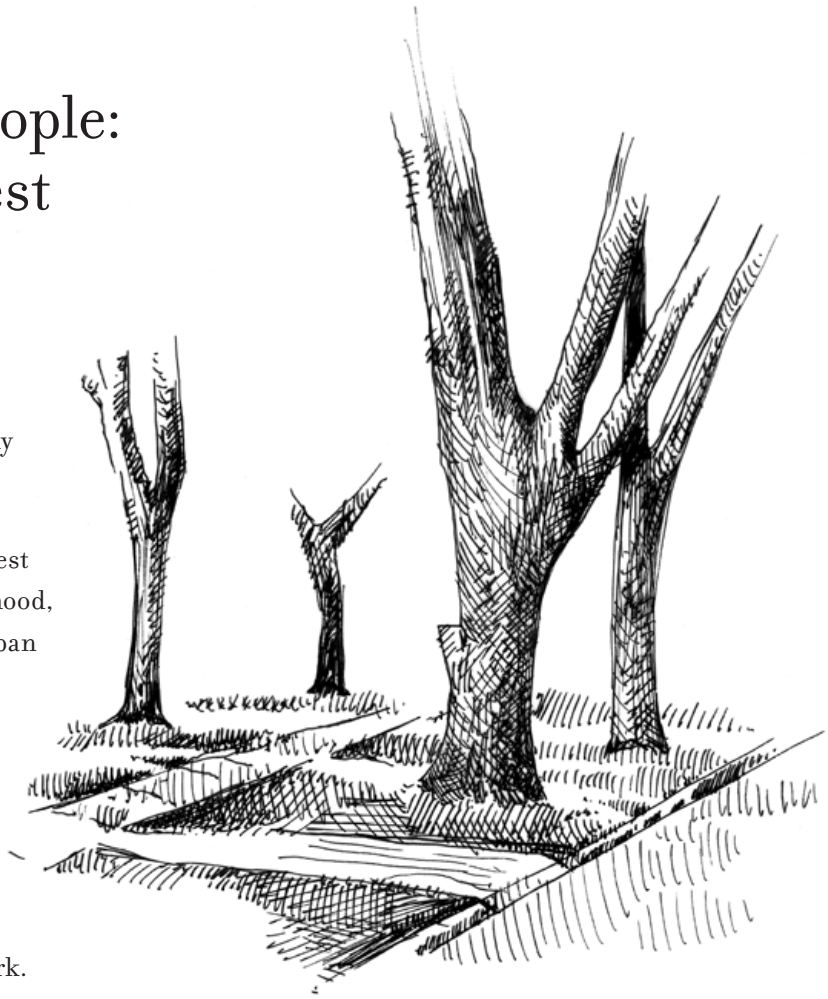
   d. All the above

**Integration of Knowledge and Ideas Questions (short answer)**

2. What types of habitat do salmon need? Use details from the reading to support your answer.

3. How do logs in streams help salmon? Use details from the reading to support your answer.

# Fun with Trees and People: Working in a City Forest



If you like both trees and people, you might like my job. I'm an urban forester.

The urban forest I work in is in Portland, the biggest city in Oregon. There are trees in every neighborhood, park and business area in Portland. Portland's urban forest has 236,000 street trees, 1.2 million park trees and millions of trees on private property. Some of these trees were planned and planted; some were left behind from native forests that grew naturally before the city was built.

One of the biggest urban forests in the United States is Portland's very own 5,100-acre Forest Park.

Part of my job is to decide which trees the city should plant along the streets. I ask questions like these: What kind of tree fits best with the other trees in the neighborhood? Which ones don't grow too high and get in the way of phone, Internet and electrical wire? Which trees like the wet climate of Portland?

I also watch for signs of disease in old trees. A diseased tree may fall down in a storm and hurt people or their homes. It can spread its disease to the trees next to it, or to the trees across the street. I lead a team of professional tree specialists called arborists in cutting those trees down. I help property owners choose new trees to replace them, and supervise volunteer tree planters.

I work with wildlife biologists to find out which wildlife species are living in Portland's neighborhoods. The best place to see wildlife in the city is Forest Park, where there are more than 112 kinds of birds and 62 kinds of mammals. But you may see some of the same creatures in older parts of Portland, too. The 100-year-old trees in my neighborhood offer shelter and food for several kinds of songbirds, hummingbirds, screech owls, woodpeckers, hawks, coyotes and raccoons. I've even seen an osprey perched at the top of a neighbor's Douglas-fir tree!

Urban forests are good for people, too. They help purify the air. They block the noise of traffic. Their shade keeps summer heat at bay and their roots absorb lots of water. This helps save our streets from flooding during big rainstorms.

And, of course, trees are beautiful. Medical researchers tell us that people who live in neighborhoods with big trees are calmer and less stressed. People who are ill get better faster when they recover in a neighborhood with trees.

If you're interested in forestry, think about going into urban forestry. Eighty percent of the people in the United States live in cities and towns. You can choose your favorite city to work in, and enjoy the great feeling of helping trees, people and animals in your town.

**Key Ideas and Details Questions (multiple choice)**

1. What is an urban forest?

   a. A collection of trees that grows in a city or town

   b. A forest along the coast

   c. A forest along a body of water

   d. A forest that grows near the top of a mountain

2. Why do urban foresters cut down diseased trees?

   a. Because they take up too much room

   b. Because they're ugly

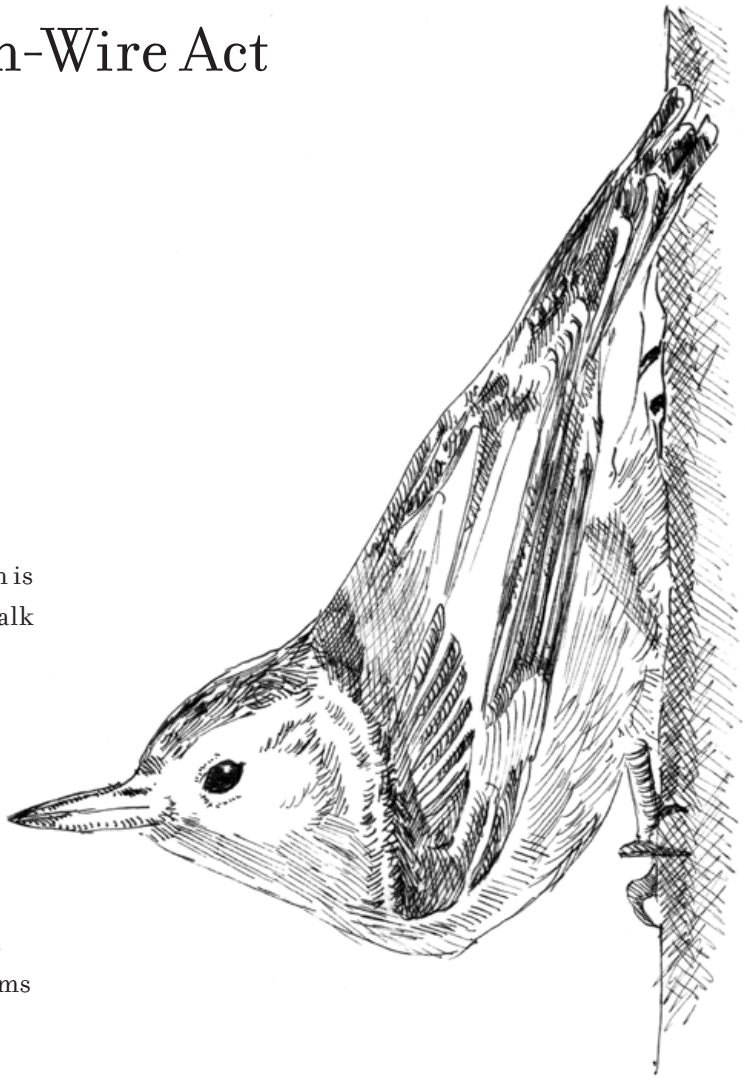
   c. Because they might fall over or infect other trees

   d. Because they use too much water

**Integration of Knowledge and Ideas Question (short answer)**

3. How are trees in cities helpful to people? Find three answers in the story.

# Nuthatch Puts on a High-Wire Act



In the Willamette Valley's oak woodlands, a daring aerial show starring the white-breasted nuthatch is beginning. A small, blue-gray songbird with a white chest and a black crown, the white-breasted nuthatch is an agile acrobat. It uses its strong legs and claws to walk headfirst down tree trunks. It can even hang upside down under twigs and branches.

Why would the nuthatch perform such bold feats? For food! This industrious hunter scurries up and down trees, snacking on meaty nuts and seeds as well as juicy insects, including beetles, ants and caterpillars. The nuthatch also plans ahead, storing acorns and seeds in tree bark for winter. It jams the nuts into holes in the bark. When winter arrives, the nuthatch uses its strong bill to hammer out the nutmeats.

White-breasted nuthatches mate for life. They don't migrate, so each pair spends the year staking out a small territory together. They look for big trees in open woodlands where they can find plenty of food and places to nest. They prefer mature oak trees with long, spreading branches and lots of natural cavities or abandoned woodpecker holes.

When not nesting, white-breasted nuthatches roost on branches. Each morning, they carefully clean their roosts by removing poop and other garbage. In winter, white-breasted nuthatches sometimes join large groups of other songbirds, such as titmice and chickadees. They find safety from predators — such as owls and hawks — in numbers.

In spring, they are ready to mate. The female nuthatch finds or makes a hole in a tree for her nest. She lines the cavity with dirt and bark. She then builds a nest cup out of soft material such as feathers, tender grass, shredded bark and tufts of animal fur. She lays about six to eight eggs and sits on them for a couple weeks while her mate brings her food.

After the eggs hatch, both parents feed and protect the chicks and teach them to fly. When leaving the nest, the parents sometimes smear smelly insect parts around the opening to deter squirrels and other unwanted visitors. After a couple months, the young nuthatches are strong enough to leave their parents' territory to find their own.

How can you watch the nuthatch's high-wire act? Listen! These noisy songbirds sing all day long. While looking for food, mates call back and forth to each other with a high, squawky "Nit-nit-nit!" Let their insistent chatter lead you to the show!

**Key Ideas and Details Question (multiple choice)**

1. What kind of birds are white-breasted nuthatches?

    a. Migrating birds

    b. Songbirds

    c. Shorebirds

    d. Waterfowl

**Integration of Knowledge and Ideas Questions (short answer)**

2. Why do white-breasted nuthatches sometimes join other flocks of birds in the winter? Use details from the reading to support your answer.

3. What do white-breasted nuthatches eat, and how do they find their food? Use details from the reading to support your answer.

# Freed by Fire: Lodgepole Pines Rise from the Ashes

For decades, a lodgepole pine cone has lain on the forest floor, its seeds tightly closed inside. Most of the other cones from the same tree opened as soon as their seeds were ripe. But this cone is different. It is serotinous (suh-RAH-tih-nus), which means "closed." As many as 40 percent of the cones on a lodgepole pine are serotinous. Glued shut with pine resin, these cones won't open until there's a fire.

Suddenly, lightning strikes a nearby tall tree with as many as 1 trillion watts of energy. Released as heat, this energy can reach up to 3,000 degrees Fahrenheit. The sap in the tree explodes, sending chunks of burning wood through the crowded forest. The burning wood acts like hundreds of matches, setting fire to nearby trees, bushes and grasses. High winds push the fire toward the stand of lodgepole pines.

Days later, the stand continues to smolder. Wisps of smoke rise from the blackened ground. Every single tree, bush, grass, flower and seed has died — except for the seeds inside the serotinous cone. The fire melted the resin that held the cone together, releasing its black seeds. The wind spreads the seeds onto the sooty ground, where they blend in with the burnt soil and become almost invisible to birds and other seed eaters.

The fire also cleared areas where new trees can sprout and grow without competition for water, nutrients and light. Come spring, the young saplings will grow slim and fast, their straight trunks reaching toward the sun.

Over time, the forest will grow crowded again. Lodgepole pines will give way to more shade-tolerant species, such as ponderosa pine and grand fir. The serotinous cones will remain closed until fire sweeps through the forest again. This system allows lodgepole pines to quickly re-establish themselves after fire wipes out competing trees.

**Key Ideas and Details Question (multiple choice)**

1. What does serotinous mean?

   a. Open

   b. Closed

   c. Fertile

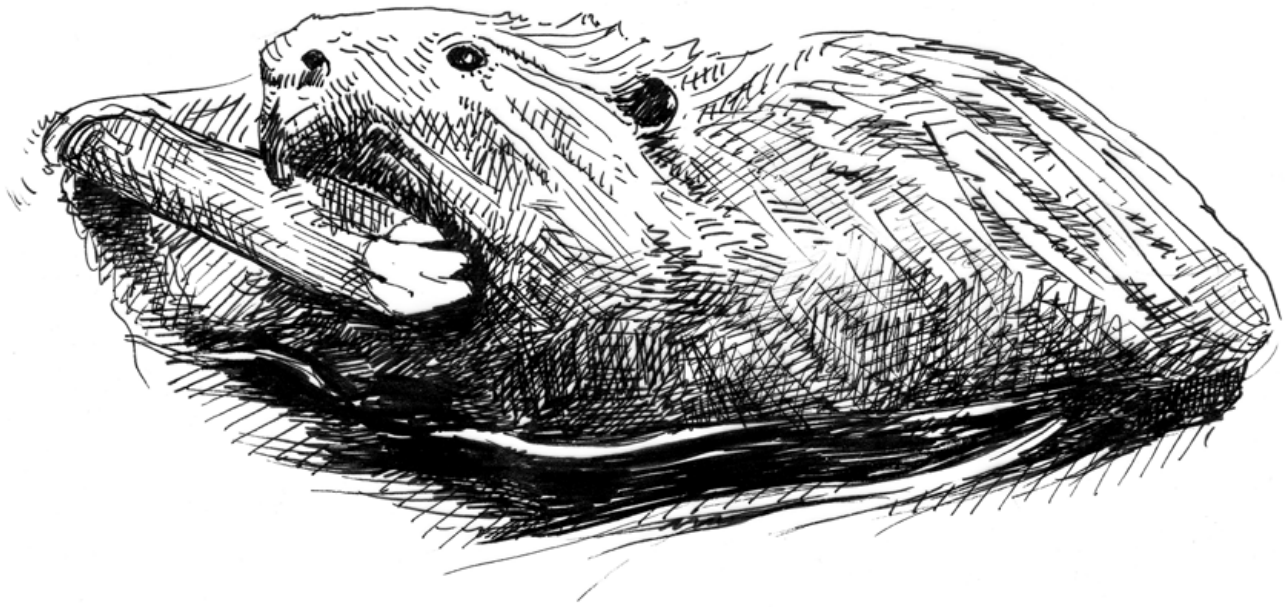
   d. Infertile

**Integration of Knowledge and Ideas Questions (short answer)**

2. How does fire help lodgepole pine forests regenerate? Use details from the reading to support your answer.

3. How does fire spread in a forest? Use details from the reading to support your answer.

# Nature's Engineer Builds Homes and Habitat



Beavers, like humans, alter nature on a large scale to suit their needs. Like us, beavers modify their environment to make their habitat a home. Once hunted to near-extinction, beaver populations in North America have greatly increased in forested watersheds.

Stocky bodies, short legs, webbed feet and powerful tails make beavers excellent swimmers, but on land they move at a slow waddle. To find food safely, beavers make their homes in bodies of water that have plenty of trees and other plants close to shore.

When looking for places to live, beaver families prefer wide ponds with slow-moving water, where they can build homes called lodges out of sticks and mud. Reachable only by water, these lodges help protect beavers from predators.

If beavers cannot find the perfect location, they will create one by building a dam to slow the flow of water. Nature's engineers, beavers know how to build dams of different shapes and sizes based on the speed of the water. They know to build a straight dam in slow water, and a curved one in fast streams.

Beavers begin a new dam by cutting down saplings, or young trees, with their long front teeth. Then, they stick small trunks and large branches into the stream bed to form a base. They build the rest of the dam with interwoven branches, and seal them with a thick mortar of mud and gravel.

The dam forces water to back up behind it, forming a pond. The beavers maintain the dam to keep the water at a level that will protect them from predators. Eventually, the beavers use up the food and building material along the pond's edges. To reach new supplies, they make more dams and ponds. They also dig canals hundreds of feet long to float supplies back to the main pond.

As beaver families grow and build more dams, they flood more and more land. This creates new habitats for fish, insects, birds and other mammals, but it can also damage roads, streams, and farm and forest crops.

**Key Ideas and Details Question (multiple choice)**

1. What kind of habitat do beavers prefer?

    a. Fast-moving water in large rivers

    b. Slow-moving water in wide ponds

    c. Large lakes with lots of fish

    d. Wetlands

**Integration of Knowledge and Ideas Questions (short answer)**

2. How does the beaver alter its environment to suit its needs? Use details from the reading to support your answer.

3. How do beavers create habitat for other wildlife? Use details from the reading to support your answer.

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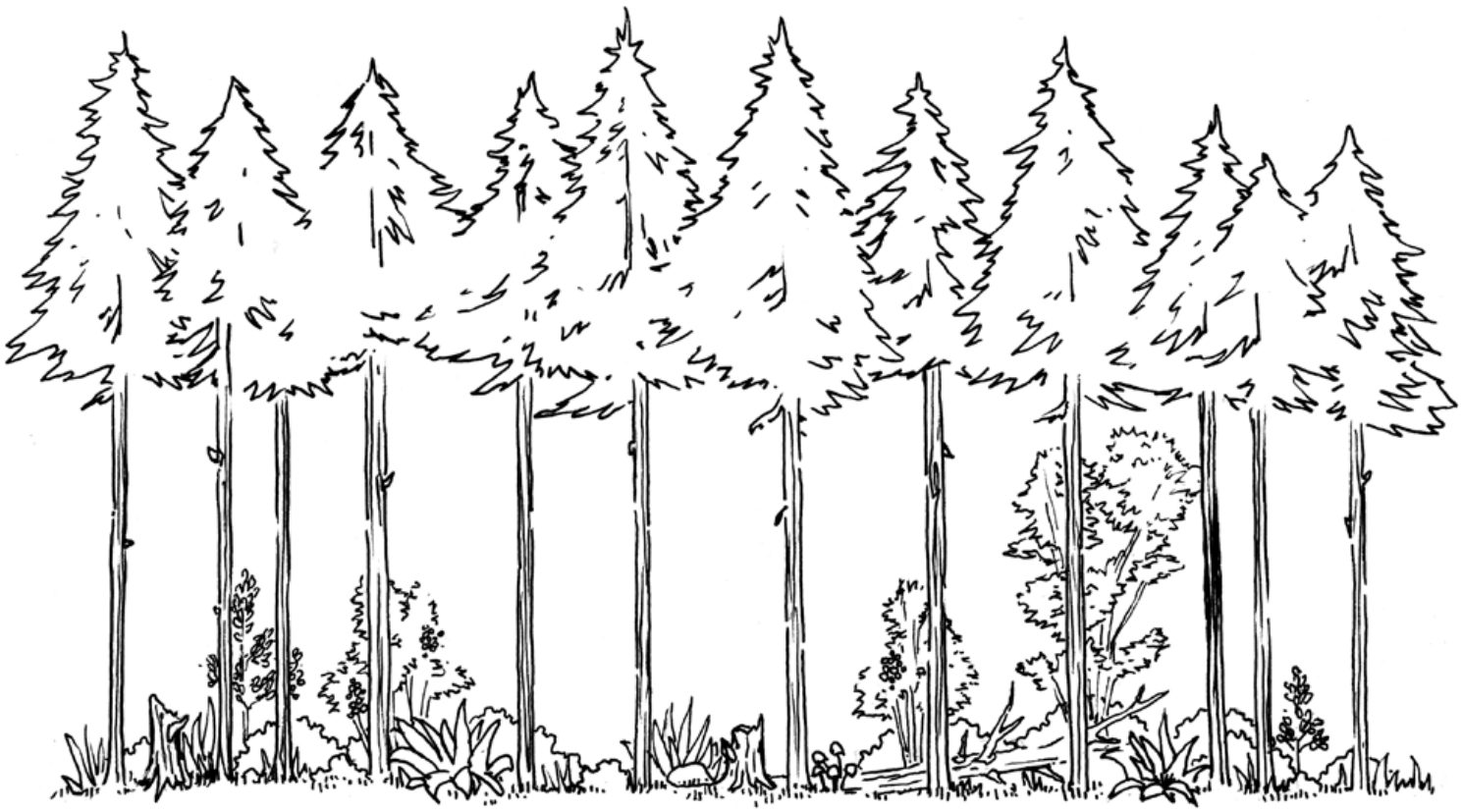



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