School Forestry Tour Booklet

Cooperative Extension Service
Oregon State University
Douglas County Office
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Oregon State University Cooperative Extension Service

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ACKNOWLEDGMENTS:

With special thanks to Ed Jensen and Bob Logan for developing the original Douglas County Extension Service Forestry Tour Book.

Thanks to the Douglas County Board of Commissioners and the Douglas County Lands Department for the use of the Glide Educational Forest.

This revision was made possible through the generosity of a grant from the USDA Forest Service Natural Resource Conservation Education Program.

Special recognition goes to the employees of the North Umpqua Ranger District for their support of this program and for use of their computer and equipment.
Location Map for School Forestry Tour

- Roseburg
- Diamond Lake Blvd
- 12 miles
- Hwy 138
- Glide
- To Whistler's Bend Park

Look for a "School Forestry Tour" sign here

You want to be here

Transfer Site

Parking Games

Green Loop

Yellow Loop

Glide Educational Forest
# School Forestry Tour Booklet

## Table of Contents

<table>
<thead>
<tr>
<th>Section</th>
<th>Pages</th>
</tr>
</thead>
<tbody>
<tr>
<td>Tree Identification</td>
<td>1-11</td>
</tr>
<tr>
<td>Forest Products</td>
<td>1-6</td>
</tr>
<tr>
<td>Forest Management</td>
<td>1-9</td>
</tr>
<tr>
<td>Fire in the Forest</td>
<td>1-4</td>
</tr>
<tr>
<td>Forest Wildlife</td>
<td>1-3</td>
</tr>
<tr>
<td>Fisheries</td>
<td>1-6</td>
</tr>
<tr>
<td>Forest Recreation</td>
<td>1-3</td>
</tr>
<tr>
<td>Oregon Archaeology</td>
<td>1-8</td>
</tr>
</tbody>
</table>
Tree Identification

Why Identify Trees?

Trees not only look different, but each species has unique key characteristics. These characteristics tell us about the forest they are found in, what other plants and animals may be found nearby, how strong their wood is, what the wood can be used for and even what the climate is like. Trees can tell us many things and each species has its own story.

The Name Game

Trees are identified by a common name and a scientific name. Common names are usually easier to remember, but they may change over time or with location. There may also be more than one common name for a tree, so common names can sometimes be confusing. On the other hand, the scientific name is always the same and it is written in Latin. The scientific name has two parts. The first part is the genus name and identifies a group of trees, like oak trees. The genus is always capitalized. The second part of the scientific name is known as the species or specific name. It is not capitalized. Scientific names may be difficult to learn at first, but learning them is well worth the effort and can be fun, too. Often, the Latin name tells us something about the tree, like where it grows, who first documented it or a certain trait that may be helpful in identification. Here's an example of one of Oregon's most famous trees!

<table>
<thead>
<tr>
<th>Common Name:</th>
<th>Douglas-fir</th>
</tr>
</thead>
<tbody>
<tr>
<td>Scientific Name:</td>
<td>Pseudotsuga menziesii</td>
</tr>
</tbody>
</table>

Okay, Show Me Your I.D.

Identifying trees is like identifying people. Identifying a person is not difficult once you become familiar with that individual's characteristics. When people you know walk by, you can recognize them by their unique qualities, like hair color, height or face shape. If you saw a friend very briefly you could still recognize him or her. You might even be able to pick out your friends in old photos, where they were younger or had a different "look", because you are familiar with certain characteristics about those people that are unique. It's the same with trees. Once you know the tree well, you'll be able to identify it even when you see only a glimpse or a small piece of it. You can even recognize trees at different ages or stages in their growth.
Let's Get Acquainted

So how do we get to know trees? We start with an introduction. We learn to recognize the leaves, fruits and flowers. Later when we become more familiar, the bark, the branching pattern, the shape and the color will offer clues to their identity.

Trees are large woody plants that usually have one large stem called a trunk. The trunk is surrounded by a layer of bark that protects the tree. Trees are usually over 20 feet tall when full grown. Other woody plants that have more than one stem and are usually under 20 feet tall are called as shrubs. This is a pretty good rule, even though there are a few exceptions.

Trees are divided into two main categories, conifers and broadleaves. Conifers have cones and needles or scale-like leaves, like pine trees. Conifers are also called evergreens, because most of them keep their leaves all year long. There are a few conifers that are deciduous, that is, they loose their leaves in the fall. Conifers are nicknamed softwoods.  

Trees with wide flat leaves that produce seeds in a fruit are called broadleaves. Broadleaved trees are also known as hardwood trees, because their wood is often harder than that of conifers. Most broadleaf trees are deciduous, that is, their leaves die and fall off for the winter. In a nutshell:

CONIFERS = SOFTWOODS, most are EVERGREEN  
BROADLEAVES = HARDWOODS, most are DECIDUOUS

Here's the Key

One tool people use to identify plants, including trees, is a dichotomous key. Dichotomous keys give two choices, either the tree has a certain characteristic or it doesn't. The key is designed so that you read the clue, then decide whether the plant has that quality or not. Then go to the next clue, continuing until you've identified the plant.

Keys make identification easier because you don't have to memorize all the characteristics of every tree. Start at the beginning of the key. Read the two statements under each headline. Decide which best describes the tree you are looking at. Then follow the arrow to the next clue. Read the statement, decide which one best fits your sample and continue until you've identified it. Don't become discouraged if you make the wrong choice. Just go back to the beginning.

Here is a simple key to help you identify some common trees of Oregon. Warning: Not all trees are in this key. For a more complete key see Trees to Know in Oregon, available from the Douglas County Extension Service.

Tree I.D. - 2
**Dangerous To The Touch**

Don't go into the forest without first learning how to identify this plant!!!

**Poisonoak** (*Rhus diversiloba*)

If you haven't been introduced yet, it's a good idea to know how to identify this plant before you meet it. Beware! All parts of poisonoak are poisonous. Leaves, stems, berries and roots all contain a toxic substance that can cause severe rashes and days of uncomfortable endless itching!

Poisonoak is not really an oak, nor is it even a tree! It grows as a vine, a tall erect shrub or a short ground hugging shrub. The leaves can vary dramatically in size and the color changes over the course of the year until they fall off for the winter. So how do you recognize this dangerous plant? Watch out for shiny green leaves in groups of three. In the fall the leaves turn bright red and the plant has white berries. Poisonoak grows along fences in pastures and with hardwood trees. You may also see it in the forest, especially along roads.

Remember this saying:

**Leaves of three, let it be!**
Some Common Native Conifers of Oregon

Douglas-fir (Pseudotsuga menziesii)

Douglas-fir is the state tree of Oregon. It is also the most common tree in our state. West of the Cascade mountains, more than half the trees are Douglas-fir. The world's largest Douglas-fir was recorded in Coos County, Oregon. It stood 330' tall and was 11' in diameter!

Douglas-fir leaves are single needles that have blunt tips and are roughly 1 inch long. They are arranged spirally on the twigs. Buds are pointed, reddish brown and shiny. The cones have very distinctive three pronged bracts that some people think look like a mouse's tail and feet as it is jumping into a hole. Look for cones under the trees. The bark of older trees is thick and reddish brown with deep grooves.

Douglas-fir trees supply more products for people than any other tree in the world. The wood is used for telephone poles, long beams, lumber, plywood and paper. Shredded bark is a popular landscaping mulch. Douglas-firs are also the country's most popular Christmas trees. Recreation, fresh air, clean filtered water and refuge for a huge variety of wildlife are also provided by these majestic forest giants.

True firs (Abies species)

The true firs include grand fir, white fir, noble fir, California red fir, Pacific silver fir and subalpine fir.

Their are six true firs native to Oregon and they look similar. Here's what they have in common:

1) upright cones, growing on the highest branches
2) cones that fall apart, scale by scale, with the cone core remaining on the tree
3) stemless needles attaching directly to the twigs
4) tree tops are pointed and dense, like church spires
5) on young stems, the bark has resin blisters
6) buds that are in clusters of 3 or more on the tip of branches

Crater Lake is a great place to see all of Oregon's true firs growing together. The true firs are used for lumber, plywood, paper and Christmas trees.
Ponderosa pine (*Pinus ponderosa*)

The most widely distributed pine in North America is ponderosa pine. These trees typically grow to 180 feet, although giants reaching almost 250 feet have been recorded.

Ponderosa pine needles usually grow in bundles of three and are 5 to 11 inches long. Pine cones are 3 to 6 inches long, egg shaped, and the scales have straight, sharp prickles that bite into your skin when you pick them up. Young trees have very dark bark. Older trees have thick yellow brown to orange red bark that flakes off in flat scaly plates that look like jigsaw puzzle pieces. The thick bark protects the trees from periodic ground fires that burn up old needles, grass, weeds and shrubs on the ground. This helps the stands remain healthy and open.

Ponderosa pine is very important species on the east side of the Cascade Mountains. It is popular for its beauty as well as it’s wood. Ponderosa forests can be very inviting, and are in demand as recreation areas. When trees are harvested, the versatile wood is used primarily for lumber and other products such as furniture, toys, window frames and doors.

Lodgepole pine (*Pinus contorta*)

Lodgepole pine trees are small to medium size trees, reaching heights of 100 feet. The needles are grouped in pairs and are yellowish green. The cones are similar to those of the ponderosa pine in that they are egg shaped and have sharp prickly scales; however, they are much smaller, less than two inches and can remain on the tree for years after they are ripe. The cones that are found on lodgepole pines need fire or intense heat to soften the thick resin that seals its cones. Once softened, the seeds can fall out of the cone. The trees have dark, almost black, bark that is thin and scaly.

This species is divided into two varieties in the Pacific Northwest. On the coast, high winds cause the lodgepoles to grow in short stubby clumps. The coast form is known as “shore pine”. The mountain form, known as lodgepoles, commonly grows in dense thickets in the mountains, where the straight, slender trunks reach 80 to 100 feet.

Lodgepole pine wood is used for paper, poles, log houses and other lumber. The name "lodgepole" came from the Indians' use of the mountain variety of this pine. The tall straight poles were used to construct lodges and teepee frames.
Sugar pine (*Pinus lambertiana*)

Sugar pine is the tallest pine in Oregon, growing to over 200 feet. It is a common five needled pine, with needles 2-4 inches long. If you look very closely, you can see a dusty white substance called bloom, on all 3 sides of the needles. The cones are the longest of all the pines, 10 to 24 inches long! The bark on large trees is reddish brown. It is composed of long scaly ridges divided by deep furrows.

Sugar pine wood is highly valued. It is used for more expensive lumber from which window frames, pattern stock and cabinets are made. The wood is light, soft and easy to work.

Western white pine (*Pinus monticola*)

Western white pine has needles grouped in fives, too. Its needles have the white bloom only on one side of the needle. Western white pine is easily distinguished from sugar pine because the cones are more slender, curved and much smaller than sugar pine, only 5 to 12 inches long. The bark of mature trees is a grayish color. It is divided into small square plates, sort of like the scales on the back of an alligator.

Western white pine has wood similar to sugar pine and is used for many of the same products.

Western hemlock (*Tsuga heterophylla*)

Western hemlock is one of Oregon's largest conifers, growing to 200 feet, however; its cones and needles are some of the smallest. Cones are one inch or less in length and the needles are just 1/4 to 3/4 of an inch long with blunt tips. The needles come in two distinctly different lengths on each twig, hence the species name (hetero-different, phyll-leaf). The hemlock can be identified by these leaves and its flexible top leader which droops over.

Hemlock trees are used for plywood and lumber, like gym floors. High quality pulp used for tissue, newspapers, magazines and books come from this tree. Hemlock fibers are also in demand for making rayon for clothing.
Western redcedar (*Thuja plicata*)

Western redcedar grows to 200 feet tall. Its scale-like leaves are closely jointed and overlapping in pairs. They are flattened as if they had been steam rolled. With a little imagination, tiny butterflies outlined in white bloom can be seen on the underside of the leaves. Cones are grouped in clusters and are about 1/2 inch long and are turned up on the branch.

Distinctive redcedar bark is very thin and made of long reddish brown stringy fibers. The soft wood is easy to work. Sweet smelling or aromatic oils in the wood protect it from insects and act as a natural preservative. Redcedar wood was used by early Indians to make many useful products including bowls, spoons, arrow and spear shafts, totem poles, houses and canoes. They also used the bark to make blankets, clothing, nets and ropes. Today the wood is used mostly as shingles, fence posts, siding, boats and outdoor decks. It is also used in closets, drawers and chests to protect clothing from moths.

Incense-cedar (*Calocedrus decurrens*)

This tree is easily recognized and common in southern Oregon. It is a smaller tree, reaching about 110 feet. When the cones open, they look like a duck's bill with the tongue sticking out. The leaves appear as scales that are longer than they are wide. Incense-cedar trees have a characteristic appearance. The flat sprays of leaves are somewhat twisted. The entire tree looks like it has been rumpled by the wind. The bark is reddish brown, furrowed and platy.

The wood is soft and does not splinter easily, so it is preferred for making pencils. It also resists decay and is used much like redcedar for shingles, shakes, siding and fenceposts. When planted around homes, incense-cedar makes a nice ornamental tree and a good windbreak, too.

Spruce (*Picea species*)

There are two common native spruce species in Oregon: Sitka, reaching 180 feet and Engelmann, which typically grows to 120 feet. Sitka spruce grows along the coast, while Engelmann is found high in the Cascade and Blue mountains. The needles are about one inch long, sharp and stiff, and grow out of tiny woody pegs on the tree.
twigs. Spruces are sometimes confused with firs, but they are easy to tell apart with a simple test. Rub your hand against the needles; spruce needles are sharp and fir needles are soft. Just remember "spiny spruce/friendly fir". Spruce cones have papery thin scales without bracts that hang down and the tree bark is scaly.

Pound for pound, the wood of Sitka spruce is said to be the strongest structural material in the world. It was in demand for building airplanes during World War II. Today it is used primarily for making paper. Its strength makes it great for ladders, aircraft, bleachers, pianos and violins. Engelmann spruce wood is mainly used for lumber, although the world’s finest violins are made from it.

**Western larch (Larix occidentalis)**

Western larch is unique, because it is Oregon's only deciduous conifer. Recognizing it is easy because the needles turn bright yellow before they fall off in autumn. They stand naked in winter, but as spring comes, light green needles appear. The needles are in bunches of 10 or more. They grow from woody spurs that look like tiny barrels lined up in rows. Larch cones are small and have pointed bracts sticking out like tiny tongues or whiskers. Older trees commonly reach 180 feet and have reddish bark. These trees, also known as tamarack, grow quickly at higher elevations in central and eastern Oregon.

Because the wood is decay resistant, it is used for lumber, posts, poles, timbers and crossties. It also makes great firewood.

**Pacific yew (Taxus brevifolia)**

Pacific yew trees are usually found growing in the shadow of Douglas-fir and western hemlock. They are small and slow growing, commonly under 40 feet, but very old yews can reach 75 feet. Needles are dark green on top and lighter green underneath. They curl under and come to a distinct but soft point. The bark is grey and scaly. Instead of cones, they have a unique fruit, a bright red poisonous berry known as an aril.

The yew bark produces a cancer fighting drug known as taxol. The wood is red, durable and strong. It is used for bows, canoe paddles, canes and fence posts.
Some Common Native Broadleaves of Oregon

Black cottonwood (*Populus trichocarpa*)

The largest hardwood growing in Oregon is the black cottonwood. Along the Columbia River it often reaches 150 feet tall. Cottonwood has slender pear shaped leaves that are green and shiny on top, and rusty-brown or silvery-white underneath. The undersides of the leaves are easily seen when the wind blows. The leaf edges can be almost smooth to finely saw toothed. Sweet smelling sap covers the buds in the spring. The tree was named for its fluffy, white seeds that are blown about by the springtime winds.

Cottonwood is used mostly for pulp and paper because it is soft and easy to bleach. The wood is also used for veneer, plywood, pallets, crates, boxes and excelsior (slender curved wood shavings for packing and stuffing).

Oregon white oak (*Quercus garryana*)

Oregon white oak is the most common oak found in Oregon. Mature oaks commonly grow 50 to 90 feet tall. Their short massive branching trunks and rounded broad crowns are familiar landmarks in the valley woodlands. The distinctive lobed leaves are 4-6 inches long, 2-5 inches wide and divided into 5-7 rounded lobes. Acorns are the seeds of these great oaks.

Early Indians depended on acorns for food and they are a vital source of food for wildlife. Oaks are valued for their beauty and shade. When harvested, oak wood is a preferred firewood. It is also used for furniture, tool handles, flooring, railroad ties, veneer, caskets and crates.

Bigleaf maple (*Acer macrophyllum*)

"Bigleaf" describes this maple to a tee. Its leaves are 6-12 inches in diameter. Some are even bigger than this page! The leaves have five main pointed lobes. Maples prefer rich moist soils in the foothills and valleys. Mature trees reach 50 to 100 feet in height. Two seeds are joined together forming a "V" shaped fruit called a double samara. Samaras are covered with fuzzy hairs and have wings up to 2 inches long.

Bigleaf maples are planted for shade in western Oregon. The wood has a variety of uses, from panelling and flooring to musical instruments and fine furniture.

Tree I.D. - 10
Pacific madrone *(Arbutus menziesii)*

Pacific madrone is an easy tree to identify for a number of reasons. First, is its unusual bark. The bark is smooth, bright orange and deciduous! That's right, it peels off constantly. It may look like the tree is unhealthy, but its not. Second, madrone is an evergreen broadleaf. The oblong leaves are 3-5 inches long. The thick, leathery leaves have a waxy coating that helps to keep in moisture so the tree can live in very hot dry spots. Madrone has white flowers and red berries.

Madrone is used in landscaping as an ornamental tree. The hard wood is used for firewood, furniture, flooring, paneling, plywood cores, veneer and pulpwood.

**Red alder (Alnus rubra)**

The most common broadleaf tree in western Oregon is red alder. From a commercial stand point, it is the most important native hardwood here. Mature trees typically reach 70-120 feet. Alder trees prefer streambanks and springs, but will grow in most places in western Oregon. Alder trunks have distinctive, grey-white bark with black blotches. Along the slightly rolled under leaf edges are large blunt teeth. Seeds develop in tiny cones called strobes.

One of red alders most important contributions to its surroundings is its ability to add nitrogen to the soil. Nitrogen is a natural fertilizer that helps plants grow. Red alder “fixes” more nitrogen than it uses, leaving an excess that can be absorbed by other plants. This special ability helps to make red alder a valuable part of the forest ecosystem.

Red alder was named for its sapwood which turns red when exposed to oxygen. Paper, furniture, cabinets, paneling, plywood, doors, toys, waferboard and firewood are some of the products that come from alder.
Forest Products

Oregon is blessed with an abundance of forests. From these forests we get many things, which we call "Forest Products". We have come to depend on a variety of materials from forests. Some of these materials are in the form that we use them. Others are processed into the products we use every day. Clean air, fresh water, food and building materials for homes, are all necessary for our survival. Other forest products, like paper, cardboard, chemicals and poles for electricity or phone lines, make our lives easier.

Can you think of any specific forest products? Make a list of the forest products you see every day. Think of five in the classroom and five outside of the classroom. Try to list things your classmates won't think of, then compare your lists.

You probably started with things that are made from wood, like desks, chairs, pencils, tables or even doors. Playground equipment, fence posts, telephone poles, railroad ties, docks & pilings, log homes and firewood may have made your list for things outside the classroom. Maybe you thought of things made of paper or cardboard. Did you come up with any lesser known products like pictures, photographic film, glue or paint? What about wild animals, hiking trails, fresh water or oxygen?

Let's look at a range of forest products, where they come from and how they are made. Some are manufactured, or processed into useable items. These include wood, paper and chemical compounds.

Wood Products

Before we can make wood products, trees must make wood. We can think of trees as factories that produce wood. They take water and minerals from the soil and combine them with energy from the sun to make food for the tree. The tree uses this food to build cellulose and other materials that make wood. See “How a Tree Works” at the end of the chapter.

When trees are cut down, their branches are cut off and the trunks are sawed into logs. The logs are put on trucks and sent to sawmills. At the mill, the bark is peeled off, then the logs are measured and cut. Some are sawed into lumber, others are peeled into thin sheets called veneer, while still others are
chipped into small pieces to make paper and particleboard. Lumber is used to build homes and offices, along with many of the things in them like flooring, tables, chairs and other furniture. Veneers are used to make plywood or covers for cabinets, doors and furniture. Paper products include: writing paper, tissues, paper towels, paper bags, cardboard boxes, wrapping paper, books and even dollar bills! See from “Trees to Wood Products” on page 3 to see how logs are processed.

If you think we use wood to make a lot of the things we need, want, and desire, you’re RIGHT! People around the world use about 22 billion pounds of wood each day. This works out to about 4 pounds per person, per day. In the United States, we use almost 4 times the amount of wood products than other people around the world. Amazingly, we use about 14 pounds of wood products per person, per day.

Now, you may ask, how can I be using this much wood? Well, that number is an average figure and it includes using our homes, furniture, school desks, and paper products like toilet paper and newspaper. Regardless, we do use a lot of wood and we need to be responsible about our use.

When we choose to use wood, we know that trees will be harvested and turned into products. This means that those trees can’t be used for recreation or by wildlife. What if we choose to use something besides wood to build our homes or to make furniture? Natural resources such as aluminum, concrete, brick, or steel all take a lot more energy to produce than wood. Using energy to produce these building materials also has an impact on the environment. What is important to understand is that whatever natural resources we choose to use, they all have an impacts on the environment, either from generating or by extracting them. We can lessen our impact by consuming less and recycling more.

Other Forest Products

Forests are dynamic systems that make many products that are not manufactured. When a forest is healthy and strong it can produce a variety of products. Lets look at these more closely.

Employment

Have you ever thought of jobs as a forest products? Many Oregonians are employed in forest management, harvesting and wood processing too! Foresters, loggers, truck drivers, mill workers, chemists, cabinet makers, and carpenters are just a few of the people that make their livings because of forest products. These jobs are important to Oregon's economy.
Fresh Water

Fresh water is one of the resources that comes from our forests. Water enters the forest in the form of dew, rain or snow. Then the trees and other forest plants, use some of the water. The rest either runs off or soaks into the soil and dead wood or plant material that is in and on the ground. Forest soil then slowly releases the water. This reduces flooding in the lowlands and puts water in rivers all year long. The water moves through the forest and joins with other droplets to form a stream. Under the protection of the forest shade, the water continues its journey downhill, eventually joining other streams. The streams join together to form rivers as the water makes it way toward the ocean. These rivers and streams provide us with water for our homes, businesses and agricultural crops. Their energy is also converted to electricity, which powers our way of life.

Clean Air

Another important resource that forests give us is clean air. During a process called photosynthesis, trees absorb carbon dioxide from the air and release oxygen back into the air. Animals, including humans, breathe in this oxygen and breathe out carbon dioxide. So you see, trees convert the air so we can breathe. Trees also take some other particles and pollutants out of the air.

Changes in the Environment

The world around us is changed by forests. A forest will make the air cooler in the daytime and warmer at night. This same phenomenon keeps outside temperature more consistent year round. Without our forests, the summers would be warmer and the winters colder. We count on trees and forests to improve the view, block the wind and help absorb noise, too. This may not seem important to you now, but if you lived in a big city like Portland or New York you'd probably appreciate the trees.
A Home for Wildlife

Forests provide wild plants and animals a place to live. The food, water and shelter they need to survive is available in and under the trees. Some forests provide food or forage for game animals like deer and elk. Other nearby forests form a refuge where these same animals can hide and get out of the weather. Along rivers and streams, a forest may shade the water and keep it cool and flowing, providing a home for fish and other water loving animals.

Recreation

Local and national governments and some private landowners set aside land and parks where people can go to experience the beauty and joy of a natural forest environment. Have you ever been in a forest and felt a sense of awe, wonder, peace or happiness? Forests enhance our lives by providing challenges, learning opportunities and a place to have fun. Have you ever been picnicing, hiking, camping or skiing in a forest?

Food and Medicine

When you made your list of forest products, did you think of foods from the forest like wild mushrooms, venison, salmon, steelhead, berries, honey, chokecherries, plums, pine nuts, and turkey? Many food additives are made from trees too! What about medicine like the cancer drug taxol.

As you can see, not all forest products are wood products. We value a whole range of forest products and manage forests to produce the many forest products we enjoy.

R - E - S - P - E - C - T

As more people are born, there are more and more demands on forests. If we want to have forests and forest products we must take care of our forests so that they can continue to supply us with the products we need and enjoy. Here’s how you can help. First, respect the forest when you’re in it, pick up trash and be very careful with fire. Second, avoid wasting wood, water and paper. Third, recycle newspapers, cardboard, glass, tin and aluminum. When newspaper and cardboard are recycled the cellulose fibers are reused to make other products. Recycling other materials creates less demand for energy and water. Recycling also creates new jobs and reduces the need to cut trees.
How a Tree Works

**Leaves** take sunlight and carbon dioxide from the air, add these to water and other nutrients to make food for the tree. This process makes oxygen and puts it in the air.

**Branches** actively grow and produce leaves. They reach to the sky, so the leaves can get enough sunlight to produce food for the tree.

**Inside the Trunk**

**Outer bark** protects the tree from insects, disease and fire.

**Phloem** moves food from leaves to the rest of the tree.

**Cambium** is where new wood is made and the tree gets bigger around.

**Sapwood** carries water and nutrients from the roots to the leaves.

**Heartwood** is in the center of the trunk. It is no longer living, but it is very strong and gives the trunk support.

**The Trunk**

**Roots** anchor the tree to keep it upright and absorb water and nutrients from the soil.
Forest Management

Forests throughout Oregon are full of life and activity. Many different plants and animals, including people, are part of the dynamic forest ecosystem that provides us with the vital resources and products we use every day. Forests also provide people with recreational opportunities and jobs. Some people working in the forest are known as forest managers, or simply, foresters. They practice “forest management”. Some forests are managed very intensively, usually for timber production. Other forests, like wilderness areas, are virtually untouched. The priorities for wilderness may include wildlife habitat, clean water, recreation, or education. Regardless of management intensity, foresters try to balance the many needs and wants people have concerning forests. Their job is a tough one as they try to manage the forest for several different objectives, in the present and the future, all at the same time.

Why Manage Forests?

Quite simply, forests are managed to provide people with the resources and products they want. The primary reason we manage forests is for the raw materials to make the products we enjoy. However, without good management, the forests may not be around in the future. Managers work to provide a sustainable yield, that is, they try to keep the forests healthy and producing at a rate that meets our needs.

A simple fact of life is that you cannot be all things at all times; however, you can be different things at different times. The same is true for a forest, so forest management embraces this concept. It is called multiple-use management. Even though the final goal may be wood production, a forest can provide other valuable things in its lifetime. For example, at one point in its life, a forest may provide abundant food for deer and elk. As the trees grow and the canopy closes in, it gives these same animals protection from the weather. As the trees continue to grow, they may produce lots of oxygen, shade, recreation and wildlife habitat, too. Later still, the trees may be harvested to give people wood and paper products.

Following are some of the most common management strategies foresters use to produce the things that people want from forests.
Common Management Strategies

Once the goals and objectives for a piece of forested land are established, management strategies are selected. The most common strategies used are even-aged and uneven-aged management. Nature creates both even and uneven-aged forest stands. The type of stand created depends on many factors including: the climate, how often disturbances (like fire) occur and the species of trees that are in the area. Forest managers think about these natural conditions when deciding what management strategy to apply.

Even-aged Management

Even-aged management creates a forest where most of the trees are about the same age. How is this done? First an area is cleared of the existing trees, often by windstorm, fire or through timber harvesting. Once the area is cleared, the site is prepared to give seedlings a good chance to grow. Seedlings are then planted and the forest begins to grow. Once the trees reach a certain age or size they may be thinned periodically and later harvested. The process can then begin anew. Many of Oregon’s Douglas-fir forests are managed in this way. This is a common management strategy for timber production.

Uneven-aged Management

Many of the same management techniques that are used in even-aged stands are also used in uneven-aged management. Can you guess what uneven-aged management is? If you think it means that trees of many ages are kept in the stand, you’re right! Mature trees in the stand produce seeds that can sprout and produce trees without human assistance. However, we may want to introduce certain kinds of trees or speed up the process of regeneration, so seedlings are sometimes planted in the openings. These openings are usually small and they can be made when other trees blow over or are harvested.

To maintain an uneven-aged forest over time, trees are thinned or harvested periodically. Often these two operations occur at the same time, since both large and small trees are cut in order to give the remaining trees the resources they need to improve their growth. The basic structure of this kind of forest can be maintained for hundreds of years with careful planning and management. Even though even-aged forests can be easier to manage, we may choose to have uneven-aged forests for a number of reasons, including wildlife habitat, fresh water production, recreation or just because they are more visually appealing.

So how do foresters achieve these management strategies? They plan and carry out several management activities to grow and maintain a forest.

Management - 2
Common Management Activities

Site Preparation - Clearing the Way for New Trees

Tree seeds and seedlings have very specific needs if they are to grow. Do you have any idea what these are?

Most tree seeds and seedlings must be in contact with bare mineral soil and have adequate moisture and sunlight to start growing. When any of these conditions are absent, the seeds fail to germinate or the seedlings die. Foresters prepare a site to remove as many negative impacts to seedling growth as they can. They use a variety of tools such as fire, bulldozers and herbicides to prepare a site for regeneration. If an area was cleared by fire, bare soil will be exposed and plenty of light will reach the ground, so there may be little to do but wait until moisture conditions are right to plant trees. However, if an area was cleared by timber harvest, the site may need some cleaning up, as branches and bark covering the ground may interfere with planting or keep seeds from reaching mineral soil. What can be done with this debris? Burning or piling the left over logging slash so that bare mineral soil is available for the new trees is a helpful option. If it has been years since the site was harvested or burned, shrubs and grasses may have taken over. These plants use up the water and nutrients that the young trees will need. If the “competing” plants are tall enough, they may also prevent the small trees from getting the sunlight they need to grow.
Can you grow healthy vigorous seedlings on this site? What would you do to prepare the site for new trees?

I can't plant this site!
Regeneration - Starting Over

How is a forest regenerated or restarted after clearing or timber harvest?

Before people began managing forests, nature took care of regenerating an area cleared of its trees. For example, in a Douglas-fir forest, the cones open in late summer (just before you head back to school) and seeds scatter over the ground. The seeds lay on the ground throughout the winter, where some of them will be eaten by small animals like birds, mice or squirrels. In the spring, the remaining seeds germinate and begin to grow if the conditions are right. To continue growing, the seedlings need moisture and nutrients from the soil and protection from animals that eat them.

So, how does nature clear an area so seeds can germinate and grow? Wildfires and windstorms are the most common ways of creating bare mineral soil for seeds.

Nature has developed a good system for growing trees. Mature trees produce many seeds, year after year, so that when conditions are right new trees will grow. This adaptation is very successful, however, humans often step in and speed up the process of regeneration.

Foresters have tried many things to regenerate forest land. At one time, seeds were sprinkled from helicopters on burned or harvested land. Although this worked, it still took a long time for the seeds to germinate and grow. Now, foresters grow seedling trees in nurseries and plant them into cleared areas. Planting trees lets us select the species we want to grow and spaces them so that the trees grow without competing against each other. Tree planters learn to choose sites where the seedlings are likely to grow. On the school forestry tour, you can ask the forester more questions about regeneration.
Fertilization - Food for Growth

Once the trees have been planted or have seeded in and are growing, foresters monitor their growth. A tree needs a certain amount of nutrients to thrive. In a natural system, nutrients are put into the soil by the slow decomposition of rocks, plants, animals, and by rainwater. A plant will absorb the nutrients it needs and use them to grow. Later when the plant dies, the nutrients break down and become part of the soil. This process of nutrient uptake and storage, then plant death and slow decomposition, is referred to as the nutrient cycle.

In some forests, this process is very slow. In other forests, some nutrients may be missing altogether. When this occurs, foresters may fertilize the area in order to help the trees grow faster. Fertilizing trees is very expensive and is done only where trees will benefit the most. Some sites have so few nutrients that even fertilizing won’t make them productive.

[Images of tree rings labeled "Not Fertilized" and "Fertilized"]

These trees are the same size, but the one on the right is younger!

Thinning - Give Me Some Space

What would happen if all of the seeds that fell out of a cone survived and grew into young trees? What if all of the seedlings that were planted survived? Well, it might get pretty crowded. In nature, some of the seedlings would die because they could not get enough light, water or other nutrients. Some seedlings may be eaten by animals or weakened by insects or disease. This natural process is called thinning. As a forest grows, individual trees get bigger, while the total number of trees gets smaller! Foresters imitate nature’s process by removing some of the trees in a young forest.

Foresters often plan to cut some of the trees in a stand in order to give the remaining trees a chance to get enough water, nutrients, space, and sunlight. A stand may be thinned several times before it is ready to be harvested. The first thinning is likely to occur when the branches of the neighboring trees begin to touch, usually around 10-15 years of age. These trees may be too small to be used as wood products and are usually left on the forest floor to rot, releasing their nutrients into the soil for the remaining trees. This type of thinning is known as a pre-commercial thinning.
As the remaining trees grow older and their crowns begin to touch again, another thinning will take place. This thinning, done when the trees are around 30 or 40 years old, is called a commercial thinning. The trees that are removed can be harvested and used to make various wood products. Other commercial thinnings may be done during the life of the stand, each one giving the remaining trees more room to grow and better access to the essentials for growth. Because each forest has only a limited supply of nutrients, water, and space, foresters try to channel these resources into the trees that will be our forests of the future. Usually, the smaller, less healthy trees are removed in a thinning, leaving the larger and faster growing trees.

You can practice thinning this stand of trees!

Thin this stand of trees so that NO crowns touch! (Hint: cross out the smaller trees first)

Harvest - Trees Leave the Forest

Trees are cut, logged, and taken to mills to produce a variety of forest products. For some forests, this is the ultimate goal - wood production. After harvest, the land is replanted so that the cycle of managing a forest can begin again. In even-aged management, a harvest area is called a “clear cut” because all but a few trees are removed from the area. In uneven-aged management, harvest units are called “selective cuts” or “partial cuts” because few trees are removed and much of the original forest remains.
Managing for the Future

Activities such as site preparation, regeneration, fertilization and thinning are just a few of the practices that occur in a managed forest. Regardless of the activity that foresters choose, they must always work within the biological guidelines established by nature. Foresters must imitate nature by knowing which species grows best in the forest they are working in and they must know how many trees to plant in order to give each tree a chance to grow. On the forestry tour ask the foresters questions about the different management activities that help Oregon’s forests provide us with the wood products, clean water, fresh air, wildlife and recreation we want for the future.
Fire in the Forest

From time to time, fire burns through a forest. Even before recorded time, wildfires burned the land. To understand the role fire plays in forests, we must first understand what fire is. When someone strikes a match, a flame appears, as if by magic. But, what is it? Where did it come from? What makes it burn?

Fire is a rapid chemical reaction caused when heat is applied to fuel, in the presence of oxygen. The fuel and oxygen are converted to light and more heat. This process needs all three elements to occur. These three essentials make up the fire triangle. If any of these elements are absent, a fire cannot start or continue burning. Let's look at each of these more closely.

1. Heat must be present for a fire to start. It is the source of ignition or what causes the fire to start. Ignition is commonly caused by electric current or friction. Lightning is an example of an electric current that can start a forest fire. Friction is caused by rubbing two things together. Rub your hands together quickly and they will become warm. This is due to friction. Friction is also responsible for a match bursting into flame. Matches can start fires and small fires, like campfires can be the heat source that starts a forest fire. How can we prevent this from happening?

2. Fuel is essential to a fire and the forest is a rich source of fuels. Fuels are combustible or burnable substances like dry grass, dead dry leaves or needles, branches, limbs and trees. Fire consumes fuel, converting it to light and heat. Can you think of other fuels?

3. The third component is oxygen. It is in the air we breathe. We need it to live and so does a fire. If oxygen is taken away, the fire cannot burn. How can the air or oxygen be removed from a fire to stop it from burning?

Fire - 1
Effects of Fire

Now that we know what fire is and what is needed for it to burn, lets look at different types of fire and their effects on the forest.

Fires can start naturally, like those caused by lightning strikes or they can be human-caused. Either way, a number of factors combine to determine the intensity of each and every fire. Some are hot and intense. These usually burn quickly and are much more dangerous than slower burning fires.

Very hot fires are fast moving and can cover large areas, these are known as high-intensity fires. The hotter the fire is, the larger the fuels it will burn. These raging fires often consume all of the fuel in their path and leave little behind but blackened tree stems and burned earth. These infernos strip the life from a forest and many years are needed for it to recover.

Moderate or low-intensity fires burn more slowly and stay closer to the ground. They are less severe and smaller in size. The less intense the fire, the less heat there is to ignite fuels, so these fires consume the smaller, drier fuels. They tend to burn in patches, moving through the areas that are driest or have the smallest, most combustible fuels. These fires are often beneficial to the forest.

Many factors determine how intense a fire will become. The type, size and amount of fuel are crucial. Fine dry fuels ignite more easily than larger less dry fuels. For example, dry grass and twigs will burn more easily than limbs or tree trunks. The weather is an important factor. Has it been warm and dry or has it rained recently? How much moisture is in the air? Hotter, drier weather can result in more intense and frequent fires. Wind is another factor. It can bring fresh oxygen to a burning embers or fuel. The drier and faster the wind, the more it encourages a fire. The landform also influences how large and hot a fire can become. For example, fire moves more quickly and easily uphill than downhill.

Fires have influenced the forests we see today. Some forests depend on periodic fire. The heat of a fire is needed for the cones of some tree species to open and drop their seeds to the ground or to help seeds sprout. Some trees need fire to clear out the understory, allowing light to reach the ground and reducing competition for nutrients needed by young seedlings.
Fire as a Tool

People have used fire to shape the forest for centuries. Native Americans set fires to improve their food supply. Fire encouraged the growth of berries and other desirable food plants. Periodic burning reduced rough grass and shrubs and made it easier to hunt and gather their food. They also used fire to heat and help harvest seeds. Where they burned, the area was open and there was more food for the wild animals they hunted for meat, too. Early pioneers used fire to clear the land for farming and homesteads. Today, forest managers are still using fire to shape the forest. After logging, unwanted branches and debris, called slash, are piled and burned. This helps to clean up the area and prepare it for replanting. This type of fire is called "slash burning". It is set only under strict weather conditions and is watched carefully.

Fires are prescribed by forest managers for other reasons too. Dead leaves and needles can collect on the forest floor creating a layer of dry fine fuels. These may be burned off periodically when the conditions are right for a safer low-intensity fire. These burns can prevent a dangerous high-intensity blaze that is difficult to control. Prescribed fire may be used to clear out old grasses and shrubs, making way for fresh new growth that wildlife like to eat. All prescribed burns are carefully watched by trained fire fighters who control them, so they don't get out of hand.

Sometimes, fires that start naturally by lightning in wilderness areas and National Parks are allowed to burn, as long as they don't threaten peoples' homes and property. Natural fires are carefully supervised; if one becomes too hot, too fast, or becomes a threat to lives and property, fire fighters try to put it out.

SMOKEY Says:

On occasion, human carelessness will result in a wildfire. Playing with matches, cigarettes and unwatched or out of control campfires can start fires that do harm to the forest. They can rage out of control destroying trees, homes, wildlife and sometimes killing people too. Remember Smokey Bear? His message "Only you can prevent forest fires" reminds us to be careful and avoid starting these dangerous fires. Please be careful when you visit the forest. Remember Smokey and his message "Only you can prevent forest fires".
Fire Suppression

Fire that is out of control is called wildfire. Wildfire threatens and sometimes destroys homes and other valuable resources. Trained people are dispatched to try to get these fires under control or suppressed. Skilled fire fighters know that a fire can be put out by removing one of the elements in the fire triangle. Do you remember what those are? A large high-intensity fire that is out of control is very dangerous and difficult to stop. This type of fire can burn for days or weeks, destroying hundreds or even thousands of acres of important resources. A change in the weather or wind is often the key to stopping an intense wildfire. How do you think the weather can help put the fire out?

It is important to remember that there are many different kinds of forest fires and fires are a natural part of our forests. Fire can be beneficial to the forest and the plants and animals that live there. However, some fires destroy precious wildlife habitat and other valuable forest resources. They can damage the land severely and make recovery difficult. Only trained professionals are qualified to use fire. The rest of us need to be respectful and very careful when we are in the forest.

On the tour, you will see the tools that professional fire fighters use to limit or control the spread of fire. Ask these firefighters about specific ways you can help stop destructive fires.
Maintaining Habitats

Oregon's forests are made up of a variety of habitats. In order for wild animals to survive, a variety of habitat must be maintained. When trees are harvested to supply human demands, land managers strive to balance many different needs. They make choices about how the land is used and the different habitats that will be around in the future. They try to respect the natural diversity and maintain it for maximum benefits.

Forest managers must be aware of the wildlife and their needs when considering activities in the forest. Here are some things they can do to help wildlife:

1. When cutting trees, leave some standing dead trees for birds, squirrels, raccoons and other animals that like to live in cavities or holes in trees.

2. When clearing an area of trees, leave some rotten logs for the small creatures like insects, lizards and mice that depend on them for food and shelter.

3. When nests for eagles, osprey and some owls are found, avoid disturbing the trees where they nest.

4. Keep machinery and falling trees out of wetlands, streams and river bottoms that provide valuable habitat for birds, amphibians, reptiles and fish.

5. When building roads or harvesting trees take measures to keep disturbed soil from washing into and clogging up streams.

6. Encourage native plants or plant food plants for wildlife, as well as planting trees.

7. Leave some areas undisturbed and natural for the benefit of wildlife.

Do not disturb wild animals. Let the wildlife be wild!

Wildlife - 3
There are many different kinds of fish that live in the streams and rivers of Oregon. You have probably heard of some popular game fish including salmon, steelhead, cutthroat trout and others. Game fish are those fish that people catch for sport. However, there are many other native fish living in Oregon waters that you’ve probably never heard about. Native fish are those fish that adapted over a long period of time to live in a certain place. Suckers, squawfish, shiners, sturgeon, chubs, stickleback, sculpin, dace, and lamprey are all examples of native fish. While not much is known about these species and they may not seem important, they all serve an important purpose. They are crucial to maintaining a healthy river system. Pictures of some of these fish are shown below. Have you seen any of these?

**Fish - 1**
**Late Arrivals**

Several species of non-native fish, or fish that weren’t naturally found here also inhabit the streams and rivers. These fish were put in local waters by people, either accidentally or on purpose. Smallmouth bass, shad, striped bass, brook trout, and brown trout are all examples of non-native fish found in Oregon. In some cases, these non-natives can have a harmful effect on native fish populations, because they upset the natural balance that took thousands or perhaps millions of years to develop.

**Life Starts in the Stream**

Some of the fish mentioned above, like the dace, sculpin, shiner, and some cutthroat or rainbow trout, spend their entire lives in the fresh water of a river system. They are called “resident fish”. These “residents” spend their whole life, from the time they hatch until they die, in a particular stream, lake or river. Other fish, like chinook or coho salmon, steelhead, sea-run cutthroat trout, lamprey and sturgeon spend only part of their lives in fresh water. These fish are called “anadromous”. They hatch in the fresh water of streams or rivers and swim down into the salt water of the ocean. There, they become adults and live for a time in the ocean, then migrate back up the fresh water rivers to the streams where they hatched, in order to lay their eggs. The whole cycle then begins again. The diagram below shows the life cycle of anadromous salmon and steelhead.

![Diagram of fish life cycle](image-url)
Young fish face a pretty tough journey throughout their lives. As small fish, they must survive the harsh conditions found in the small streams and rivers. These little fish may encounter predators or other animals that would like to eat them, including great blue herons, larger fish, ducks and humans. Floods present another hazard because the raging water could wash them downstream or destroy their habitat. Droughts can cause the water to dry up leaving them no place to live. Some other dangers include pollution, lack of oxygen, loss of cover to hide in, irrigation pumps and dams.

Anadromous fish face all of these challenges and swim miles to the ocean, where they face a whole new set of challenges as they grow into adults. The predators may be even bigger including larger fish, seals, sea lions, commercial and sport fishermen. Also, changing ocean conditions can leave them without enough food or cover.

During their upstream journey to lay their eggs, anadromous fish face numerous obstacles that may prevent them from completing their mission. Fisherman, dams, floods, poor habitat, predators, drought, and pollution can all reduce the health or number of fish that survive to reproduce.

Because life is dangerous and fish parents can’t stay with their young to protect them as they grow up, very few fish survive to spawn. The few that do survive produce enough young to increase the chances that the species will survive. Each female fish lays a tremendous number of eggs. For example, salmon or steelhead lay 2,500 to 3,000 eggs and sturgeon can lay millions of eggs! From all these eggs, perhaps a few adult fish from each set of parents will return to spawn and keep the cycle going. The diagram below shows fish survival.

![Diagram of fish life cycle]

Eggs → Smolts → Ocean Adults → Spawning Adults → Fry → 2,500
**Habitat: Home Sweet Home**

To survive and thrive, all animals need good quality habitat and fish are no exception. "Good" habitat includes oxygen to breathe, water, food and shelter.

Fish breathe oxygen like other animals, but they generally get theirs from the water. Obviously, fish need water to survive. Fish in streams generally need clean cool water that flows all year long, even in the hot and dry summer months. Cool, flowing water usually contains plenty of oxygen for fish to breathe. Warm water contains much less oxygen and makes breathing difficult for fish. Cool clean water also contains vital nutrients needed by aquatic insects, plants and other small organisms. These small creatures and plants are in turn used by other organisms, forming the base of the "food chain" in a stream.

Food is necessary for fish survival, too. In streams, insects make up the largest part of a fish's diet. Bugs that live on land, such as grasshoppers, beetles and ants, as well as bugs that live in the water, such as mayflies, caddisflies and stoneflies are the most common meals for these fish. Fish feed on many other insects from the land and water, too.

![MAYFLY](image1.png)

![CADDISFLY](image2.png)

![STONEFLY](image3.png)

Shelter is probably the most basic habitat requirement. Without a place to hide from predators, be protected from big storms or find food, fish would have a tough time surviving. Different sized fish need different kinds of shelter or cover. Small fish that are 1 to 2 inches long may be able to use a small branch or rock to hide behind, but bigger fish that are 3 to 10 inches long need larger cover, such as down logs, large boulders and deep pools.

*Fish - 4*
What about other types of habitat? Adult fish need a place to lay their eggs or spawn and this is called "spawning habitat". Generally, good clean gravels - rocks ranging from a pea to a baseball in size, are what fish need. When the gravels are dirty, smaller sand or silt particles fill the spaces between gravels and can smother and kill the eggs. The picture below displays salmon constructing their nest in the gravel. A salmon nest is called a redd.

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**People and Fish**

In the Pacific Northwest, salmon and steelhead have been an important source of food for thousands of years. Many Native American cultures depended upon these fish for their survival. Today, these fish are still a valuable food source for many people. They also provide jobs in the commercial fishing and recreational sport fishing industries.

Recently, there have been fewer salmon and steelhead returning to the streams in the Pacific Northwest. There are many possible reasons for these population declines. For example, when too many fish are caught, there are not enough fish left to spawn and produce the next generation of fish. Additionally, when the habitat that these fish need is in bad shape, not enough young fish survive to reproduce.

Habitat deterioration or destruction can be caused in many ways. In what ways do you think fish habitat can be destroyed? Well, there are natural events like floods or landslides. Also, people do things that have harmful effects. They don’t think about the fish or water that many be impacted. Human activities that can be harmful to fish and their habitat include dumping used chemicals into streams, large mining operations, unmanaged cattle grazing, irrigation for crops, construction of dams, or too much logging or road building near streams. A number of other human actions can also have a bad effect on fish populations and water quality.

Most of the activities above can all be done in a way that will lower the risks to fish and water quality. How do you think we can do these activities without damaging or destroying fish and their habitat?
Restoration and Conservation

If we want salmon, steelhead and other fish to be around in the future, we must change the way we do certain things! Instead of dumping used chemicals on the ground where they find their way into streams, recycle them or find another use for them. For example, take paint, paint thinner, fertilizer and other garden chemicals, antifreeze and motor oil to the landfill for recycling or disposal. Ranchers can better manage their land by building fences to keep livestock out of streams. When cattle and horses are allowed to graze through streams they eat grasses and shrubs that shade the stream and help keep the water cool. (Remember cool water makes it possible for fish to breathe.) Sharp hooves also break down the stream banks, causing soil particles like sand and silt to wash into the steam, damaging spawning habitat. Instead of building more dams for electricity, we can conserve energy or look for other sources. If dams must be built, build fish ladders so the migrating fish can get upstream to spawn. When irrigating crops, avoid wasting water by using less and put screens on the pumps so they don’t suck up the little fish.

When it comes to logging, leave wide strips of trees called buffers, next to streams. Remember, fish use large wood for cover, and the trees also shade the stream and keep it cool. Avoid cutting trees on steep slopes or unstable soil that could result in a landslide or erosion. Remember, adult fish need clean gravels to lay their eggs in. Leave wood and boulders in streams - the fish use these for cover from predators and storms.

Once fish habitat is damaged, its very difficult to fix or rehabilitate! We can all play a part in preventing damage and protecting the “good” habitat that’s left. This is the best way to make sure that the fish will be around for generations to come.

Besides encouraging adults to do what they can, what can you do to help the fish? Actually, there are quite a few things you can do to help fish and “conserve” resources. These include: turning off the lights when leaving a room. Fewer demands for electricity means fewer dams will be built to supply it. Take shorter showers and don’t let the tap water run when you’re brushing your teeth. This will leave more water in the streams for the fish. Practice catch and release fishing. Pick up trash around lakes and streams, especially plastics like fishing line and the plastic rings that hold six-pack pop cans together. These are just a few little things we can all do so that Oregon will have fish in the future.

Fish - 6
Forest Recreation

People have always enjoyed the forest for its beauty and diversity. Over the past decade, there has been an increasing demand on the forest for recreational opportunities. We need to play or recreate to refresh and renew our minds and bodies. Some people like to recreate by picnicking or sightseeing, while others enjoy more strenuous activities like hiking or rock climbing. Camping, skiing, fishing, hunting and birdwatching are some recreational activities that people enjoy in forests. Can you think of at least three others?

Americans are able to enjoy outdoor recreational activities in a number of places. Public land like local parks, state and federally managed lands are all managed, at least in part, to provide recreation for people. Wilderness areas and National Parks were created to preserve unique areas and their unique scenic, natural and historical features, while providing enjoyment and educational opportunities for people.

These opportunities are present in areas that range from undeveloped primitive to highly developed urban settings.

The least developed areas are those set aside in their natural condition. These primitive recreational sites have no buildings or services such as bathrooms or running water. They are places where people can get back to nature and experience the solitude of the natural world. For land managers like the Forest Service, the challenge is to keep these areas free from human influence. Wilderness is an example of an undeveloped primitive area. Wilderness areas have no roads; cars, trucks and even power equipment are not allowed.

Semi-primitive areas are natural environments that include some improvements like campsites. People can enjoy the beauty of nature and still have a few civilized conveniences. Many parks and campgrounds in the forest fit in this category.

The most convenient and developed recreational areas are urban. Urban recreational areas often have all the conveniences of home and are managed primarily for recreation. These places can have parking lots and gift shops for the large numbers of people that visit these highly developed sites. Look at a map of Oregon and find examples of each of these. Remember more than one recreation area type may be found in a large forest or park. For example, Crater Lake National Park has primitive areas in the backcountry, semi-primitive campgrounds and urban facilities at the park headquarters.

Recreation - 1
Obviously, different areas are suited to different types of recreation. Forest trails provide a place for activities like bird watching, horseback riding, mountain biking and hiking. Rivers and lakes allow boating, rafting, swimming, water skiing and fishing opportunities. However, all activities suited to one place may not be compatible with each other. Imagine riding a horse up a steep narrow trail and coming face to face with a radical mountain biker flying down the hill! How about cross-country skiing on a quiet trail, enjoying the solitude and having a near miss with a speeding snowmobile. Conflicts occur - that is why some areas are set aside for certain activities. For example a trail may be reserved for hiking only, while another is just for mountain bikes. As more people head to the forests, conflicts are becoming more common. Recreation planners try to reduce conflicts so people can have fun on public lands. Simply following the rules posted at each recreation site will make your visit to the forest more safe and fun.

As the human population grows, even more people will want to visit forests and other wild areas. How will we keep these areas healthy and enjoyable? We can be considerate of others; otherwise, more rules will be made. People are encouraged to follow the rules and show respect for the area and its resources, so they can be enjoyed in the future. Here is what you can do:

1. Follow any rules that are posted at the recreation site.

2. Have fun, but avoid being careless or sloppy, which can lead to unintentional damage to the recreational site or its resources.

3. Pick up your trash, put it in trash cans or take it home and dispose of it.

4. Keep pets under control, prevent them from disturbing others and clean up their messes.

5. Stay on trails - this prevents erosion and trampling of sensitive plants.

6. Use designated roads.

7. Use established campfire rings and stay with the fire until it is safely out.

8. Report damage or vandalism to camp host, ranger or land owner.
Stop Litter and Vandalism

People that deliberately destroy signs, facilities, wildlife or other resources are known as vandals. Damaging property (public or private) is vandalism. Vandalism not only looks ugly, but is very expensive and costs us all. Imagine going to your favorite camping spot on the beautiful sunny weekend. You remember how much fun you had last time you were there. You arrive to see the signs full of bullet holes, the picnic tables turned over, the bathrooms spray painted with graffiti, toilets stopped up, trees destroyed or trash all over the place. How would you feel? Disappointed? Angry? Do you think “How can people be so rude, inconsiderate and irresponsible?”

ARE FOLKS ALWAYS PICKIN’ UP AFTER YOU?

Be a responsible forest user by doing your part to keep the forest recreation environment healthy and enjoyable, for yourself and others. Encourage your friends and family to do the same. Do your best to minimize your impact on recreation sites by following the rules. When you get ready to leave, make sure the area is cleaned up; better still, leave it cleaner than you found it.

Other Recreational Activities

At the beginning of this section, you were asked to think of at least two recreational activities that can occur in a forest. Did you think of any of these?

Wildland and wildlife photography, wildlife watching, birdwatching, wildflower hunting, field botany, swimming, boating, water skiing, jet skiing, rafting, kayaking, canoeing, backpacking, packing with horses and llamas, snow camping, cross country or downhill skiing, snowmobiling, ATV riding, mountain biking, orienteering, survival skills training, cave exploring, rock climbing, sight seeing and visiting interpretive centers.
Oregon Archaeology

People have lived in Oregon for at least 13,000 years. These early people didn't make books or videos to tell us about their lives, but they did make tools and things that they used in everyday life. These things can tell about how early people lived, what they ate, how they caught and cooked their food and sometimes even what they considered important. The scientists that collect and study these items are known as archaeologists.

The Science of Archaeology

Archaeologists are detectives, peering into the past by sifting through the things left behind by people. Discovery of artifacts or objects that people made, together with the location and arrangement of the artifacts, along with other objects like animal bones, can create a picture of how early people lived. When archaeologists begin looking at a site, they carefully study where each item is in relation to other items. The objects can tell a more complete story when they are found together, where their owners left them.

As time goes by many of these archaeological sites are destroyed or damaged and valuable information is lost forever. Floods, erosion, animals and even people may carry away vital clues to past history. The older the culture, the less likely it is that we will get a clear picture of how the people lived. Wood and soft materials like grass or leather decay and disappear. So, after many years only the hardest materials remain, like bone and stone. Stone tools, bones, soil and tiny pollen grains are used to reconstruct scenes of the past, including the climate and the plants and animals that were alive. Artifacts give clues to how people hunted and prepared their food. But they cannot tell us everything. So the archaeological record may not be the same as the historic or written record. For example, stories, beliefs, rituals, religion and behaviors are lost when they are no longer repeated or recorded.

Archaeologists working with today's cultures can learn about people by studying the things they throw away. Just like people today, people in the past threw away unusable or unwanted items. Their garbage piles or prehistoric dumps are called "middens". Middens are a rich source of archaeological information. Layers of trash in the midden tell a story over time. When found by scientists, these are excavated very carefully. Analysis of pieces of bone, stone, shells, plant remains and charcoal from cooking fires give us data on the lifestyle of the people.

In order to piece together human history, artifacts and the sites where they are found are carefully studied. If someone found a projectile point, like an arrow head and took it, a valuable clue to the past would be lost forever. So it is against the law to pick up such artifacts without a permit.

Archaeology - 1
Oregon’s Pre-Historic Time Periods

In Oregon, archaeologists divide early American Indian artifacts into three time periods. First was the Paleo-Indian time period that started at least 13,000 years ago. Then came the Archaic time period. This is followed by the Historic time period that began when explorers and settlers arrived. In the Historic time period people often wrote about people and events, so there are written records. Time periods were made based on changes in the tools that people used. New tools were made food sources changed and people developed better ways to hunt, process and store food. These time periods overlap, but in general, large thrusting spears were used, to kill animals the in Paleo-Indian times. In the early Archaic time period, smaller spears were more common, after many of the largest animals died out. In the middle Archaic period, people mastered a spear thrower called an atlatl, and in Late Archaic times they developed bow and arrow hunting.

Time Periods for Human Inhabitation of Oregon

<table>
<thead>
<tr>
<th>Ice Age</th>
<th>People cross Beringia to N. America</th>
<th>Climate gets warmer and drier, large herd animals go extinct. Many early human cultures develop.</th>
<th>Number of Years Ago</th>
</tr>
</thead>
<tbody>
<tr>
<td>12,000</td>
<td>10,000</td>
<td>8,000</td>
<td>6,000</td>
</tr>
<tr>
<td></td>
<td></td>
<td>4,000</td>
<td>2,000</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>250</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Now</td>
</tr>
</tbody>
</table>

Explorers arrive

The First Oregonians

The first people to live in Oregon are now known as Paleo-Indians. (Paleo = Ancient) Scientists believe the Paleo-Indian people crossed a land bridge called Beringia, that linked Asia to North America during the last great ice age. Because these people lived so long ago, there is little evidence left of their cultures. We do know that they lived in small groups that moved around, probably following their food supply from place to place. In this way they migrated over North and South America.

These early Indians liked to live around lakes or marshes, where animals came to drink and food was more plentiful. Some Paleo-Indians hunted large herd animals like mammoths, mastadons, camels and giant bison. They used long thrusting spears with large points to kill these large animals. The points were named Clovis points. They have been found at several sites in Oregon, including one found recently near Glide. They have also been found scattered all over North America. What does this tell you?
Clovis points and the tools found with them are known as the "Clovis artifact tradition". Artifacts are items made or modified for human use. They include tools, weapons and ornaments. Certain kinds of tools are usually found together in a site. These groupings of tools reflect a time, a place and a lifestyle. There have been many artifact traditions found in Oregon, but Clovis is the most common from Paleo-Indian times.

**Regions of Oregon in the Late Archaic Time Period**

About 3,000 years ago, the climate became similar to what we know today. The cultures of the Oregon Indians that explorers met began about this time in the late Archaic time period. These cultures lasted until the explorers and settlers arrived. They were divided into six categories, based on the tools they used and where they lived. The terrain and the climate were major factors shaping the lives of these people and the food they could find. Indians lived in small groups, bands or villages in most of Oregon. These small groups were widely scattered over the land. Each group lived far from other groups, except along the lower Columbia River.

**Lower Columbia**

These people were known as the Chinooks. They lived along the Columbia River from The Dalles to the Pacific Ocean. Their culture was dramatically different than any other in Oregon. They enjoyed a rich and plentiful food supply including: salmon, sturgeon, seal, clams, ducks, geese, beaver, muskrat, otter, deer, elk and a huge variety of plant foods. Chinooks were very skilled at havesting and preserving salmon and other foods. As a result, they had a stable food supply, so they were able to build permanent shelters. Large cedar plank houses were constructed in villages along the river. They ranged in size from 25 feet by 40 feet to 40 feet by 120 feet. Take a moment to measure the size of your classroom. How does it compare to these multi-family homes? Large numbers of people lived in this area. At the time the explorers arrived, the Lower Columbia was one of the most densely populated places in North America!
Chinooks used the Columbia River system like we use a highway. In their cedar canoes, they could travel hundreds of miles. They could carry many items in their canoes that would have been impossible to carry while walking. So, they developed a large trading network. Wealth was important to the Chinooks. Wealthy Chinooks had large stores of food and free time for recreation and artistic endeavors. They created bone, stone and wood carvings and canoes to trade for shells, jewelry and even slaves!

Oregon Coast

Many archaeological sites have been found along the Oregon coast, but most are fewer than 3,000 years old. About 3,000 years ago the ocean rose to its current level and many older sites are now under water. Coast Indian artifacts include bone fishing hooks, fishing spears or harpoons, fishing net weights made from stone, decorated seal and elk teeth. What do these artifacts tell you about what they ate? They ate seals, shellfish, fish and mammals along with plant foods.

Coastal Indians did some trading with their neighbors and built circular and rectangular plank homes over shallow pits. They weren’t as wealthy as the Chinooks, but they had dogs!
**Willamette Valley**

Before the settlers arrived, the valley was an open grassland. There were many marshes and islands of forest. The valley flooded frequently. In the winter, people lived in multi-family homes that were located above the flood plain. People living on slopes of the Cascade mountains often found caves for shelter. Winter homes were rectangular structures built over pits, with tree bark roofs. In the summer, people usually lived out in the open but, sometimes they built temporary shelters, like the one pictured here. In the spring and fall, they gathered the roots of the camas lily. It was their main food. Many camas ovens have been found, along with the tools to grind the baked camas bulbs. They also ate hazel nuts, acorns, tarweed seeds, wild cherries, plums, deer, elk, fish and small game animals like rabbit, beaver, muskrat, raccoon and turtles. They developed skills for making baskets and mats. They also did some trading.

**Southwestern Mountains**

The Southwestern Mountain region consists of rugged forested mountains and interior valleys cut by streams and rivers. The Rogue and Umpqua River basins are in this region. The Indians walked wherever they went, so travelling was difficult and the people lived in small isolated bands. They were so isolated that there were about 15 different languages spoken in this area when settlers arrived in the 1800's.

In general, native people built winter villages with up to six or seven houses in a village. Houses were built over shallow pits. The walls and roofs were made with planks or bark. You will see an example of this type of shelter on the tour.

In warmer months, these people moved to small hunting or gathering camps. They actively hunted or set pitfalls traps for large animals like elk and snares for small animals like rabbit. They built fishing platforms and fished with hooks, spears, harpoons and nets. From gathering camps, they dug roots from camas and cat's ear lilies, then baked the bulbs in earth ovens to store for winter. They also collected and dried seeds and berries, like strawberries, thimbleberries and salmonberries. In the fall, they hunted big and small game and

Archaeology - 5
collected ripe nuts, like acorns that they later ground in a hopper mortar. The acorn flour was rinsed to remove the bitterness and boiled before eating.

**Columbia Plateau**

Huge floods at the end of the ice age destroyed most of the evidence of the early inhabitants of this area, which is roughly the northeast quarter of the state. Early explorers found that the Indians had an abundant, dependable food supply. They learned efficient ways to catch, preserve and store salmon. By developing methods to preserve the foods they harvested they were able to change from wandering hunters to village dwellers. This lead to a more permanent living. They built mat lodge homes and pit houses. The Indians had time to build better homes and make creative items like art, games, fancy clothes and jewelry. Since they did not have to move often to find food, they began to keep more things and trade them for other things too. They had horses for travelling and transporting goods. Artifacts found in this area include fish hooks, bone harpoons, fishing net weights, bone tools, combs, beads, game pieces. Mortar and pestles were used to grind dried seeds, nuts, roots, fish and meats.

**Great Basin**

The Great Basin region occupies the southeastern quarter of the state. The area is a large cold dry desert, that is mostly sagebrush-grasslands. It took great skill and knowledge of the environment to survive in this harsh land. The Indians ate mostly roots, seeds and berries. They also hunted birds and mammals like rabbit, ground squirrel, deer and antelope. Plants were used to make baskets, tools, clothing and woven mats. Mats were tied to frames to make homes and shelters. The Indians in this area lived in small bands that roamed over large territories to find enough food and water. They built winter villages, where they spent the harshest months of the year. When the temperature warmed up in the spring, they moved to temporary camps where they hunted, fished and

Archaeology - 6
gathered roots, like camas, seeds from tarweed, and berries like huckleberries, elderberries and currents. Can you think of any roots, seeds or berries that we eat?

**Time Periods for Early Americans in the Great Basin**

<table>
<thead>
<tr>
<th>Period</th>
<th>Paleo</th>
<th>Early Archaic</th>
<th>Middle Archaic</th>
<th>Late Archaic</th>
<th>Historic</th>
</tr>
</thead>
<tbody>
<tr>
<td>Climate</td>
<td>Cool &amp; wet, End of ice age</td>
<td>Becomes warmer &amp; drier</td>
<td>Very warm &amp; very dry</td>
<td>Becomes like it now, Few people, winter villages present, bow &amp; arrow appear</td>
<td>Now</td>
</tr>
<tr>
<td>Hunters</td>
<td>Bisons, horses, camels &amp; mammoths</td>
<td>Hunt with Clovis Points on large spears. Few people.</td>
<td>Hunting deer &amp; antelope with smaller spears and darts thrown with an atlatl.</td>
<td>Settlers arrive</td>
<td>Explorers arrive</td>
</tr>
<tr>
<td>Number of Years Ago</td>
<td>12,000</td>
<td>9,000</td>
<td>7,000</td>
<td>3,000</td>
<td>250</td>
</tr>
</tbody>
</table>

**Atlatl or Spear-Thrower**

**Historic Time Period- Explorers and Settlers Arrive**

Explorers and settlers began arriving in the 1770's. This began the Historic time period from 250 to 150 years ago. It was the beginning of the end of the Indian's way of life in all areas of Oregon. The explorers and settlers brought old world diseases with them, like measles and smallpox. The natives had never experienced these diseases, so they had no immunity, that is, their bodies were not able to fight the infections. In just a few years, diseases wiped out many Indian villages and killed up to 9 out of every 10 Indians in Oregon. After so many people died, the Indians that were left could not carry on life as they had known it. Many cultures were destroyed. Their stories, beliefs, behaviors, and skills were lost, because there were few people left that knew them. There weren't enough Indian people to collect the food, build homes or defend themselves. Additionally, settlers did not understand the Indian's way of life. They claimed land, began clearing trees, building and plowing the land, destroying much of the food Indians depended on. In the mid 1800's, most of the remaining Indians were moved to reservations, where they were thrown together with the remains of many other Indian groups. Since that time, there have been many written reports about early Oregonians. If you'd like to know more, please ask your tour guide and check out books at the library.
Preserve Prehistory

Before the explorers arrived, early Indians did not read and write like we do, instead they talked and passed information on to each other with stories. Since these people are gone, the only remains of many of these early cultures are artifacts. Each site where artifacts are found could give valuable clues to how these people lived. These artifact sites contain some of the heritage of the Indians living today. So it is important that knowledgeable archaeologists study the sites, so that the remaining history is preserved. You can help preserve early American prehistory by leaving artifacts, like spear points and arrow heads, exactly where you find them. Report the find to authorities by calling 1-800-333-SAVE. Also, report anyone stealing artifacts and refuse to buy any artifacts. While on the tour, an archaeologist will show you replicas of artifacts. Ask how they were important and what you can do to help preserve prehistoric items.

SIDE AND CORNER NOTCHED
MIDDLE ARCHAIC POINTS