Forest Essays

Level 7-12

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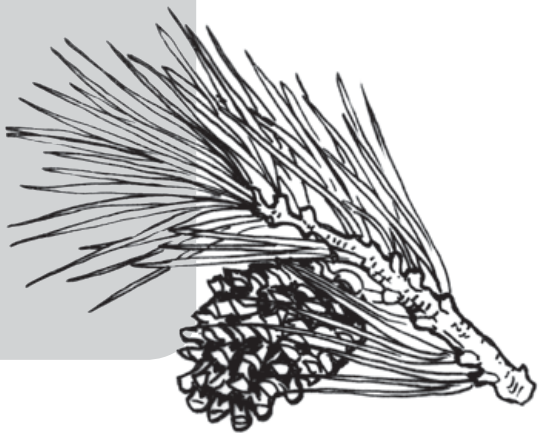


Big Red Wins Back Title as Nation's Largest Ponderosa Pine

Want to see the tallest ponderosa pine tree in America? Visit Big Red at La Pine State Park in central Oregon. Nearly 170 feet high, Big Red towers above the other trees around it. It stands as tall as a 15-story building. It's so wide it takes six adults to hug it.

In 1945, Big Red was named the nation's largest ponderosa pine. It held this title for nearly 50 years. Then a storm snapped off its crown, or top. Big Red's title was given to a tree in California.

People thought Big Red would die, but the strong old tree lived on. Big Red was already ancient — between 500 and 600 years old — when the first pioneers came to Oregon. To live so long, Big Red had to survive disease, high winds, insect attacks and fires.

Its gnarled, cinnamon-red bark helped protect it from repeated fires. As the tree grew, it also dropped its lower limbs. That helped prevent fires from climbing up into its crown. Foresters believe Big Red has survived anywhere from 50 to 120 fires.

Many of the other trees in the area were logged, but not Big Red. This mighty tree probably escaped the loggers' axes because of the large fire scars at the base of its trunk. Because of these scars, this tree would not have made good lumber.

To grow so big and strong, Big Red must have lived in a healthy forest for most of its life. Ponderosa pines grow best in places with short, dry summers and cold, snowy winters, such as eastern Oregon. But there is one thing they do not like, and that is too much shade.

In the past, fires swept through Oregon's forests every five to 10 years. A century ago, people began to fight fires to protect homes and forests. They thought fighting fires made forests healthier and communities safer. Instead, forests grew thick with tangled brush and shade-loving trees. This dense undergrowth created fuel to feed large, disastrous fires.

Many forests, especially ponderosa pine forests, have adapted to frequent, low-intensity fires. Some, in fact, depend on fire to create conditions ponderosa pines need to live long, healthy lives. Small fires help clear out dense bushes and small trees, leaving only large, fire-resistant trees. This process gives the remaining trees more light, water and nutrients they need to thrive and grow.

A healthy ponderosa pine forest looks more like a park than what most people think of as a forest. Instead of thick bushes and other trees, they're filled with grass and small plants beneath towering ponderosa pine trees.

In 2013, foresters decided Big Red's rival in California was a different type of ponderosa pine. Big Red was recrowned the nation's largest ponderosa pine of its species! Long live Big Red!

Key Ideas and Details Questions (multiple choice)

1. How tall is Big Red?

   a. 170 feet

   b. 70 feet

   c. 100 feet

   d. 150 feet

2. Why was Big Red not logged?

   a. Too tall

   b. Too wide

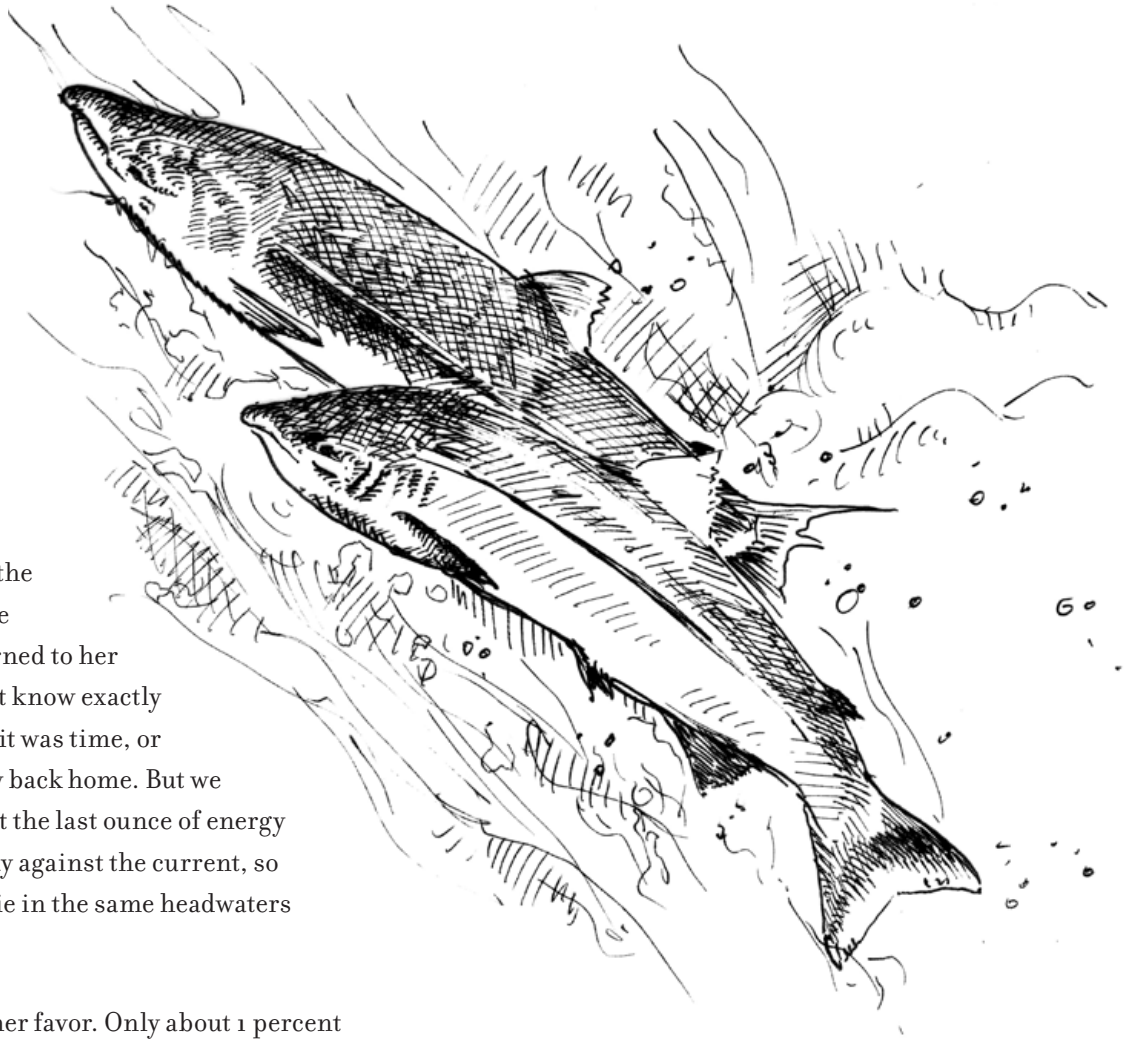
   c. Too scarred

   d. Too twisted

Integration of Knowledge and Ideas Question (short answer)

3. What does a healthy ponderosa pine forest look like? Explain why, using details from the reading to support your answer.

A Salmon's Journey Home



After several years in the Pacific Ocean, a female Chinook salmon returned to her home stream. We don't know exactly what made her decide it was time, or how she found her way back home. But we do know that she spent the last ounce of energy she had to fight her way against the current, so she could breed and die in the same headwaters where her life began.

The odds were not in her favor. Only about 1 percent of salmon make it back. Most die along the way. To survive, she had to swim hundreds of miles without stopping to rest or eat, evading predators and clearing obstacles, including pollution, waterfalls and dams.

It was a long, difficult journey. Once back to her birthplace, she made a nest, called a redd. Twisting her body back and forth, she used her tail to scrape out a shallow nest in the gravel. She deposited thousands of pea-sized eggs, which were then fertilized by a male. She guarded her redd for a few days until, weakened from the long journey and effort, she died.

Even after her death, this salmon continues to help her offspring. Her decomposing carcass contributes nutrients to the food chain, nourishing insects and other invertebrates that serve as food for the young salmon, which are called fry.

Fry stay in freshwater streams for about one year, or until they grow strong enough to make their journey to the ocean. Once there, they remain at the mouth of the river, called an estuary, for another year, while they feed on larger invertebrates and other fish and become used to living in salt water.

When they reach adulthood, Chinook salmon move into the open ocean, where access to larger and more abundant food increases their size to 30 pounds and more. They remain in the ocean for several years, until nature prompts them to return home. Then the cycle begins again.

Some scientists believe salmon smell their way home. They think salmon rely on a smell "memory bank" they built as young fish when they migrated from their home stream to the ocean.

Key Ideas and Details Question (multiple choice)

1. What percentage of salmon make it back home to breed?

   a. 1 percent

   b. 10 percent

   c. 20 percent

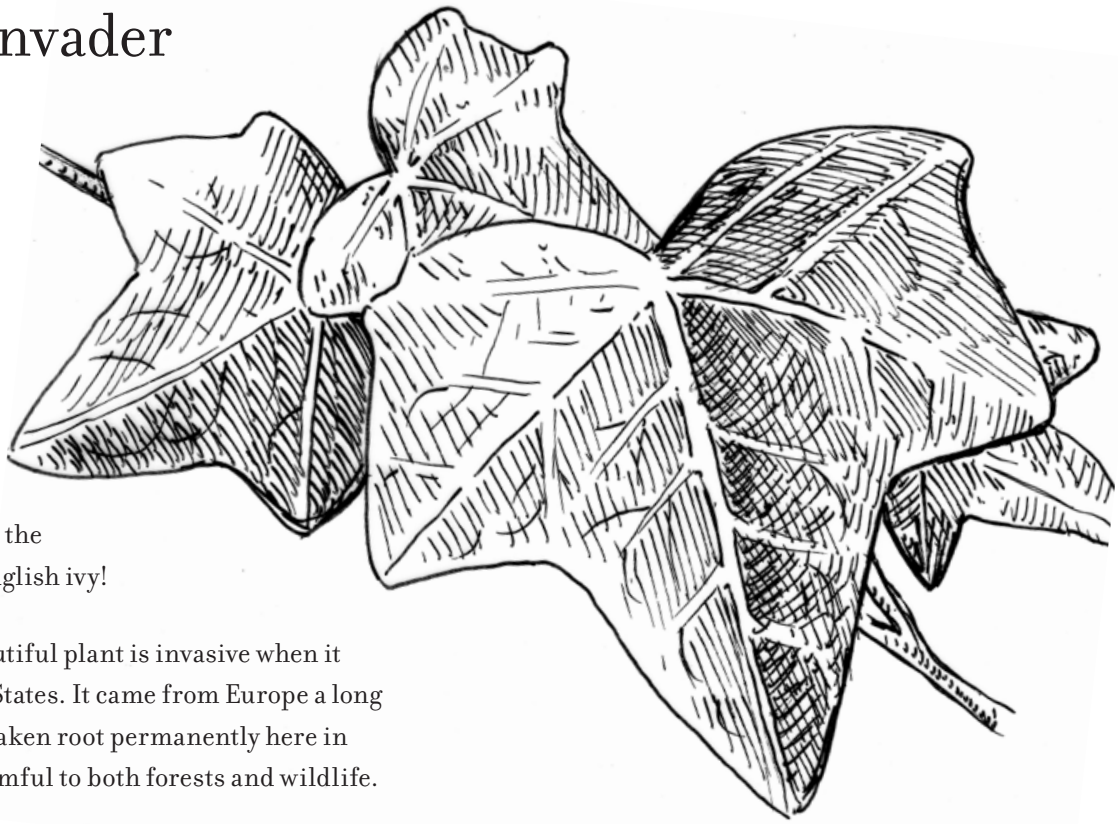
   d. 40 percent

Integration of Knowledge and Ideas Questions (short answer)

2. How do salmon find their way back home? Use details from the reading to support your answer.

3. How do salmon help their offspring after they die? Use details from the reading to support your answer.

Destructive Foreign Invader



There's an invader in the forests of Oregon: English ivy!

This deceptively beautiful plant is invasive when it grows in the United States. It came from Europe a long time ago, and it has taken root permanently here in Oregon — but it's harmful to both forests and wildlife.

You've probably seen English ivy in your neighborhood. It often grows on the ground, but it's actually a climbing vine. It can grow up to 100 feet long and climb nearly any surface, from the sides of buildings to tree trunks. It has sticky roots on its stems, so it can climb straight up and stick to vertical surfaces. Little discs like suction cups grow and adhere to these surfaces, so the ivy sticks for good.

On the ground English ivy grows thick, like a carpet, killing all the plants in its way. It grows up the bases of shrubs and blocks out light, either killing the plant outright or weighing it down so much that it falls over.

English ivy especially likes to climb trees. It doesn't matter what kind — the ivy will wrap itself around any tree's trunk and climb to the top to be close to the sunlight. Day after day it grows around the tree, leaving nothing uncovered. Eventually, it blocks the tree's light altogether. Sometimes a tree is so weak after losing its war with English ivy that it blows down in a storm.

This nasty plant takes some hard fighting to defeat. If you step on it, its twigs and stems break. But that won't stop it; the broken pieces of stem will take root and generate a new plant.

English ivy kills the native plants that Oregon's wildlife use for food and shelter, wiping out much-needed habitat. And it isn't useful to wildlife at all — its leaves are poisonous, killing animals that try to eat them.

Ivy has climbed up trees in sections of Portland's 5,100-acre Forest Park, the largest urban park in the country. In 1992 the city began the Ivy Removal Project to restore Forest Park's native habitats by removing the invading ivy.

You can learn more about English ivy and other invasive species, and report any you've found, at the Oregon Invasive Species Online Hotline. In Portland, the No Ivy League organizes work parties at least one day a week to remove English ivy by hand throughout Forest Park. It's a dirty job, but someone's got to do it! If you live in Portland and want to do your part to protect our wildlife habitats, you can look up these groups on the Internet to get involved.

Key Ideas and Details Questions (multiple choice)

1. English ivy is native to:

    a. South America

    b. Canada

    c. The United States

    d. Europe

2. What is the name for a plant that doesn't belong in a certain place?

    a. Invasive

    b. Lost

    c. Native

    d. Killer

Integration of Knowledge and Ideas Question (short answer)

3. What are two reasons English ivy is bad for wildlife? Please find your answer in the story.

A Douglas-Fir Seedling Reaches for the Light

Deep in a forest on the Oregon Coast, a Douglas-fir seedling struggled to survive. It took root on the dark forest floor, beneath towering trees and spreading bushes.

The Douglas-fir seedling was lucky to have sprouted. Chipmunks and squirrels ate most of the other seeds in its cone. The wind drove this seed deep into the forest, where it fell on a patch of dirt with just enough sunlight to give it the energy it needed to sprout.

At just a few inches tall, the seedling looked more like a bristle from a brush than a tree. It had a tiny, twig-like trunk and a spike of needles instead of branches. It had to compete with nearby plants for the water and minerals in the soil. It used energy from the sun to spread tiny tendrils of roots wide beneath the soil to grab whatever moisture and nutrients it could.

One winter day, a mighty storm blew in from the Pacific Ocean and whipped across Oregon. For three days and nights in early December, hurricane-force winds and heavy rain battered the forest. Gusts measured nearly 150 miles per hour, toppling tall trees like toothpicks. Called the Great Coastal Gale of 2007, this storm flattened 3,500 acres of trees.

After the storm, all the tall trees around the Douglas-fir seedling lay flat on the ground, toppled by the storm. The seedling felt the full rays of the sun. It was not the only one. Several other seedlings also took advantage of the sunlight, growing four times faster than they did before.

As the Douglas-fir seedlings stretched toward the sunlight, they grew into saplings a couple feet tall, with branches and smooth, gray trunks.

This Douglas-fir will reach reproductive maturity in 12 to 15 years. It will make cones and pollen, and will no longer be considered a sapling. Winged seeds will be tucked in its cones. If they're lucky, some of those seeds will be carried on the wind and take root in good soil and sunshine.

In 50 years, the Douglas-fir will be a mature tree with dark, furrowed bark and long, sloping branches. It will be about 100 feet tall, with a canopy that spreads 60 feet wide. It will tower over many of the other trees and have all the sunshine it needs. But it will also be vulnerable to winds and storms that may knock it down.

Elsewhere in the forest, a different seedling struggles to grow in the shade beneath a mature tree, waiting for its turn in the sun.

Key Ideas and Details Questions (multiple choice)

1. What does a Douglas-fir seedling need to grow?

    a. Water

    b. Sunlight

    c. Nutrients

    d. All the above

2. When does a Douglas-fir reach reproductive maturity?

    a. 2-5 years

    b. 12-15 years

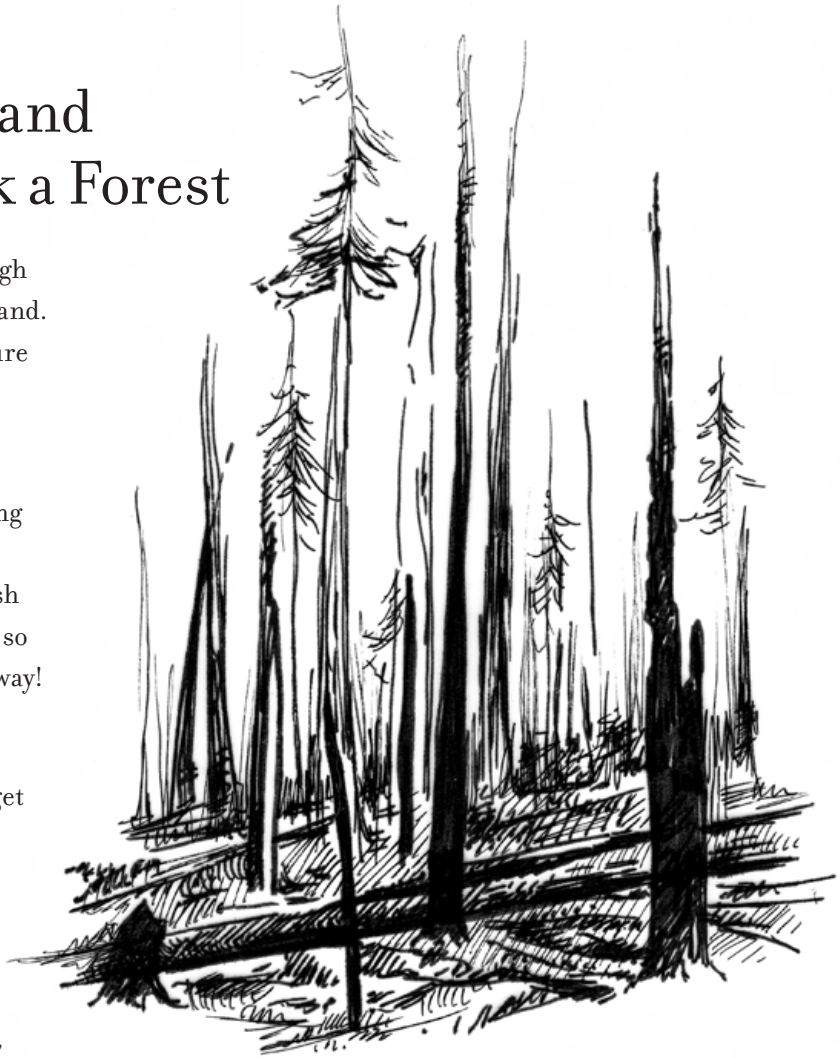
    c. 25 years

    d. 50 years

Integration of Knowledge and Ideas Question (short answer)

3. What happened to the seedling after the Great Coastal Gale of 2007? Use details from the reading to support your answer.

Community Members and School Kids Bring Back a Forest



Eighty years ago, a 15-mile wall of fire burned through the Tillamook Forest across an area the size of Portland. Drawing huge amounts of oxygen from the air, the fire created winds that traveled more than 80 miles per hour. People said it sounded like a freight train.

The wind uprooted giant fir trees and threw them long distances. The smoke rose 40,000 feet into the sky, where people hundreds of miles away could see it. Ash landed on ships 500 miles out to sea. The smoke was so thick that it was dark at noon in Portland, 75 miles away!

The first Tillamook Forest fire in 1933 was so huge that firefighters gave up and simply helped people get away. In 20 hours, 220,000 acres of trees burned. Thousands of animals died in the fire. But the 1933 fire was only the first in a series of big fires that devastated the Tillamook Forest.

Between 1933 and 1955, fires blazed every six years, until the Tillamook Forest wasn't green anymore. It looked like a desert, with dead trees sticking up like burnt matches as far as you could see. Even the soil was black. People started calling the Tillamook Forest the "Tillamook Burn."

In the 1950s, the state of Oregon started a big project to revive the forest by planting new trees. State workers cleared out the dead trees and recruited thousands of volunteers to help them. Families collected tree cones from other forests to be processed for new seeds. Helicopters spread millions of seeds over the burnt ground.

Many people joined the replanting effort. Schoolchildren were recruited to help plant new trees, and 25,000 kids came in buses and vans from all over Oregon. The kids worked in teams. The bigger ones went first, clearing patches of ground and making holes for tiny trees called seedlings. Then younger children put the seedlings into the holes and covered the roots with soil.

The project took a long time. Every year for 25 years, school kids came to plant trees in the Tillamook Burn. After about 10 years, volunteers could go out and see that the seedlings they'd planted had become young trees. By the 1980s, the trees were middle-sized and started looking like a real forest again.

Today, the Tillamook Forest is full of big trees and all kinds of wildlife — birds and bears and salamanders and insects — much like it was before the fires. The hard work done by volunteers of all ages really paid off. The forest is managed by the Oregon Department of Forestry for multiple uses: wildlife habitat, recreation and timber harvest, which creates jobs and lumber for home-building.

Take a trip to the Tillamook Forest, located in the Coast Range between Portland and Tillamook, and visit the Tillamook Forest Center. You'll learn more about the Tillamook Burn and hear stories told by kids — now grown up — who helped bring back the forest.

Key Ideas and Details Questions (multiple choice)

1. What was the "Tillamook Burn"?

   a. A big forest fire near Tillamook

   b. A fire in the city of Tillamook

   c. A series of big fires that devastated the Tillamook Forest

   d. A healthy forest in Tillamook

2. After it was replanted, how long did it take the Tillamook Forest to return to a forested state?

   a. About 10 years

   b. 50 to 60 years

   c. 30 years

   d. It still hasn't come back

Integration of Knowledge and Ideas Question (short answer)

3. Did the author convince you that kids can work together to make a difference in a forest? Why or why not?

High-Climbing Botanists Discover Treetop Ecosystem

Recently some adventurous botanists took their lives in their hands to climb some of the tallest, oldest coastal redwood trees in the world. Their adventure resulted in a great discovery. It turns out there's an entirely separate ecosystem way up in the redwood canopy!

To reach the canopy, these botanists use a harness attached to ropes looped over solid parts of the tree far above them. Once they near the top, they are able to walk across the big branches sideways, doing research at 200 or more feet in the air.

Coastal redwoods are the tallest trees in the world. Some are 350 to 370 feet high, taller than a 35-floor skyscraper, and they can grow more than a foot per year. They're so tall, you often can't see their tops from the ground. The trunks of some trees grow 25 feet in diameter, taking the average adult eight paces to walk all the way around. And they're not only the tallest trees in the world; they're also some of the oldest. They can live for more than 2,000 years!

Coastal redwoods grow in a 450-mile strip along the Pacific coast, from central California to the California-Oregon border. Heavy winter rains and dense summer fog provide the trees with water, and they create their own rain by capturing the fog way up in their highest branches. Because they capture water in their canopy, coastal redwoods can sustain a separate canopy ecosystem.

How? It's all about the way the trees grow. Over its long life, an ancient redwood tree survives fires and storms. Its highest branches break, and it might lose its top altogether. But instead of dying, the tree grows new trunks and branches. Over hundreds of years, trunks and branches keep sprouting from larger trunks and branches, over and over, way up at the top of the tree.

Redwood needles collect in this complicated canopy where the largest branches meet. As they break down over time, these piles of needles form soil mats. These support many kinds of epiphytes — plants that grow on other plants.

The result is like a hanging garden, with ferns, huckleberry bushes and layers of soil that support animal and plant life. Tiny worms and crustaceans, wandering salamanders and other animals spend their entire lives up in the canopy without ever touching the ground.

Redwood canopy researchers are only beginning to understand how the canopy ecosystem works, and they are learning more as they study it. They'll be the first to tell you: A fascinating world is hiding, way up in the tops of the coastal redwoods.

Key Ideas and Details Questions (multiple choice)

1. What is an epiphyte?

    a. A pile of redwood needles

    b. A system of trunks and branches

    c. A soil mat

    d. A plant that grows on other plants

2. What age tree is able to sustain a separate ecosystem in its canopy?

    a. 35 years old

    b. 100 years old

    c. Hundreds of years old

    d. Newly grown

Integration of Knowledge and Ideas Question (short answer)

3. What two important things support the wildlife that lives up in the canopy? Take your answers from the story.

Planting a Tree Could Change Your Life

Have you ever heard of a hoedad?

A hoedad as we now know it is a long, L-shaped blade with a handle that's used to plant tree seedlings. But 40 years ago, a Hoedad was a member of a cooperative tree-planting group in Lane County, Oregon. The group started as a small crew that planted trees for Weyerhaeuser just east of Eugene. Soon it grew to 13 crews. Its members say the experience changed their lives.

The Hoedads were run democratically, and most members were college-educated. Some had families, and most lived in tents or trailers on tree-planting sites. "We were a cooperative crew," one of the crew members recalled. "We worked for shares and lived in big army tents. We had to maintain our own vehicles and campsites, gather wood and cook for ourselves. The risk of injury required people to be very careful and very thoughtful."

The Hoedads are part of a long history of tree planting in Oregon. In the first 40 years of the 20th century, very few acres of new forest were planted in Oregon. This began to change when the state passed the Forest Conservation Act in 1941. This act required logging operators to either leave uncut trees behind so the trees would reseed themselves, or plant new tree seedlings.

Replanting in Oregon was kick-started when a series of terrible fires in the Tillamook State Forest devastated huge areas of forest in the 1930s and 1940s. State foresters spread seeds from the air and organized paid and volunteer tree planters. By 1955 more than 15 million tree seedlings had been planted. Slowly the Tillamook State Forest grew back, and it is now thriving.

Today Oregon forest landowners plant 30 million to 40 million trees each year to replace their harvested trees. That's 11 tree seedlings for each resident of Oregon!

Present-day tree planters will tell you that the hard work of planting tree seedlings hasn't changed much

over the years. Planters work on crews of five to 20 people. They carry big, lumpy bags of tree seedlings around their waists. They use hoedads, or planting spades, to dig holes, then put seedlings into the holes and cover their roots. They repeat this process 500 to 1,000 times each day until all the seedlings are planted.

This job is not for everyone: You work in the rain and wind, and you hike on steep forest terrain and climb over downed brush, carrying that big bag of seedlings and your tool. You have to be physically fit, and also patient and determined.

On the other hand, tree planting may be the most rewarding work you can do. You know you're planting a forest, and that you're part of a long history — a whole army of people who have planted trees before you.

Key Ideas and Details Questions (multiple choice)

1. What's a "hoedad"?

   a. A garden hoe

   b. A freshwater crayfish

   c. A bag of tree seedlings

   d. An L-shaped blade used for planting seedlings

2. During what year did Oregon pass its first law requiring forest owners to replant trees?

   a. 1987

   b. 1941

   c. 1971

   d. 1993

Integration of Knowledge and Ideas Question (short answer)

3. How did fires in the Tillamook Forest help Oregonians understand the importance of replanting?

My Life as a Wildlife Biologist

Have you ever wondered what a wildlife biologist does every day? Before I became one, I wondered, too. My name is Mike, and I'm a wildlife biologist working as part of a wildlife research team for a large private timberland owner.

I got interested in wildlife because I love the woods, and I love learning about animals. There are thousands of different kinds of creatures in the forest. They're all fascinating to me, from the tiniest insects to the biggest animals, such as bears and cougars.

All these animals — from birds to frogs to termites — play a role in the forest environment, and they're all connected to each other. And the forest environment changes as trees are harvested and new ones are planted. If one species is affected by changes in the forest environment, then other species might be affected, too.

To understand how important forest habitat is to wildlife, wildlife biologists look at which habitats are best for each animal. What food do they need? What about temperature, access to clean water, and safe places to hide and have their young? How do they react to changes in these environments?

Right now we're studying the habitat needs of a terrestrial, or ground-living, salamander. My team is trying to find out how these critters react when we harvest trees of the same age in a given area of the forest.

My company works hard to protect wildlife as it harvests trees. Other people in the company count on my team and me to help them determine which trees they can safely cut, using the information we gather during our studies.

When older trees of the same age are cut at the same time in part of the forest, it can change the temperature of the forest floor, because more sunlight will be able to reach it. Salamanders don't like to get too hot, so we're studying how harvesting might impact the salamanders living in the areas where we harvest.

To better understand how our harvesting might affect them, we'll count how many salamanders live in different parts of the forest. We'll survey them in areas where trees have recently been cut and newly planted small trees are growing back, and in areas where we haven't been cutting. Then we'll write down all the data we find and analyze what we've learned.

Being a wildlife biologist is a lot of fun. My favorite part is being out in the woods, watching wildlife. The forest is ever-changing — no single day is like the next. I also learn new things about wildlife all the time, and there's nothing more special to me than that!

Key Ideas and Details Questions (multiple choice)

1. Where are you most likely to find a terrestrial animal?

    a. In a tree

    b. On the ground

    c. In the air

    d. In the water

2. What does the word "habitat" mean?

    a. An animal's natural environment

    b. A salamander's skin

    c. An animal's vision

    d. The forest floor

Integration of Knowledge and Ideas Question (short answer)

3. How does Mike feel about his job? (Use details from the reading to support your answer.)

1920s Logger Becomes Leader in Sustainable Forestry

Oregon has a cutting-edge approach to sustainable forestry. We're known all across the country for it. We've been paying close attention to forest management for more than a century. Oregon State University began its forestry program in 1906. In 1941 we passed the Oregon Forest Conservation Act, which deals with reforestation and fire protection. In 1971 we became the first state in the country to pass a law regulating forest practices.

This unique way of thinking didn't emerge out of nowhere. It is the result of a lot of intensive study and hard work.

One of the most influential people in Oregon forestry is a man named Bill Hagenstein. Slowed but still sharp at age 98, Hagenstein learned about forests from the bottom up, in the 1920s. "I worked in 38 different logging camps before I was 20," he says. He worked from morning until night, six days a week. He learned firsthand about the problem of renewing forests.

In those days loggers cut all the trees they wanted in one area, then moved to another piece of land and started over. They didn't plant new trees; they left the forest to grow back by itself.

The longer he worked in logging, the more obvious it became to Hagenstein that this was a shortsighted practice. The trees wouldn't last forever. Logging companies would need to plant new trees after they'd cut down the old ones. If they didn't, they — and the builders who built homes and businesses in Oregon — would run out of trees.

Hagenstein decided he needed to do something about this problem. He went to college for several years to learn the science of trees and forests. He learned how to keep forests healthy, even as they were being harvested.

He didn't waste any time trying out what he had learned. Right after college he helped set up the first forest-seedling nurseries in America. In 1942, thanks in part to Hagenstein's hard work, the Nisqually Nursery produced its first crop of Douglas-fir seedlings. These were used to replant 4,000 acres of burned land in Pierce County.

Hagenstein became a leader in forestry beginning in 1948, when several forest industry groups joined to create the Industrial Forestry Association. He led IFA for 35 years, becoming an important spokesman for sustainable forestry all across the United States. He testified about sustainable forest practices before Congress more than 250 times.

Along the way he helped form the American Tree Farm System, an organization that teaches forest owners how to balance the human need for wood products and the ecological needs of forests. In the 1960s he co-founded the World Forestry Center in Portland. WFC now has a Discovery Museum, two working tree farms and the World Forest Institute, where scientific information is available to everyone doing work in forests.

Bill Hagenstein thinks like a scientist, and he cares about people, not about politics. He understands how vital forest products are to everyday life. "Live without wood or wood fiber in your life for a year," he says, "and then come talk to me. Talk is cheap. Life isn't."

Bill Hagenstein was born March 8, 1915 and died September 4, 2014.

Key Ideas and Details Question (multiple choice)

1. When did Oregon pass its first important forest practices law?

   a. 1941

   b. 1986

   c. 1971

   d. 2001

Integration of Knowledge and Ideas Questions (short answer)

2. What is sustainable forestry? Find your answer in the story.

3. Why is it important to plant new trees in managed forests? Use details from the story to support your answer.

Shocking, Implanting and Gacking: The Hinkle Creek Research Project

Why would a researcher want to shock a trout with a Taser, implant it with a tiny transmitter and then make it throw up in a pan? It sounds strange, but these steps are an important part of a big forest experiment at Hinkle Creek, near Roseburg. Here researchers are using the scientific method as they study how logging affects the watershed.

As Oregon's population grows, so does our demand for wood products. The challenge is figuring out how to balance our needs with the needs of the environment. Oregon was one of the first states to pass laws regulating logging and forest road building. Since passage of the 1971 Oregon Forest Practices Act, harvest practices have changed a lot.

More than 40 years later, technology offers new ways to determine whether these changes are doing what we hoped. The Hinkle Creek project is a 10-year study of the forest watershed. Its goal is to determine how today's harvest practices are affecting watershed and wildlife health.

The project is designed as a paired watershed study. Hinkle Creek has two similar watersheds: The north fork of Hinkle Creek drains one watershed, and the south fork drains the other. Together, the watersheds total 5,000 acres. The north fork is the control area. The landowner, Roseburg Forest Products, agreed to leave this 2,500-acre area untouched for the 10 years of the study. The south fork is the treatment area, and it's currently being harvested according to the law.

To figure out how many fish are in Hinkle Creek and to track how timber harvesting affects cutthroat trout, scientists follow individual trout as they move throughout the watershed. They temporarily stun the fish and insert a small PIT tag — a microchip transmitter — in its abdomen. The tag gives the fish a unique number, like a barcode at the supermarket. Gate readers stretched across the stream read the tags. This tracking lets researchers know whether or not the fish move to new habitats after logging.

The other half of the equation is figuring out what kinds of food the fish are eating, and where. To learn this, the scientists recapture the tagged fish and perform "fish gacking" — making the fish throw up its latest meal for analysis in the lab.

To analyze the information they've collected, researchers use several tools, including Arc Maps — color-coded maps that show where the fish like to hang out. They have found fish that never go anywhere; they have also found fish that leave the watershed altogether. In some ways, fish are like people: some are risk-takers, and others are conservative. These differences in behavior may turn out to be very helpful to the species as a whole. But researchers can't know that without more study.

As the Hinkle Creek researchers learn more, they come up with new questions to ask. New methods are applied to those questions, and the experimentation process starts again. Over the 10 years of the Hinkle Creek project, these researchers are hoping to come to some useful conclusions about how timber harvesting affects fish.

Key Ideas and Details Question (multiple choice)

1. What year was the Oregon Forest Practices Act passed?

   a. 1958

   b. 1987

   c. 1971

   d. 1995

Integration of Knowledge and Ideas Questions (short answer)

2. What is fish gacking, and why do scientists do it? Find your answer in the essay.

3. How do scientists figure out how many fish there are in the experimental section of Hinkle Creek?

Whitebark Pine Hangs on for Dear Life

On Wizard Island in Crater Lake, a small tree clings to the thin soil of a steep slope. Nearly bent in half, its trunk is twisted like a corkscrew. Most of its branches are gnarled and bare. The dwarfed size and ghostly shape of this tree earn it the nickname "elfin tree."

Although the tree is so misshapen that it's hard to recognize, its white-gray trunk, purple cones and long needles in clumps of five tell us it is a whitebark pine. It owes its fantastical form to its tenacious hold on life. "Krummholz" is another term used to describe its unusual shape. It comes from the German words "krumm," meaning "crooked, bent or twisted," and "holz," meaning "wood."

Few trees can survive the harsh conditions high in the mountains, but the whitebark pine is a hardy mountaineer. It is usually found at timberline, the highest elevation where trees can grow. When dwarfed and deformed by exposure and high winds, it contorts itself into unusual shapes to anchor itself and find nutrients.

The whitebark pine plays an important role in subalpine ecosystems found near timberline. A pioneer species, it is often the first tree to establish itself after a fire, providing shelter for other trees. This tough tree also provides food and shelter for a variety of wildlife, including elk, squirrels, bears and birds — especially the Clark's nutcracker.

The whitebark pine and the Clark's nutcracker depend on each other in a symbiotic, or mutually beneficial, relationship. The tree provides food and shelter for the bird. The nutcracker's gray and black feathers help it blend into the tree's gray bark, and its dagger-like beak fits perfectly between the scales of the whitebark pine cone.

In turn, the nutcracker helps the tree reproduce by dispersing its seeds. The Clark's nutcracker saves some of the whitebark pine's large, nutritious seeds for later, stashing them in a pouch under its tongue and then burying them underground. This bird can cache, or store, nearly 100,000 seeds in a single summer! The seeds that aren't eaten germinate and grow in the spring.

If you venture high into the mountains, look for a whitebark pine tree. There's a good chance it was planted by its avian partner, the Clark's nutcracker.

Key Ideas and Details Question (multiple choice)

1. What is a timberline?

   a. A line of trees waiting to be cut

   b. A line dug to protect trees from fire

   c. The place where the largest trees grow

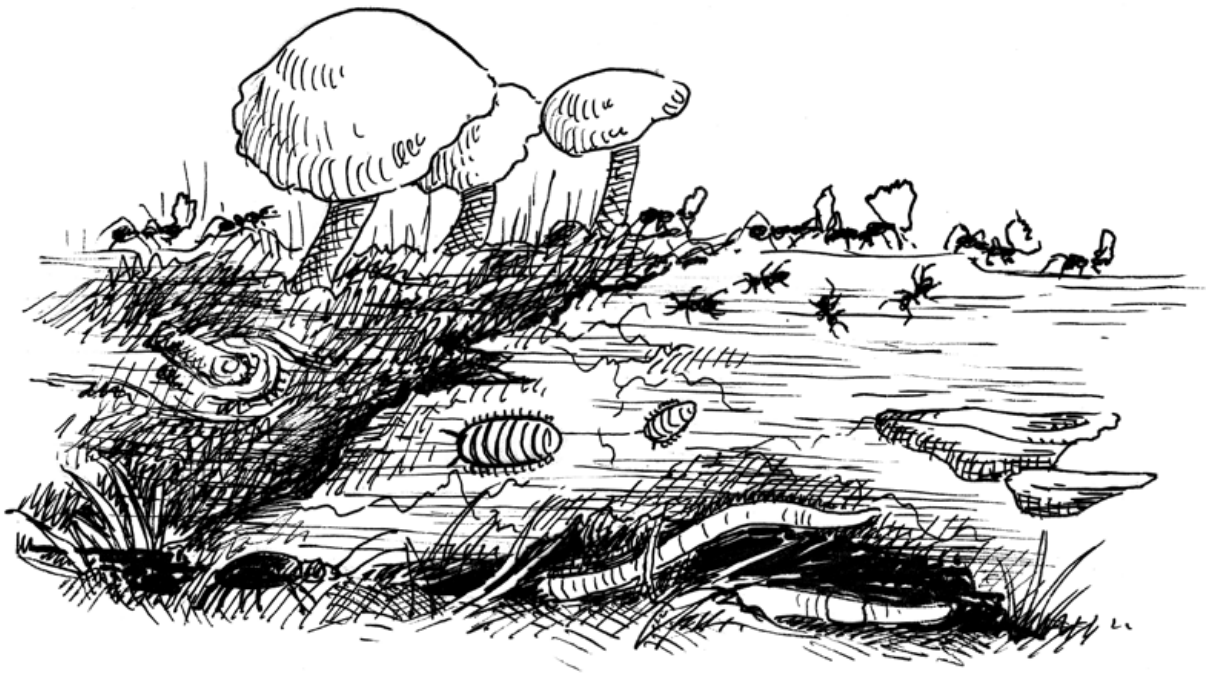
   d. The highest elevation where trees can grow

Integration of Knowledge and Ideas Questions (short answer)

2. What causes the whitebark pine's unusual shape? Use details from the reading to support your answer.

3. How do the whitebark pine and the Clark's nutcracker benefit each other? Use details from the reading to support your answer.

Armies of Decomposers Keep the Forest Clean



Oregon's forests are home to magnificent organisms such as towering trees, cunning cougars and big black bears. Like all living things, they grow, make waste, reproduce, get old and die. In the process they leave behind quite a mess, including partially eaten meals, last year's winter coats, leaf litter, carcasses, and piles and piles of feces. Who cleans up after them?

Armies of small but important organisms called decomposers, including worms, ants, slugs, snails, flies and other invertebrates, do the dirty work. They help break down the dead and decaying organic matter living things leave behind. Decomposers recycle nutrients back into the forest to be used again by other organisms. Nothing is wasted in nature!

Animals such as ants and worms serve on the front line. They eat dead plant material like leaf litter, as well as animal remains such as skin, hair, bones and feces. The small pieces they leave behind — as well as the feces they make after digesting them — are broken down even further by the next squad of decomposers, which are called microorganisms.

Microorganisms are living things that are too small for humans to see without a microscope. They include bacteria and certain types of fungi, such as yeasts and molds. These tiny creatures break organic matter into increasingly smaller and smaller parts until nothing is left but basic essential compounds, such as nitrogen, phosphorus and magnesium.

Bacteria and fungi break down these small pieces by producing chemicals called enzymes that digest dead material. The digested material then provides a food source for other microorganisms in the soil.

Although decomposers are at the bottom of the food web, they are a vital part of the path of energy and nutrients that flows through ecosystems. Without nature's cleanup troops, organic matter would pile up on the forest floor. Plants would not receive the nutrients they need to live — and without plants, animals would have nothing to eat.

Key Ideas and Details Questions (multiple choice)

1. Which of the following are examples of decomposers?

    a. Bacteria

    b. Mold

    c. Worms

    d. All the above

2. What are microorganisms?

    a. Living things too small to be seen without a microscope

    b. Interior organs

    c. Dead matter

    d. Decaying matter

Integration of Knowledge and Ideas Question (short answer)

3. Why are decomposers important? Use details from the reading to support your answer.

When Beetles Battle Pines, It's a Pitched Pine Beetle Battle

In a forest in central Oregon, a ponderosa pine is caught in a life-or-death struggle with a beetle. Its bark is riddled with dozens of small holes that ooze sticky globs of yellow resin — a clear sign that an army of mountain pine beetles has invaded it.

Although it's no bigger than a grain of rice, the mountain pine beetle is strong enough to bore into pine trees to feed on the inner bark and lay eggs. The trees fight back by releasing pitch that traps the beetle and pushes it back out, essentially suffocating it in resin.

"One attack is not going to kill a tree," says Dr. Stephen Fitzgerald of Oregon State University's College of Forestry. "But when a tree is mass-attacked, its defenses become overwhelmed and it just can't pitch out all the beetles."

It is the mountain pine beetle's larvae that do the real damage. When the larvae hatch, they eat their way up and down the tree's tender inner bark, etching long grooves called galleries. These grooves disrupt the flow of nutrients and water within the tree, eventually killing it. When this happens, the mountain pine beetles move on to another tree.

The mountain pine beetle is a type of bark beetle — the most common bark beetle native to Oregon. Other common bark beetles include the western pine beetle, the Douglas-fir beetle and the fir engraver.

Insects — including bark beetles — are a natural part of the forest ecosystem. Most pine trees and pine beetles can live in balance. In fact, insects perform valuable functions such as breaking down and recycling leaf litter, which provides food sources for birds and other animals. But when drought and overcrowding weaken a pine forest, mountain pine beetles can take over, wiping out literally thousands of acres of trees.

"The bugs are a symptom of a much greater problem: changes in forest composition and structure over large landscapes," says Dr. Fitzgerald.

Before people began fighting and suppressing forest fires in Oregon and elsewhere, frequent low-intensity fires kept forests from becoming overcrowded, and they also killed bark beetles.

In 2009, mountain pine beetles attacked nearly half a million acres. That's nearly 700 square miles, or roughly five times the size of Portland!

According to Dr. Fitzgerald, pine bark beetle populations can be reduced by thinning and opening up dense clusters of trees. "By doing this, the remaining trees have more resources available to them, like water, nutrients and sunlight. This improves tree growth and vigor and makes the trees resistant to bark beetle attacks," he says.

Key Ideas and Details Question (multiple choice)

1. What is the most common bark beetle in Oregon?

   a. Mountain pine beetle

   b. Western pine beetle

   c. Douglas-fir beetle

   d. Fir engraver

Integration of Knowledge and Ideas Questions (short answer)

2. How do trees fight against bark beetle attacks? Use details from the reading to support your answer.

3. How do frequent low-intensity fires help control bark beetles? Use details from the reading to support your answer.

How Oregon's State Tree Got Its Name

When is a fir tree not really a fir tree? When it's a Douglas-fir, Oregon's state tree.

Botanists, or people who study plants, have argued about this tree's name for a long time. The most common tree in the Pacific Northwest, the Douglas-fir is an evergreen conifer, or cone-bearing tree, like firs, pines, cedars, spruces, redwoods and hemlocks. But while it's similar to these other types of trees, the Douglas-fir is in a class of its own — just like the person it was named after.

Decades before the Oregon Territory became part of the United States, a young Scottish botanist named David Douglas sailed half a world away from his home to explore the Columbia River region and collect plants. He arrived at the newly established Fort Vancouver in 1825.

At first Douglas traveled with Hudson's Bay Company fur trappers. He quickly learned the Chinook Jargon trade language and began traveling with a Native American guide. Over the next two years he covered nearly 4,000 miles.

Douglas explored the Pacific Northwest and the Hawaiian Islands for 11 years, sending specimens back to Great Britain by boat and returning home every few years. All in all, he introduced nearly 250 new plant species to Europe.

Douglas died mysteriously in Hawaii in 1834 at the age of 35. His body was found at the bottom of a pit used to trap wild cattle. He was last seen alive in the company of a hired guide, an Englishman named John, who had been a convict in Australia. John disappeared soon after Douglas' body was discovered, and no one was ever charged with murder.

In his journals, Douglas called his namesake tree "one of the most striking and truly graceful objects in nature." He described it as "gigantic," and "remarkably tall, unusually straight … and thickly clad to the very ground with wide-spreading pendent branches."

Although Douglas was the first European to collect the Douglas-fir, he was not the first to describe it. The tree's scientific name, *Pseudotsuga menziesii*, honors a rival Scottish botanist, Archibald Menzies, who first documented the tree in 1791 while traveling with Captain Vancouver on his trip around the world. The genus, or type, is "Pseudotsuga," which means "false hemlock."

The Douglas-fir is called the "tree of one thousand uses" because of the many products made from it, including fences, flooring and furniture. It is also a favorite for Christmas trees. The Douglas-fir provides food and shelter for a variety of animals that eat the seeds in its cones and make homes in its trunk and branches.

No matter what you call it, the Douglas-fir is important to people and wildlife.

Key Ideas and Details Question (multiple choice)

1. Which of the following is false?

    a. The Douglas-fir is Oregon's state tree.

    b. The Douglas-fir is the most common tree in Oregon.

    c. The Douglas-fir is an evergreen conifer.

    d. None of the above

Integration of Knowledge and Ideas Questions (short answer)

2. What are some adjectives David Douglas used to describe the Douglas-fir?

3. What products come from Douglas-fir trees? Use details from the reading to support your answer.

Monster Storm Wreaks Havoc

The Oregon Coast is no stranger to massive winter storms, but the Great Coastal Gale of 2007 was one for the record book. It left chaos and devastation in its wake.

Unlike the famous Columbus Day Storm of 1962, which hit without warning, the Great Coastal Gale of 2007 gave advance notice. The National Weather Service had been tracking two typhoons in the Pacific Ocean for nearly a week before it struck. Typhoons — storms with winds that circle around a center of low atmospheric pressure — are similar to hurricanes, but they occur in the west Pacific Ocean instead of the east Pacific or Atlantic oceans.

Forecast models showed a stream of strong, moist air extending from Hawaii to Oregon, called a Pineapple Express. The size and scope of the storms prompted the National Weather Service's Portland office to issue its first-ever hurricane-force wind warning for the Oregon Coast.

"This thing is an absolute monster," said Matt Zaffino, a meteorologist for KGW-TV in Portland. "It's huge. It covers the entire Northeast Gulf of Alaska."

The Great Coastal Gale of 2007 hit during the first weekend of December. For three days storms pounded the coast with a steady assault of high winds and heavy rain. The region between Newport, Oregon, and Hoquiam, Washington, bore the brunt of the strongest gale-force winds. Gusts as fast as 130 miles per hour were recorded near Tillamook.

The storms snapped trees like twigs, flattened large stands of trees and caused widespread flooding, landslides and power outages that lasted for days. Preceded by snow and frigid conditions, the storms raised temperatures, which melted mountain snow and contributed to severe flooding. Highways between the Willamette Valley and the coast had to be closed because of standing water, fallen trees and landslides. In some areas the flooding was so bad that the Oregon National Guard had to evacuate people from their homes. Five Oregonians lost their lives.

"Trees in the millions fell before such a powerful force, bringing to mind the blast zone of the 1980 eruption of Mount St. Helens," said Wolf Read, a meteorological consultant. "The forest did not have a chance."

The storm felled trees on forestland throughout Oregon. Since then, landowners have salvaged the fallen timber and, as required by Oregon law, replanted.

People still argue about whether the Great Coastal Gale of 2007 was worse than the Columbus Day Storm of 1962.

But even though the October 1962 storm had stronger wind speeds in some places, Read said the 2007 storms were worse: "The gale completely outclassed the Columbus Day Storm — and probably any other windstorm in the modern record — in terms of the duration of high winds."

A truly historic event, the Great Coastal Gale of 2007 will be remembered for many years.

Key Ideas and Details Questions (multiple choice)

1. What is a Pineapple Express?

   a. Hurricane

   b. Stream of moist air extending from Hawaii to the Pacific Coast

   c. Dish at a Chinese restaurant

   d. Typhoon

2. What storm is the Great Coastal Gale of 2007 compared to?

   a. Columbus Day Storm of 1962

   b. Willamette Valley Flood of 1996

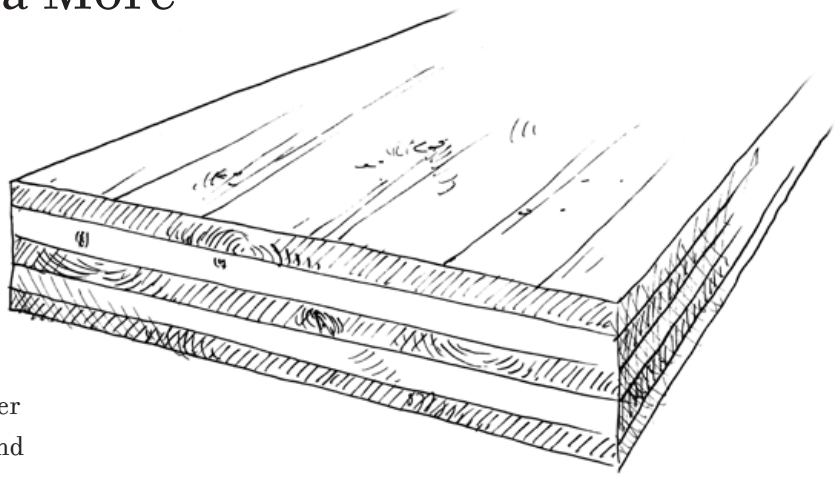
   c. Christmas Storm of 2009

   d. Great Gale of 1880

Integration of Knowledge and Ideas Question (short answer)

3. What happened to some of the trees that were felled by the storm?

Engineered Wood for a More Sustainable Future



What beats both concrete and steel in strength per pound, and can be used to build homes, offices and skyscrapers with lower environmental impacts?

Wood. More specifically, engineered wood products. Advancements in wood technology have taken an already natural and sustainable material and turned it into a modern engineering marvel.

Engineered wood products are manufactured by gluing wood strands, particles, fibers, veneers or boards together into composite materials. These products are often stronger than traditional solid lumber. Another big advantage of engineered wood products is that they make efficient use of the entire log. Today, nearly 100 percent of every log is turned into building products or other usable materials. Even the bark and sawdust are collected and burned as fuel to generate electricity that powers the mill.

Some engineered wood products are strong enough to construct apartments, commercial buildings and even bridges. These products, which include glue-laminated posts and beams (glulam) and cross-laminated timber (CLT), are part of a category known as mass timber. True to their name, these products are massive. Glulam is made by gluing pieces of lumber end to end and face to face to form much bigger pieces, which can be more than 100 feet long and six feet or more wide. CLT is made by layering solid lumber into large panels that are stacked perpendicularly and glued together. Each layer can have as many as 100 boards arranged side by side. A single CLT panel can have three, five or even seven layers that span up to 10 feet wide, nearly 60 feet long and 12 inches thick.

Both CLT and glulam can support multi-story buildings, but they weigh less than comparable concrete and steel products and can be installed more quickly. In combination with other materials, these mass timber products can be used to build earthquake-resistant buildings. As a result, wood can now be used in many more applications, including mid-rise and high-rise buildings.

Compared to concrete and steel, wood products have a significantly lower environmental impact. Wood requires less energy to manufacture and is generally more energy-efficient in use. This means using wood results in fewer greenhouse gas emissions and less air pollution. Better still, wood is renewable, recyclable and biodegradable.

Using wood also helps fight global warming, because it literally grows on trees. Through photosynthesis, trees absorb carbon dioxide from the atmosphere, emit the oxygen and store solid carbon in their trunks and branches. A single cubic meter of solid wood stores the equivalent of up to one ton of carbon dioxide – one of the worst greenhouse gases.

Responsibly grown and harvested wood is naturally renewing, and when a building is finally torn down, its wood can be recycled or burned for energy. And because Oregon law requires reforestation after a harvest, wood grown here is truly a renewable resource.

Key Ideas and Details Question (multiple choice)

1. What are engineered wood products?

   a. Products made from solid lumber

   b. Products made from dimensional lumber

   c. Products made from wood particles, fibers or layers

   d. Products made from steel and concrete

Integration of Knowledge and Ideas Questions (short answer)

2. How does using wood help fight global warming? Use details from the reading to support your answer.

3. Why are wood products a good alternative to concrete and steel? Use details from the reading to support your answer.

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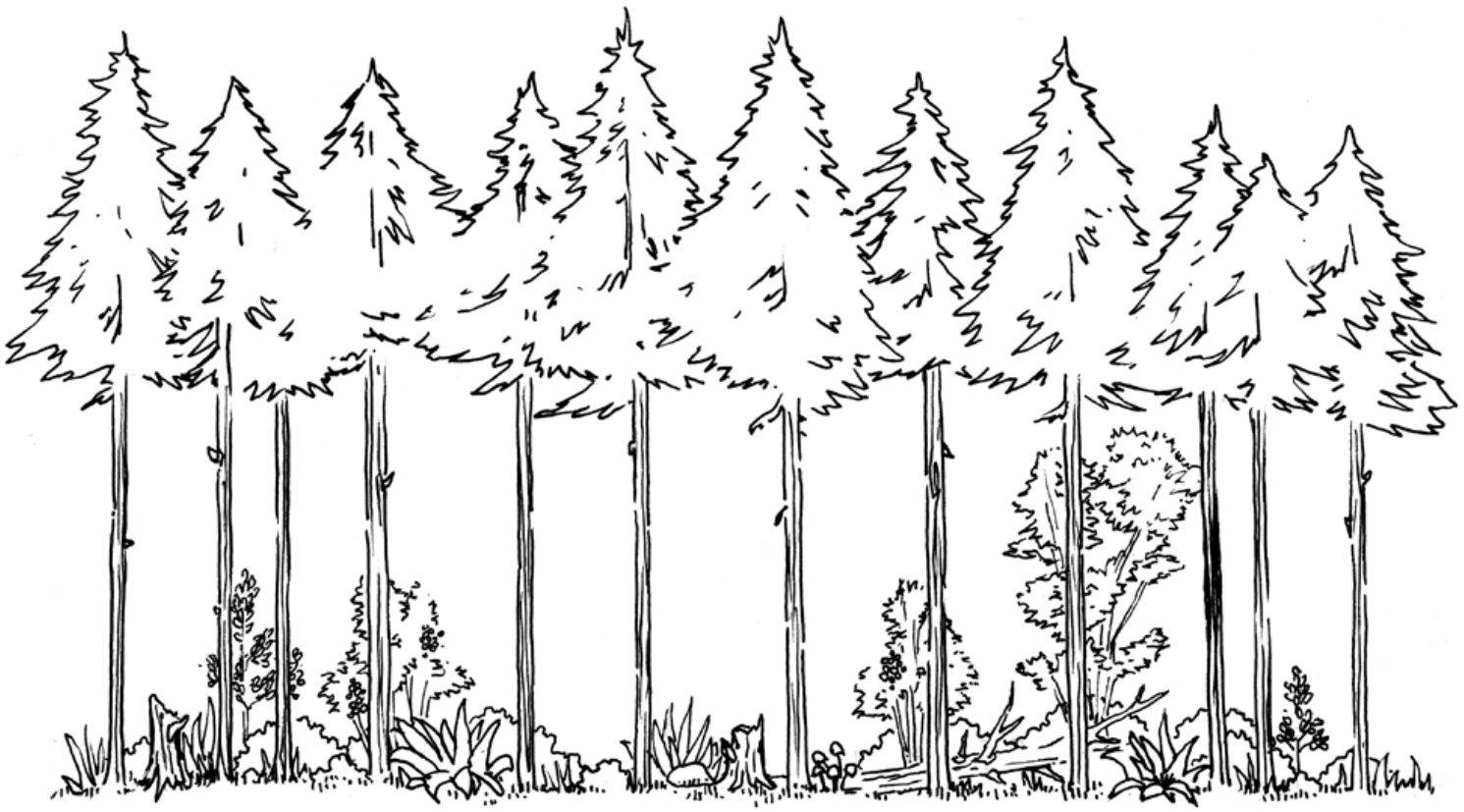

Oregon Forest
Resources Institute