Celebrating 51 years

WHATCOM COUNTY

6th Grade Tour

May 5 & 6, 2009

IN OUR 51st YEAR

Since the spring of 1959, over 40,000 sixth grade students from Whatcom County have participated in a special opportunity to see the forest through the eyes of professionals who manage it. The goal is simple: to show young people the immense natural ecosystem of our timberlands and explain how we culture it, protect it; enjoy it and how we use its abundant resources.

By having this exposure at an early age, these young people are able to develop clearer understanding of the values, costs, and sometimes-controversial issues involved in forest management.

Since it's beginning, the annual tour has surely accomplished these goals and much more. Some of the earliest sixth graders who participated have grown up, raised families, and now their children have taken the tour. Two generations of experience has proven the importance of the very educational Whatcom County Sixth Grade Tour.

The continued commitment of Whatcom County educators in cooperation with public and private timberland managers assures that yet another generation of young people will receive this valuable gift of a day in the woods with forest professionals.

Our honor roll of contributors includes: Whatcom County School Districts, Hampton Affiliates, Georgia -Pacific Corporation, the State Department of Natural Resources, the U.S. Forest Service, the National Park Service, the WSU Whatcom County Extension, the Natural Resources Conservation Service - Whatcom Conservation District, the Whatcom County Farm Forestry Association, Black Mountain Forestry Center, Sierra Pacific and many individuals. Many individuals contribute greatly to the Sixth Grade Tour each year.

A LEGACY OF FORESTS AND FORESTERS

Forest are wonderful places, full of trees, shrubs, birds, animals, insects and numerous other creatures and vegetation. They may look the same, but you will learn that they are all very different. Some forests have old trees, some have young, and there are different species. A forest is always changing, mostly very slowly, but sometimes quickly. Trees grow bigger each year and then are replaced by new ones. Every time you visit you favorite spot in the woods it will be different, that's the way nature is. Just like with people, every day is different and change occurs as life continues on.

One thing that is special about trees is how long they can live, from fifty years to hundreds of years. The foresters and landowners that grow trees are special people with the foresight and commitment to plant trees today that they may never see become mature, but they do it anyway. Just think about the dedication it takes to plant trees and grow a forest.

The work of a forester is not only to grow and care for trees, but also to be involved with the many other aspects of forestry. One of those is sharing the knowledge and experiences they have gained from working in the forest. That is what the foresters and other resource people do for the 6th Grade Tour each year. One of the dedicated foresters that taught at the tour for over 30 years was Henry "Hank" Reasoner. Hank passed away in 2004 and will be remembered by the thousands of 6th graders who listened to him each year talk about the forests and his life working in the woods. It's important to listen to those who have the knowledge of the past so we can better understand the future. When Hank was young, he saw the trees on the hills cut to make lumber for new houses. Then he watched the new forests grow back, many because of his work as a forester. He understood that forests change and the importance of planting new trees for the future. A fellow forester and friend of Hanks, Bert Powell, also passed away in 2005. Bert helped teach at the 6th Grade Tour and spent a career in the local timber industry. In 2008, we lost John Wibbens. As with the other 2 foresters, John spent a career in the timber industry and promoted the industry to the youth. They would want to be remembered for their dedication to forestry and contributions to make sure Washington State was always green with trees.

As you study about the forests and how important they are to our lives, remember that they are always changing. The small seedling you will plant this year, will grow, become tall and future generations will enjoy its shade.

WHATCOM COUNTY SIXTH GRADE CONSERVATION TOUR

May 5 & 6, 2009

Sponsors:
Black Mountain Forestry Center
Hampton Affiliates
Sierra Pacific
National Park Service
Washington State Department of Natural Resources
United States Forest Service
Whatcom County Farm Forestry Association
WSU Whatcom County Extension
Natural Resources Conservation Service, USDA

The Conservation Tour is at the Olsen Creek Seed Orchard located on the "Y" Road.

PROGRAM

Coordinator: Michael L. Wallace, Extension Educator, WSU Whatcom County Extension

STATION:

1. Introduction
   Whatcom County Farm Forestry Association

2. Forest Protection
   Washington State Department of Natural Resources

3. Water
   WSU Whatcom County Extension
   Whatcom County Water Resources Division

4. Soils
   USDA-Natural Resources Conservation Service

5. Wilderness/Recreation
   U.S. Forest Service
   U.S. Parks Service

6. Forest Ecosystem Management
   Sierra Pacific

7. Forest Regeneration and Improvement
   Hampton Affiliates

8. Timber Harvest/Use of Forest Products
   Black Mountain Forestry Center

Tree seedlings donated courtesy of the Whatcom County Farm Forestry Association.

America's first industry: now more important than ever.

Over the years, industries have come and gone. But the first industry in America – the first enterprise that produced finished products from raw materials – is still vital and dynamic. In fact, it's more important today than ever before.

When early English settlers landed at Jamestown, Virginia, they were awed by the immensity of the forest. But the leader of the group, Captain John Smith, quickly recognized its commercial possibilities. He conveyed his ideas to London, and several months later Dutch and Polish millwrights arrived in the New World. Under the direction of Captain Smith, they constructed a sawmill near Jamestown, and America's first industry was born. The year was 1607.

The Value of Lumber

Soon, America's vast virgin forest was supplying products for many industries. The forest also provided building materials for homes, shops, and churches.

Because of the heavy demands on the forest and the inaccessibility of the enormous wood supply in the interior, the early colonist actually worried about a wood shortage. As early as 1798, newspapers and magazines were urging conservation measures to preserve and improve the forest. It's interesting that the methods advocated at that time are common in modern siliculture (forest management). Editorials urged the thinning of diseased and stunted trees. The harvesting of old trees to promote growth of younger, faster-growing trees. And the thoughtful regulation of fires which settlers often used to clear land for crops.

But conservation was difficult because wood was vital for colonists. They used it to build buggies, buildings, ships, butter churns, walkways, furniture - almost everything.

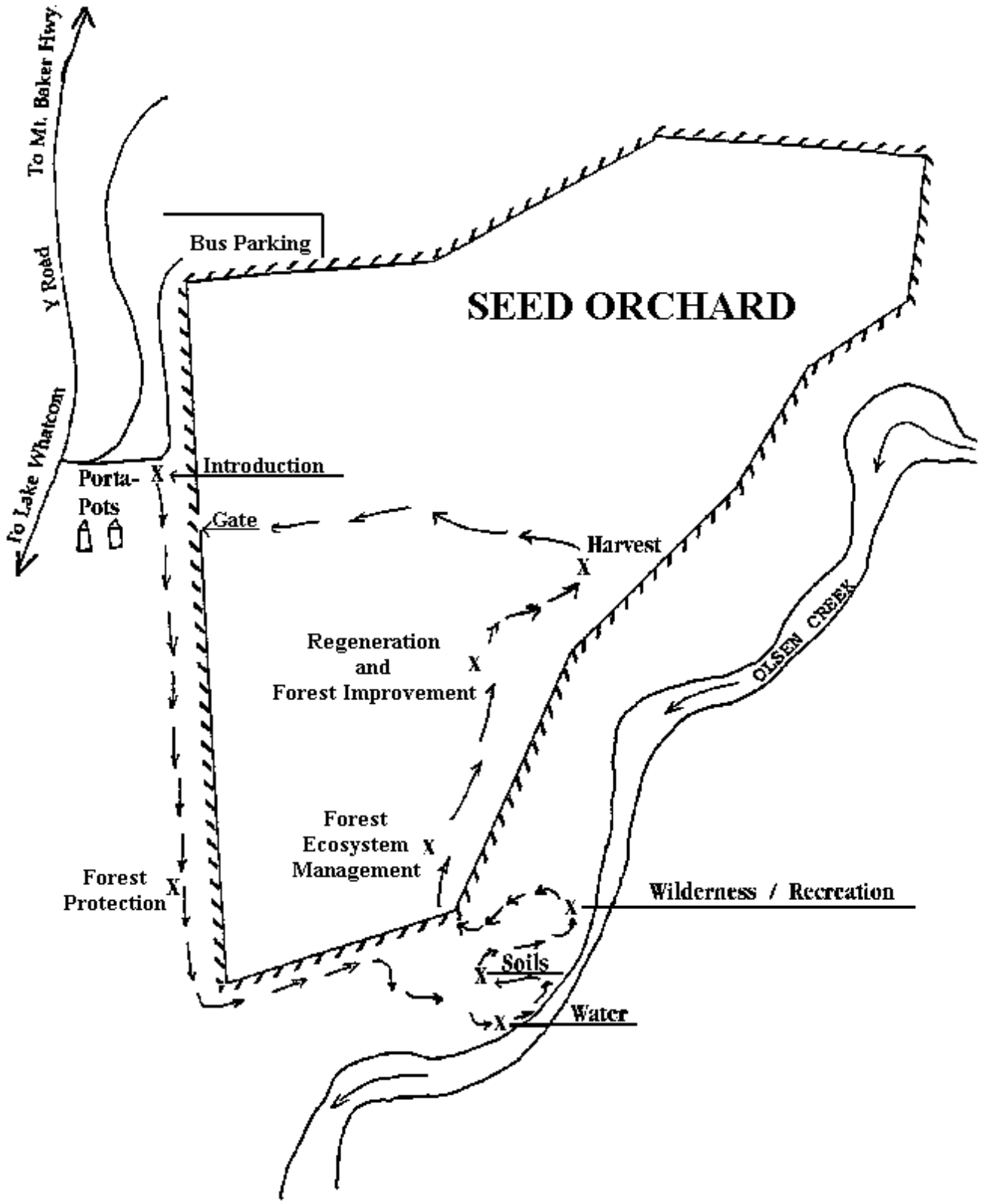
The colonists and early Americans found other interesting uses for trees. A famous colonial charter was hidden in the base of a tree to keep it from the British. On a tree in northeastern Tennessee, these words were carved: "D. Boon killed A BAR on Tree in THE Year 1760." "D. Boon" was of course Daniel Boone. George Washington assumed command of the ragtag colonial army beneath another famous tree, the "Washington Elm," in Cambridge, Massachusetts.

The Future of the Forest

These are just a few examples of the role played by the forest in early America. It was important then. It's important now. And it will be even more important in years to come. Because wood is a renewable source. And, while other natural resources are dwindling, the forest can go on forever.

Teachers, Guides and Guests

Please be advised that weather conditions throughout the year can create unpredictable hazards, particularly near Olson Creek. Slippery surfaces, exposed roots and un-rooted trees can be dangerous. Encourage your students to be alert when hiking through the woods.



Station #1

Introduction and Tree Names

You are guest of the Hampton Tree Farms.

Trees of the forest all have common names. We will examine 3 common evergreen (conifers) and 3 deciduous. For more information and images of these trees go to *http://plants.usda.gov/cgi_bin/topics.cgi?earl=plant_profile.cgi&symbol=PSME* and type in the tree that you would like to learn more about.

WESTERN HEMLOCK

Tsuga heterophylla

This species has become recognized as a really important tree. In coastal forests it is often found mixed with Douglas-fir or the true firs. It also occurs in sizable pure stands. It competes favorably in growth rate with the Douglas-fir but can withstand much more shading. The wood is used for lumber production and pulpwood mostly.

One characteristic of the Western hemlock is that the terminal leader droops.

Western Hemlock has been designated the "State Tree of Washington."

DOUGLAS-FIR

Pseudotsuga menziesii

Douglas-fir, also known as red fir, yellow fir, and Oregon pine, is the most important tree in the West. It is also the most important lumber species in the United States, and is used for cross-ties, piling, plywood, fuel, and Christmas trees.

There are two distinct forms of Douglas-fir. The coast form is larger with trees up to 300 feet tall and 6 feet in diameter. It is one of the fastest growing species in the United States. It grows in the Pacific slope forest often in extensive pure stands. The mountain form is an island tree found higher elevations and grows only moderately fast at best. At maturity trees will be up to 130 feet tall and 3 feet in diameter.

One characteristic of the Douglas fir is cones with three-lobed bracts extending beyond the cone scales.

RED ALDER

Alnus rubra

Red Alder is generally considered to be the most important hardwood in the state. Used for furniture, pulpwood, and fuel wood, primarily, it is the only alder reaching commercial size.

WESTERN REDCEDAR

Thuja plicata

Western redcedar is one of the important species in the state, and reaches its greatest sizes near the coast.

Practically all of the wooden shingles and shakes made in the United States are made of Western redcedar. It is also used extensively for poles, fence posts, boat building, interior finish, and lumber. Wood of this tree resists decay very well. Not only is the wood of the Western redcedar valuable, but the tree itself is a highly prized ornamental.

One characteristic of the Western redcedar is that their cones cluster like a swarm of bees on the branch ends.

BLACK COTTONWOOD

Populus trichocarpa

Black cottonwood is the largest of the hardwoods native to the state. This is also the principal cottonwood native to Washington. It is used for paper pulp, fuel and surface veneer on plywood.

The tree is a common companion of the state's undeveloped streams where it grows along the shorelines and forms limited pure stands on the surrounding bottomlands.

Leaves are alternate, simple usually ovate, finely crenate-serrate, rounded or heart-shape, rounded or heart-shaped at the base, stalk-rounded-dark green above, rusty brown to silvery below, and 3 to 4 inches long.

Buds are about 3/4 inch long with 6 or 7 visible scales, resinous, and with fragrant odor when crushed. Terminal buds somewhat larger than lateral ones.

BIGLEAF MAPLE

Acer macrophyllum

Bigleaf maple is the most important maple native to Washington. Like red alder, it is used primarily for furniture and fuel wood. It is also a good street and shade tree.

This species grows rapidly and is found in mixture with Western Washington trees. It is used commonly for ornamental purposes also.

Leaves are opposite, simple, palmately (hand-like) five-lobed, terminal lobe often three-lobed, margins entire, heart-shaped at base, green above, paler below, 8 to 12 inches long, with stalk 10 to 12 inches long.

FOREST PROTECTION

Fire, insects, diseases and animals are all parts of the natural forest ecosystem. They all play an important role in nutrient recycling and are interdependent upon each other. Too many or too few of any of them can negatively impact a forest. Foresters know that extremes can occur naturally and because of human influences on the environment. Forest protection is the process of maintaining the balance of these four factors in managing the forest for timber, wildlife and fish habitat, water quality, and other uses.

FIRE

Even without human influences, fire occurs naturally. Lightning is the most common natural ignition source of fires. The spread of fires through the forest is dependent upon the weather and amount of burnable material (fuel). All forests eventually have enough fuel and the right weather for a fire to spread, even rain forests. The natural fire cycle involves the reoccurrence of fires and build-up of fuels in between them. Fire cycles vary in different forests from 3 to 500 years. Fires can build soil by producing nutrient-rich ash from wood, or destroy soil by burning too hot and sterilizing the ground. They can kill disease-causing fungi, reduce insect and animal populations, or weaken trees allowing increases in populations of tree-eating organisms. Natural fires are important for certain seed germination and plant renewal.

Humans have used fire in the forest for thousands of years. Native Americans in this state used fire in tree felling, maintaining meadows and berry picking sites, and hunting. European settlers used fire for clearing land. Forest land managers have used controlled fire to prepare sites for reforestation, to reduce wildfire hazards, to control insects and disease, to remove invasive vegetation, and to enhance wildlife habitat. Fire can be a tool or a hazard depending on when and how it occurs.

Uncontrolled fire is called wildfire and can cause harm to the environment and result in a great deal of property loss. In this part of the state, 96% of all wildfires are human-caused. People who use the forest for recreation or have built homes in forested areas cause many of these fires by accident. Outdoor garbage burning (which is illegal) has started many large wildfires that destroyed trees and homes in this state.

The natural fire cycle is often disrupted when homes are built in the forest. Fires that would normally burn the area are put out in order to protect the new homes. This allows more fuel to build up and increases the intensity of future fires. Eventually a fire may start that cannot be stopped, destroying homes and the forest that was able to withstand smaller fires.

For land managers, foresters, and firefighters, maintaining the balance of fire in the forest is much more difficult when homes are present. Homeowners who live in forests need to be aware of the dangers of wildfire and be responsible in protecting their homes. By using fire-resistant building materials, and creating a small clearing around their homes, homeowners can create a defensible space that would allow fires to burn past their homes.

INSECTS

Insects constitute the largest group in the animal kingdom. The great variety of species fills many roles in the ecosystem. The forest depends on insects for pollination and decomposition. Insects are also a major food source for other forest animals and other insects. Certain insects feed on tree foliage, seeds, or inner bark and wood, and spread tree diseases.

Damaging insects of concern to the tree growing industry can be categorized as defoliators, bark beetles and wood borers.

Defoliators eat leaves and tree needles (foliage). They are commonly the larvae of moths. When leaves are consumed, the tree's ability to produce food by photosynthesis is lost causing a reduction in growth and vigor.

Since conifers do not have the ability to grow all their needles back each year like hardwood trees, attacks by large numbers of defoliators can be lethal. Two important defoliators are the Tussock Moth and the Western Spruce BudWorm. Both species cause more damage east of the Cascades than in Whatcom County.

Bark Beetles lay eggs in the bark of trees. The larvae, or grubs, bore extensive galleries in the layer between the bark and the wood and feed on the inner bark or cambium. These galleries reduce the flow of water and nutrients up and down the tree affecting the tree's health. The weakened tree may then become susceptible to other insect attacks and diseases. If the tree dies, its fallen limbs become fuel for fires.

Wood boring beetle larvae tunnel through the wood of weakened and dead trees creating holes that reduce the quality of milled lumber. These holes range in size from pinholes to 3/4" depending on the size of the beetle larva. We find all of these insects at low densities in the forest. Healthy trees are usually capable of withstanding minor insect attack. However, using bark beetles as an example, if a stand of trees is in a weakened condition from some other cause they may not be able to produce an abundant flow of pitch to push the beetles out. The bark beetles will then have enormous reproductive success, creating an epidemic population that can overwhelm even healthy trees. Under these conditions thousands of acres of trees can be damaged or killed. Acres of dead trees in turn create severe fire hazards.

DISEASE

Most important tree diseases are caused by fungi. Fungi also provide very important functions. Nutrients are incorporated into the soil and made available to plants by fungal decomposition of plants and animals. Certain fungi functionally increase a trees fine root system where nutrients are actively taken up. Fungi can live for decades in soil or wood colonies. The word's largest living organism is a fungus that is spread over acres. Fungi that decompose dead wood are saprophytes. Some fungi attack portions of live trees and digest the cellulose or lignin within the wood. While diseased trees may become hosts to insects and cavity-nesting birds and animals, the loss of timber quality and tree mortality are concerns to foresters.

Fungal diseases are categorized by the portion of the tree affected. Root rots decay the underground portion of the tree. Eventually, the tree topples for lack of support. Root rots may affect the healthiest trees as well. Although no cure is known for root rots, some are specific to particular tree species. It may then be effective to plant an alternate species for at least one crop.

Stem diseases affect the main trunk. These rots usually enter through wounds, dead limbs, or insect holes. The decaying of the main stem causes a large reduction in the volume of wood a tree produces. Trees that have swollen bases, scars, or fungal growths on the outside called conks are likely to be decayed on the inside.

An important non-fungal disease is Dwarfmistletoe. This parasitic plant produces tiny grape-like seed pods that explode to shower seeds over the forest. The young plants send roots through the bark into the cambium to feed on the host's nutrients. This interrupts the tree's normal distribution of energy creating wildly increased twig and wood growth (called witches brooms) at the site of the infection. Dwarfmistletoe does not directly kill the tree, but it does slow down growth, reduce wood quality, weaken the host tree, and increase fire hazard. Removing infected trees and planting a different species helps to reduce dwarfmistletoe.

ANIMALS

The forest is home to many animals that use it for shelter and food. Trees are food sources for various animals whose impact on the forest are generally insignificant. Significant damage may occur in forests that are managed for timber production when the trees suffer damage that reduces their growth potential or causes physical defects.

Animals that feed on trees fall into three categories: stem eaters, browsers, and seed eaters.

Stem eaters such as beaver, bear and porcupine feed on the nutritious cambium layer found between the bark and the wood. Those areas where the cambium is removed die causing the tree to lose vigor as it expends energy sealing the wound with pitch. If enough cambium is destroyed, the tree will die. Tree wounds provide an entry site for insects and disease. Porcupines eat cambium near the treetop, often killing the upper portion of the tree. Bears may also be attracted to cambium in the spring when the cambium is richest in sugars. A bear can feed on several trees daily, eating the cambium at the base of the tree and killing trees up to 20 inches in diameter. Foresters have recently created feeding stations in areas where bear damage has occurred. The bear can feed itself with sugary pellets until other natural food plants become available.

Browsers such as deer, mountain beaver and rabbits eat the branches and leaves of young trees. They may kill the tree or deform it by altering it growth pattern. Most importantly in Western Washington these animals often reduce a small tree's height. Seedling height is critical in overcoming competition from brush species, which may grow faster than conifer seedlings. When the brush becomes thick and taller than the seedlings, the seedlings begin to die from lack of light and nutrients.

Seed eaters such as squirrels and chipmunks reduce the amount of seed available to forest nurseries or for natural seeding. However, it is also believed that squirrels may actually inoculate seeds with a beneficial fungus. Inoculated seed may have a competitive edge over other seed.

Birds are important to the forest in two ways. First, some birds such as woodpeckers eat insects that are harmful to trees. Second, birds spread tree seeds in their droppings.

FOREST HEALTH AND FIRE PREVENTION ACTIVITY

1. Forest protection is the process of eliminating insects, disease, and fire. T - F

2. List four benefits that a natural fire may provide to a forest.

3. How do forests affect fire, disease, and animals?

4. List five problems that an intense wildfire can cause.

5. List four ways insects are harmful to the tree growing industry.

6. Burning garbage in a forest area is OK if it is in a burn barrel. T - F.

7. List four ways homeowners can reduce the risk of wildfire to their homes.

WILDFIRE WORDSEARCH

Search for the words below in this puzzle and circle them. They may be spelled forwards, backwards, and place vertically, horizontally or diagonally.

D E S C A L O N I G X T L A S E W A T I R O O B
B F I R E P L A C E C G Q C H O A B B E E L U N
J D E N L U E X K Y L S K Y O W L K R H N F S O
E L O P R I A N E S E S L D S H A K E S P I A R
R E I A Q U V K R T L K Y K E N B R W K R R P I
M N E D N K E J O N E S O R A V E S M O K E N W
I F L X L N S I E M P R E M N Y T O U R S F U T
O O D E T F I R O U T G L O S R I V I L O I K P
L S E R V I C D O O H R O B H G I E N F N G D R
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D E E Y R U L F N O T H A I R Y A M N C A L I F
E R R C O M I B I A T O E N R W Q T E P R D O G
R I G M E S T I C G E K A R L G I H F N J H N U
S F O A G I L B F I R A S A F O E N I E G T B T
B O O K U L M A K S H Y L O N L A M R I K J E T
N R H M I A F E N O S R A R M O T R E E S N D E
F U A D T E N K O G N S E Y E L Y O W S M O K R
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R N H I R G N I N R U B O V K C R T R O O F E B
E E A O K N U V S L Y C O E A R F E K F R A W I
S B E N M O N E D A L H K B F B N U S D V G O K
T B R I H E C E L L S O S L O W S E M A L F L R

ANIMALS
ARSON
BURNING
EXTINGUISHER
FIREFIGHTER
FIREPLACE
FIRE RING
FIREWORKS
FLAMES
FOREST
GUTTERS
HOME
HOSE
LEAVES
MATCHES
NEIGHBORHOOD
PREVENTION
RAKE
RANGERS
ROOF
SHAKES
SHOVEL
SMOKE
SMOKEY
SPARK
TREES
WATER
WOOD

THE FOREST IS A COMPLEX SYSTEM

Presented by the National Park Service

A forest is a complex system. The building blocks of a healthy forest consist of sunlight, clean air, water and soil. The green plants of various species, ages, and sizes provide the structure of the forest. These organisms purify water and air, moderate the climate, provide food and homes for wildlife, and hold the soil in place. Dead trees, those that are standing and those which have fallen, are storehouses for water, provide shelter for wildlife and new surfaces for plants to grow, and, with the help of decomposers will be turned into soil.

Fungi are important components of a forest too. Both above ground fruiting bodies and below underground mycelia, provide food for wildlife, help trees absorb water and nutrients, and break down dead plants and wildlife (decomposers) into the soil.

A healthy forest in the Pacific Northwest also includes a variety, or diversity, of native insects, slugs, spiders, birds, mammals, amphibians, and fish. We will henceforth call this group of living things 'wildlife'.

Within a forest there are constant interactions among green plants and wildlife. Photosynthesis provides plants with sugar-energy for their own growth and oxygen for wildlife use. Wildlife also drinks or lives in the water that cycles through green plants and the soil. At the same time that photosynthesis is occurring, wildlife species search for their own food-energy: some get food-energy from flower nectar, some consume the fruit and/or foliage of green plants (herbivores), some consume each other (carnivores), some consume both plants and wildlife (omnivores), some (along with the fungi) consume dead plants and dead wildlife (decomposers), while other species may consume both living and dead wildlife. The consumption (or eating) of living and dead plants and wildlife cycles nutrients through the forest.

Wildlife moves according to their needs, and thus, do not always spend their entire lives within one area. In their search for adequate food, water, shelter, space, or mate, wildlife may migrate from a higher to a lower elevation, from a cooler to a warmer climate, from salt water to fresh water. The life cycle of salmon is a perfect example of migration: salmon begin as eggs in a fresh water stream or river; once the fish hatch they experience several stages of growth as they migrate to the salt water; once in the salt water they consume large quantities of food until they are ready to return to the stream or river of their birth to mate/spawn and die.

A forest is a place for people too. Within National Parks there are forest where people can camp, hike, fish, canoe, enjoy the quiet, and learn about this beautiful planet. National Parks are for us to enjoy today and preserve and protect for future generations.

<u>Words to know & understand:</u>

CARNIVORE: A living thing that eats only other animals. An example of a carnivore is a mountain lion.

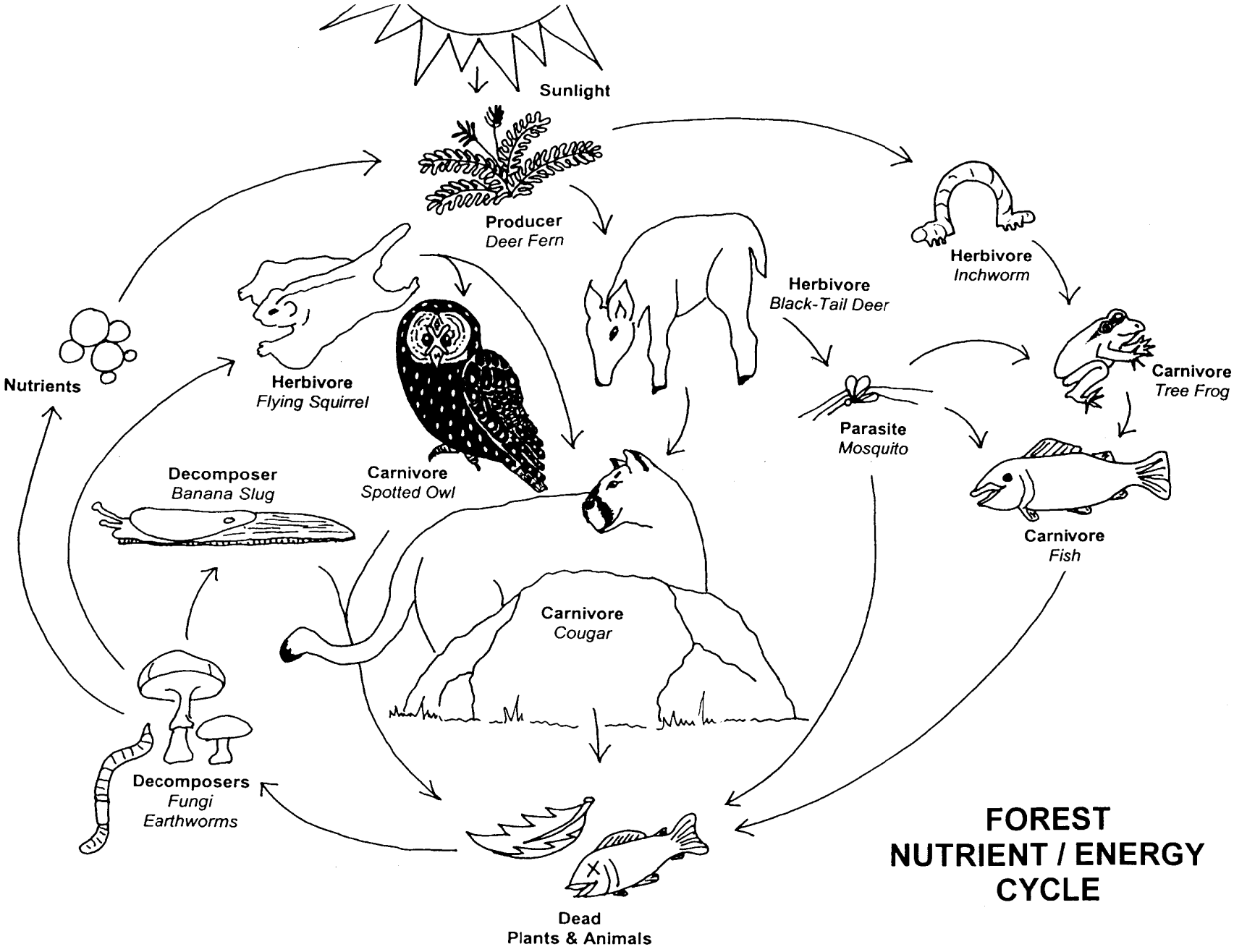
CONSUMERS: A living thing that eats/consumes, and thus obtains energy from, another living thing.

ENERGY CYCLE: The flow of energy from green plants to plants eaters to meat eaters to decomposers to the soil, air, and, water, and back to green plants to plant eaters (& the cycle continues).

HERBIVORES: A living thing that eats/consumes only plants. An example of an herbivore is a rabbit.

OMNIVORE: A living thing that eats/consumes both plants and other animals. An example of an omnivore is a bear.

PHOTOSYNTHESIS: The process by which green plants convert light energy into food energy. In green plant cells, sunlight causes a chemical reaction in which water and carbon dioxide are converted to sugar and oxygen. The plant uses this sugar to grow.



FOREST NUTRIENT / ENERGY CYCLE

Station #3

WATER

Water touches each of us everyday. We drink it, play in it, use it for commerce and industry as well as relaxation and recreation. Clean water is particularly important to our special quality of life here in Whatcom County. Rivers, lakes, bays and our rainfall help to create our special environment and habitats for wild life.

What is a Watershed?

Wherever you live, you live in a watershed and are part of the watershed community. Simply put, a watershed is a drainage basin, an area of land from which a stream gets its water supply. A watershed may be as small as the upland drainage of a farm pond or as large as the Nooksack River Basin. It then becomes more than just a combination of hills, valley streams, forest, grass, farm crops, and soil. A large watershed also includes cities, people, roads and wildlife.

You and the other people who live in your watershed are part of the watershed community. So are the mammals, birds, fish and insects. All depend on the watershed and they in turn influence what happens there. The condition of a watershed determines how well it works for us. When rain falls, a watershed covered with vigorous plants and a layer of dead and decayed vegetation acts like a blotter or sponge. Water sinks deeply into the ground instead of rapidly flowing off the surface and washing soil away. An undisturbed watershed discharges clean water, an essential requirement for all life from the salmon who use of for hatching and rearing to the humans who use it for drinking and recreating.

Water is only one product from a watershed. Watersheds provide other valuable and necessary benefits and uses such as trees for lumber, crops, forage, habitat for wildlife and homes for insects. Some of these activities can have a serious impact on the watershed if carried out without awareness and stewardship.

Watershed consciousness is an important factor in our management of natural resources. We all need to be aware of the impacts we can have on our water resources. This means taking care of the entire system of the water cycle.

Biological Integrity

The quality of a stream's water is a reflection of the land and water practices in the watershed. If the watershed is polluted, the stream will be polluted. If the stream is clean, the watershed is probably clean as well. How do we measure the health of our watersheds? One way is to look at how well the watershed supports life, or to measure the biological integrity of the system.

Aquatic insects (macroinvertebrates) are in integral part of a stream ecosystem. Many spend all or part of their lives in water, usually in the immature phases. A variety of environmental stresses can impact these macroinvertebrate populations. Some bugs such as mayflies, stoneflies, and caddisfly larvae are highly sensitive (intolerant) to changes in stream conditions resulting in poor water quality. Removing streamside vegetation causes a rise in water temperature because trees shade and cool the water. Intolerant insects may leave or die. Other species of bugs such as rat-tailed maggots and midge larvae may thrive in warm or polluted conditions. Water quality researchers test both the chemical nature of the water and the biological nature of what can live in the water. Macroinvertebrate populations are used to monitor changes in stream conditions over time and to assess the cumulative effects of environmental stresses. Poor conditions will likely decrease the diversity of insects found in a stream by decreasing the number of intolerant species and individuals as well as increasing the tolerant species and individuals.

For example, if you sample a stream and find primarily mayflies, stoneflies and caddis fly larvae, the water quality is good. If you find maggots, black fly larvae and snails, the water quality is probably poor. Baseline data is essential to accurately assess the health of a specific stream. Adequate oxygen, abundant and diverse food sources, and cool temperatures all characterize a healthy stream. These are the same conditions needed for an abundant and diverse population of intolerant macroinvertebrates and salmonids.

Imagine
Imagine being in the woods by a stream in early summer. Sunlight filters through the trees and reflects on the water. You sit on a rock by the stream dangling your toes in the cool refreshing water. You can hear a low hum of insects all around you. A small salmon fry snaps at a bug on the water surface. A fat green frog catches a damselfly on its tongue and plops back into the stream. Dragonflies dart by and hundreds of mayflies rise and fall together in a silent vibrating cloud. *

** This paragraph is adapted from the Pond and Stream Safari Guide to the Ecology of Aquatic Invertebrates, a 4-H Leaders Guide form Cornell Cooperative Extension*

Would you fish in this stream? Would you eat your catch? Is it a good place to fish? What can you do to protect water and enhance fish?

Salmon are particularly persnickety fish. They require streams with high water quality to survive. Good stream for salmon are good streams for people too.

Glossary

Biological indicator: A living thing whose presence or absence tells something about the quality of the environment.

Erosion: The wearing away of any part of the earth's surface by weathering, corrosion, dissolution or abrasion.

Food web: The complex association of plants and animals in nature whereby organisms are interconnected because they are sources of food for one another. At the base of the wood web are green plants and bacteria which supply food for small animals. Larger animals eat smaller animals as well as plants. Detritovores recycle nutrients by breaking down decaying plants and animals.

Habitat: The specific environment or area in which a creature lives. For example, the habitat for a stonefly nymph is the cool riffle of a stream.

Habitat requirements: Environmental conditions necessary for survival of a given species.

Macroinvertebrates: Animals without backbones that are large enough to be seen without a microscope.

Nymph: The immature form of certain insects such as stoneflies, mayflies and true bugs. Nymphs go through incomplete metamorphosis to become adults.

Run-off: The increase in water flow of rivers and streams caused by the melting of mountain snow or extra flow of water into a creek during and after rain storms:

Silt: Fine particles of sand and soil deposited by water.

Watershed: The area around a stream that drain into the stream.

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GLACIERS AND GLACIAL FEATURES

Glaciers glisten as the most striking mountaintop feature of the North Cascades. Boasting over 300 glaciers and countless snowfields, the North Cascades National Park Service Complex is one of the snowiest places on earth and the most heavily glaciated area in the United States outside of Alaska.

Glaciers form when more snow accumulates in winter than melts or evaporates during the following summer. As the snow compacts into ice, it slowly moves downhill. As glaciers move, they gouge and scrape the land redefining the landscape. The North Cascades glaciers may be disappearing, most have shrunk dramatically during the last century. This is due to the combined effects of less precipitation and warmer summers, which most scientists now attribute to global warming.

Glaciers mirror the trends of climate change, resulting in life changes through soil development and distribution of vegetation. Glaciers are indicators of climate changes such as temperature and precipitation. As reservoirs of snow from past winters, pollutants may wash into mountain lakes and streams where they enter the food chain. Salmon and other aquatic life, along with plant and animal life could encounter difficulties as glaciers disappear.

Geologic Formations

The North Cascades are still rising, shifting and forming. Geologists believe that these mountains are a collage of terranes, distinct assemblages of rock separated by faults. Fossil and rock magnetism studies indicate that the North Cascades terranes were formed thousands of miles south in the Pacific Ocean. Attached to slowly moving plates of oceanic rock, they drifted northward merging together about 90 million years ago.

Colliding with the North American Continent, the drifting rock masses were thrust upwards and faulted laterally into a jumbled array of mountains. The collision broke or sliced the terranes into north or south trending faults that are still evident today.

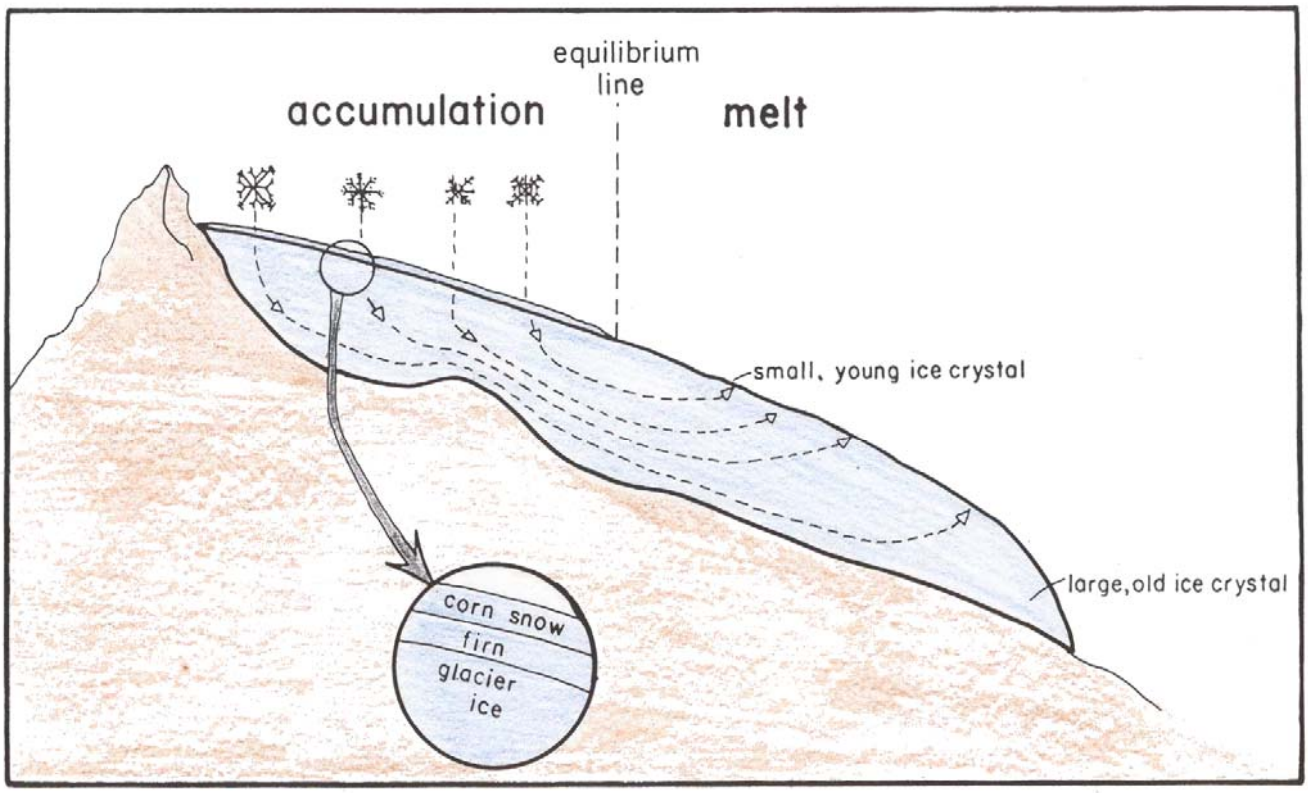
Over time, these predecessors to today's North Cascades were further faulted and eroded to a nearly level plain.

During the past 40 million years, heavier oceanic rocks thrust beneath the edge of this region. Intense heat at great depths caused them to melt. Some of the melt rose to the surface as fiery volcanic eruptions like Mt. Baker. The rest recrystalized at various depths to form vast bodies of granitic rock forming the core of the North Cascades. These gigantic pinnacles have pushed upward to majestic heights again, exposing the roots of the ancient collision zone.

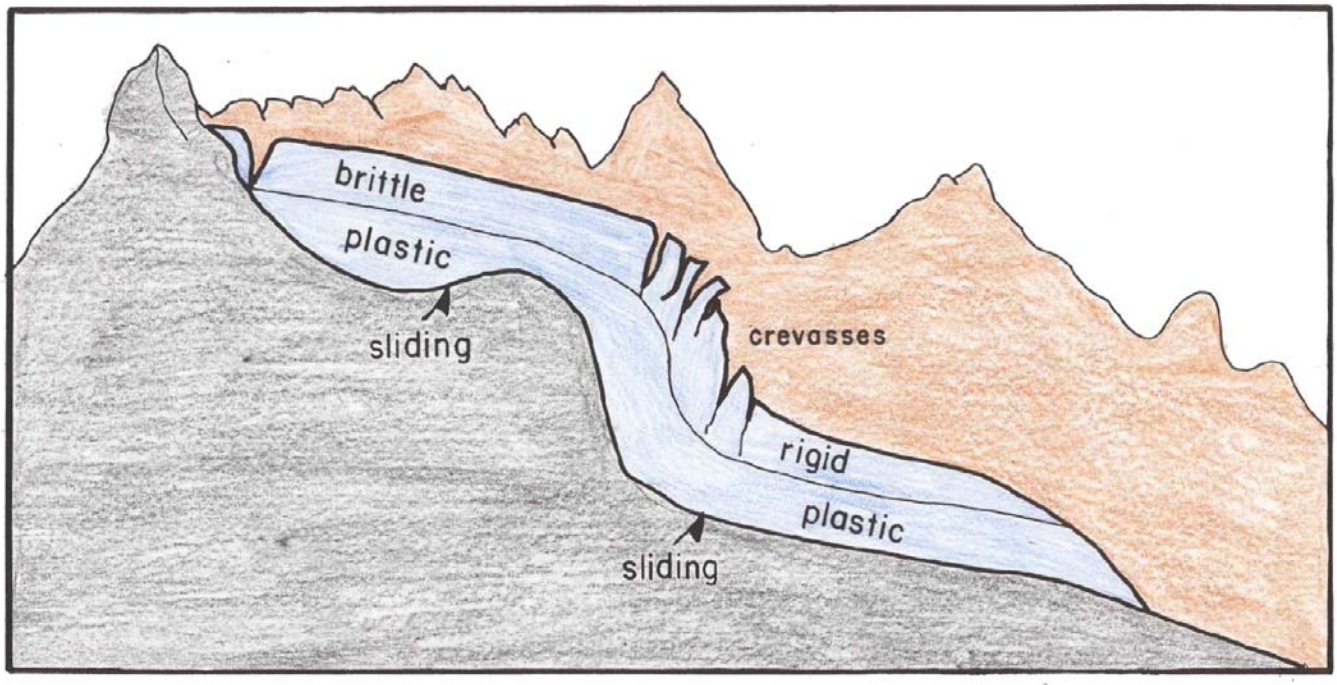
Scientists agree North Cascades geology comprises some of the most complex and least understood geology in North America. For more information on both the variety of rock types here and the North Cascades geologic history, visit *www.nps.gov/noca/*

Crevasses on the Inspiration Glacier northwest of Cascade Pass. Note the predominant direction of these crevasses. They run across the glacier because of the ice is accelerating down a steep slope. In the upper left part of the picture a swarm of crevasses form an icefall.

This jagged ridge in the Picket Range is known as a glacial arete. These ridges are made from two glaciers carving out the rock from both sides.



Schematic cross section view of the accumulation and melt zones of a typical North Cascades glacier in late summer.



Schematic cross section of the physical properties of flowing glacial ice. Brittle ice and crevasses are limited to approximately the upper 100 ft (30m) of the glacier.

Station #3

SOILS

Only 1/4 of the earth's 200 million square miles is land. About half of this land (1/8 of the total earth's surface) has the soil and climate to make it potentially suited for the production of food and fiber and for habitation. Boiling it down one step further, of the potential areas available for use, many are not suited for food and fiber production because they are already inhabited or they lack the characteristics that would make them naturally productive and suitable. This leaves about 1/32 of the earth's surface available for food and fiber production and future habitation. When looked at from the perspective of soil, however, it is really only the thin upper portion (the topsoil) of that 1/32 that possesses the natural fertility and characteristics so important to sustainable and wise use.

The world's population is increasing at a rapid pace but the amount of land we have is constant. More and more people are becoming dependent on this limited acreage for their food. For this reason we all need to take great interest in the land and do all we can to make certain that each acre of land is put to its best use and used within its capabilities.

There are over 20,000 different types of soil in the United States. Some of these soils are deep and fertile and are capable of allowing almost unlimited plant growth. Others are very shallow and plant growth is severely restricted. Some soils are well suited for home building while others are too wet, or too steep, or too unstable to support the weight of a house.

Building a house on unstable soils could be disastrous since the house might shift and actually break apart. Building on good farm land could also be disastrous since the land would be lost for food production. On the other hand, trying to grow crops on poor land is impractical since the yield would be low and the soil might be damaged by erosion.

The soil forming process is extremely slow. It takes several thousands years for nature to build enough soil to adequately support plant life. Soil can be damaged or lost through misuse or by erosion in a short time. Therefore, we must treat soil carefully, understand soils limitations and take the necessary steps to conserve it.

DURING THE FIELD TRIP WE WILL LEARN:

1. What a soil is and what makes up soil.
2. How soils are formed. How this particular forest soil was formed.
3. How and why soils differ.
4. How different soils have different capabilities and limitations.
5. Some concepts on classifying soils.
6. What a soil survey is and how the information found in a survey helps people.

The specific soil type at the Soils Station is 157 - Squalicum gravelly loam, 15 to 30 percent slopes. Utilizing your copy of the Whatcom County Soil Survey please work with the students to identify the specific characteristics and limitations, described in the lesson, for Squalicum gravelly loam.

NOTES:

1. SOIL - A mixture of minerals, organic matter, air and water on the earth's surface that is capable of supporting plant life.

2. SOILS ARE MADE UP OF:
   a. Mineral matter (45%), rock fragments, sand, silt, and clay.
   b. Organic matter (5%), (both living and dead);
      animals - worms, insects, rodents, etc.
      plants - roots, stems, leaves, bacteria, fungus
   c. Water (25%)
   d. Air (25%) (within the pore space).

3. SOILS ARE FORMED BY:
   a. Weathering of rocks and materials (parent material)
      - Chemical Weathering: the affect of water, acids and minerals in solution acting on rock to cause chemical decomposition (breakdown) into smaller particles.
      - Mechanical Weathering: the influence of temperature, plants, water, ice and wind on soil causing destruction of rock fragments.
   b. Movement and Deposition of Material:
      - by water, wind and gravity.

4. ALL SOILS ARE NOT THE SAME:
   The physical characteristics of soil are influenced by the environmental conditions under which it formed. Environmental factors include:
   a. Type of parent material
   b. Climate (temperature and rainfall)
   c. Vegetation
   d. Topography (relief, drainage patterns, aspect)
   e. Length of time for soil formation and weathering processes.

5. SOIL TYPES CAN BE DETERMINED BY FIELD EXAMINATION OF SOIL:
   By grouping them according to similar properties (texture, depth, color, wetness, slope, etc.)

6. IT IS IMPORTANT TO KNOW ABOUT SOIL TYPES:
   a. To determine best use of land.
   b. To know the limiting factors of soil.
   c. To know what is needed to protect the soil.

Station #5

WILDERNESS

Presented by USDA Forest Service, Mt. Baker Ranger District

What is Wilderness?

The word "wilderness" means different things to different people. For the federal agencies responsible for managing public lands and resources the word has a special meaning. It refers to those areas within National Forests and Parks, the Bureau of Land Management and U.S. Fish and Wildlife Service that have been designated by Congress as Wilderness.

The idea of preserving certain areas of land in their natural state dates back to the mid 1800's. Conservationists like John Muir, Robert Marshall, Aldo Leopold and others sought through the years to gain support for wilderness preservation. In 1964, Congress passed the Wilderness Act and it was signed into law by President Lyndon B. Johnson.

The Act calls for the establishment of a National Wilderness Preservation System, to be composed of federally owned areas designated by Congress as "wilderness areas". These areas are to be managed for the enjoyment of the American people in such a way that:

- Leaves them unimpaired for future use and enjoyment as wilderness
- Provides for the protection of these areas
- Preserves their wilderness character.

Within the Act, Wilderness is defined and recognized as an area where the earth and its community of life are untrammeled by man, where man himself is a visitor who does not remain. It is further defined to mean in this Act an area of undeveloped Federal land which:

- Retains its primeval character and influence, without permanent improvements or human habitation
- Is protected and managed so as to preserve its natural condition.

Wilderness in Whatcom County

Since the passage of the Wilderness Act in 1964, over 91 million acres have been added to the Wilderness Preservation System. In Washington State, over 4.25 million acres (10% of the State) are in designated wilderness.

In Whatcom County, Wilderness areas are managed by both the US Forest Service and the National Park Service. The Mt. Baker Wilderness and the Noisy-Diobsud Wilderness cover approximately 130,000 acres in Whatcom County and are managed by the Forest Service. The Stephen Mather Wilderness, managed by the North Cascades National Park, encompasses approximately 281,413 acres in Whatcom County.

The role of the Forest Service

The Forest Service is responsible for ensuring that these areas are taken care of so that future generations will be able to enjoy the wilderness. At the same time, managers strive to attain a high level of primeval character and allow natural processes to operate freely within these areas.

To accomplish this numerous approaches have been developed:

- Trails provide access into the areas and they may be steep, rough and difficult to follow.
- Where bridges do not exist creeks may have to be forded.
- Fallen logs from winter storms may have to be crawled over.
- Conditions within the Wilderness are monitored so that the "health" of the area can be determined.
- Overused campsites may be closed and restored, allowing them to return to their natural condition.
- There are no cabins or shelters.
- Motorized equipment (cars, snowmobiles) or mechanical transport (bicycles) is not allowed.
- Timber harvesting (logging), road building, or other developments such as hydroelectric dams are not permitted in Wilderness areas.

How do we take care of it?

Although federal agencies are legally responsible for managing Wilderness areas, everyone has a role and responsibility. In order to keep Wilderness wild, we all need to minimize our "impact" on the Wilderness environment. "Impact" refers to changes visitors create in the Wilderness, such as trampling of fragile vegetation or pollution of water sources, which diminish the wilderness experience of others. As visitors, our behavior and actions should be appropriate. Following the simple Leave No Trace (LNT) principles shown below allows visitors to enter and enjoy the Wilderness without damaging it or leaving any sign or trace of one's stay.

- Plan Ahead and Prepare
- Travel and Camp on Durable Surfaces
- Dispose of Waste Properly
- Leave What You Find
- Minimize Campfire Impacts
- Respect Wildlife
- Be Considerate of Other Visitors

A Day on the Trail in the Wilderness

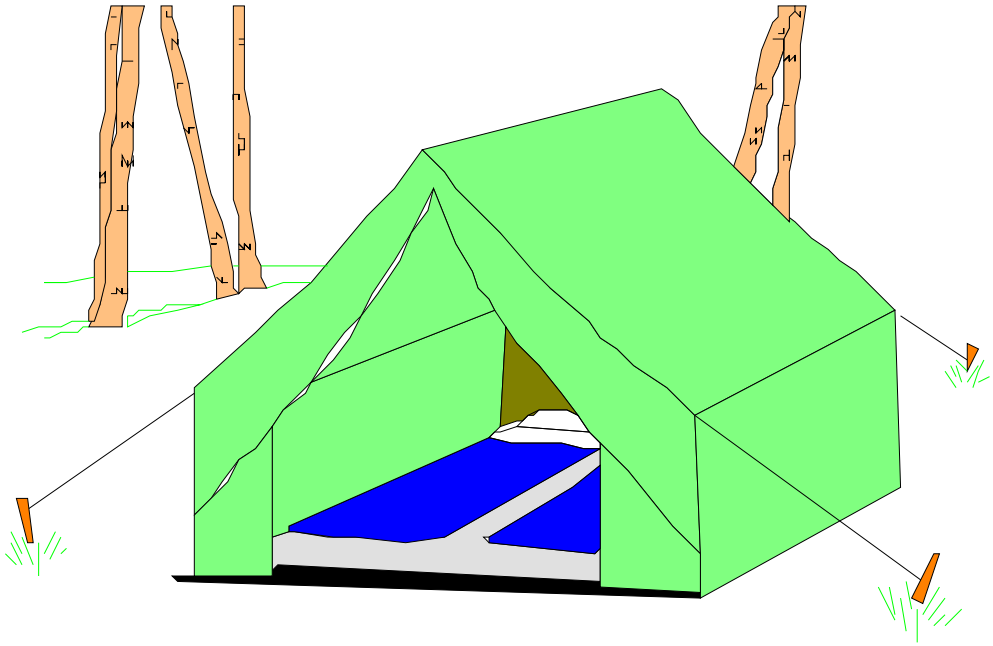
For the Whatcom County 6th Grade Conservation Tour, a Forest Service Wilderness Ranger will meet each class at the Wilderness Entrance sign at the beginning of the station. The ranger will lead the class along a trail for a hike into the imaginary Mt. Baker Wilderness. Discussions and activities during the hike are interactive and students are encouraged to participate.

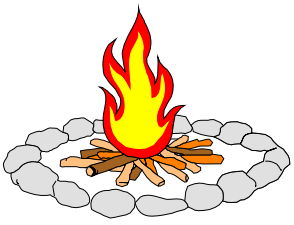
References for further study of Wilderness

North Cascades Institute - Environmental and educational curriculum publications relating to Washington State and the Pacific Northwest are available through North Cascades Institute (NCI). Call NCI at 360/856-5700, ext. 209 or visit www.ncascades.org for more information.

Leave No Trace - The Leave No Trace educational program promotes skills and ethics to support the sustainable use of wildlands and natural areas. The program originated as a way to help recreationists minimize their impacts while enjoying the outdoors. For more LNT information or to order materials, call 1-800/332-4100 or visit www.lnt.org.

Discover Your Northwest (formerly Northwest Interpretive Association) - is a 501(c)(3) nonprofit social enterprise based in Seattle, Washington and also licensed to operate in Oregon, Idaho, California, and Montana. Since 1974, we have provided on-site resources that help visitors have a great experience when visiting Northwest public lands and inspire them to become stewards of these places. From Mount Hood National Forest outside of Portland to the Klondike Gold Rush National Historical Park in downtown Seattle, we passionately believe in the people-value of Northwest public lands. Visit their website at http://www.discovernw.org/





Station #6

FORESTERS, FORESTS, AND ECOSYSTEM MANAGEMENT

WHAT IS A FORESTER?

Most people, when asked, aren't quite sure what a forester is. We're often confused with park rangers, game wardens, or loggers. A forester's job contains certain aspects of these other professions, but our careers are different from each of them.

To put it simply, foresters manage forests. Traditionally the emphasis was on growing trees for harvest. While that is still a large part of our profession, there is much more to it than that. Today's forester deals with a number of issues: wildlife, scenic values, water quality, and forest recreation to name just a few. In a typical day, a forester may deal with everything from elk habitat enhancement to computerized mapping, supervising tree planting crews, or maybe working with tree genetics at a seed orchard.

While our careers may have a low profile, our handiwork is anything but. Every time you step into your house, write a letter, take a picture, go fishing, or drive your car, chances are that you're using one of the resources we help produce. The trees we grow are used for everything from the obvious, such as lumber for your home or paper for school, to the not so obvious, such as photographic film and plastic car panels. The forests in which we grow our trees also provide numerous other benefits, from providing clean water for fish, to moss for florists, homes for wild animals, or maybe a place to go hiking.

WHAT'S THE DIFFERENCE BETWEEN PRIVATE FORESTS AND PUBLIC LAND?

While many forests may look alike, their owners often have sharply contrasting ideas as to how they should be managed. Public forests are owned by all of us, through our state, federal and local governments, and are often managed with an emphasis on recreation and wildlife preservation. Private forests are privately owned -- by the company, and ultimately by people who have invested in the company with the expectation of a fair return.

Every American now uses two 80' tall 16" diameter trees every year -- more than the US currently produces. This demand requires us to import ever increasing amounts of wood from other countries where environmental laws aren't as strict. With public forests producing less timber, private forests must fill this gap between supply and demand. Meeting this need provides a special challenge to our foresters, who must simultaneously protect the other resources of the forest.

WHAT IS ECOSYSTEM MANAGEMENT, AND HOW DO WE USE IT?

Ecosystem Management has been described hundreds of different ways, but most definitions seem to agree that it means management for more than just timber resources. In other words, we need to manage our lands for the benefit of all resources, whether they're recreational, commercial, or ecological in nature. It also means when we consider an action we must assess its effect on the tree farm as a whole. We've always been at the forefront of the timber industry in this respect, and it's something of which we're particularly proud.

A passive "preservation" approach to protecting environmental qualities can work very well, but the active approach of a working tree farm can accomplish still more. One of the tools used by our foresters is the thinning of young forests, which can simulate many important characteristics of old-growth forests. Wildlife biologists believe that the habitat created by our thinning will attract the wildlife species normally found only in old growth. We also take an active role in programs that enhance habitat areas for fish, elk, and other wildlife species found on our farm.

When you own as much forest as we do, you soon discover that other people want to use your land. Some people think it's a great place to dump garbage and old cars, steal trees, or start fires. Other people think our forests are a great place to go hiking, fishing, camping, hunting, or horseback riding. Providing for these social values is an important part of ecosystem management, which we are happy to do as good neighbors. The tough part is separating the first group of people from the second. Many land owners respond to this problem by closing their land to everyone. That's the simple and inexpensive solution, but we prefer to take a different approach. We welcome people to recreate on our land, but limit some areas to access by foot, horseback or bicycle. This minimizes wildlife disturbance, and also makes some undesirable activities a little more difficult. In addition to limiting access, we have also hired a ranger who patrols our farm to stop those who would damage or abuse our lands.

Private forests are diverse places, with pressures and demands upon them increasing every day. Foresters must work within the idea of a whole landscape if we are going to protect all the resources of our forest lands. We are still in school too. Every day we learn a little more, and get a little better at our jobs.

Living here in Whatcom County, as most of us do, we all see the forests that surround us, but hear very little about what happens there. Maybe you'd like to know more, or have some questions you'd like answered. If so, bring them with you to the Conservation Tour and we'll be happy to answer them.

FOREST REGENERATION

Today in forest land management, the forester must plan ahead for the next timber crop before the present crop is harvested. Thoughtful plans are made for the next crop to be regenerated by natural or artificial methods of reforestation.

The first action the forest manager must take after the harvesting operating has taken place is preparing the logged-over area for reforestation. This is called "Planting Site Preparation.' When the logged area is to be artificially regenerated the logging slash and debris will either be burned with a controlled slash fire or chipped and mulched. When natural regeneration methods are to be used, the logging slash is fire-trailed and left to decompose.

Natural regeneration of a forest can be achieved by leaving uncut patches of mature tree seedlings or aerial seeding with tree seed upon the clear cut area.

Tree seedlings raised in the nursery are grown in field beds and grow two to three years before they are large enough to transplant in the clear cut areas. These trees are called "bare root seedlings" because when they are lifted from the nursery beds the soil is washed from the roots to ease packaging and transportation to the planting sites in the forest.

In recent years a new method of growing tree seedlings has developed. These seedlings are called "container trees". Container trees are grown in greenhouses under controlled environments. The container trees are grown one year and are large enough to transplant in the clear cut areas. These trees are transported and planted with soil intact with the roots which reduces transplanting shock.

Planting of tree seedlings on low elevation areas takes place in the late fall and early spring. The higher elevation areas are planted in early fall and late spring.

When the regenerated plantations are established, the forest manager must manage and protect them for 60 to 70 years until the next harvesting operation. This will require protection from fire, insects, disease and animals as well as eliminating unwanted trees or vegetation that will compete with the planted trees for sunlight, soil moisture, and soil nutrients.

The young tree plantations will be pre-commercially thinned or weeded between the ages of 10 to 20 years and commercially thinned between the ages of 30 to 60 years. The plantations will be fertilized several times throughout their growing period.

FOREST IMPROVEMENT

It is possible to improve forests through the selection of the best seed for production of new crops of trees. Genetics involves qualities which may be inherited from one generation to another and it applies to plants as well as animals. In a general sense, the biggest, best formed and fastest growing trees may produce seed that will grow into trees which are similarly big, well-formed and fast-growing. Through the selection of the proper seed from parent trees it will be possible to, eventually, produce planted or seeded forests which should produce more wood of better quality than the natural forests we now have.

Parent trees are selected primarily on the basis of form, growth rate, disease resistance, and since seed is the goal they must also be selected for fruitfulness.

Seed may be collected from the parent tree by climbing the tree and collecting its cones, this however is sometimes very difficult and costly on a yearly basis due the trees large size or its location in the forest.

Another method of obtaining desired seed is through propagation of selected parent trees from vegetative shoots, thus reproducing their genotypes exactly. This is accomplished by collecting small branches (scion) from parent trees and grafting the scion onto a rooted tree (rootstock) in such a way that the cambial layers are in close contact and can grow together. Grafted trees can then be planted in desired location and will have the same genetic characteristics as the parent in which the scion material was collected. This is known as a Clonal Seed Orchard. Grafted trees in a seed orchard may start producing seed within 2-3 years.

Further improvements of the seed can be accomplished within the seed orchard through pollination. Controlled pollination is the artificial transfer of pollen from one flower to another under such conditions that both parents are known.

The seed from controlled pollination can then be planted, and these improved seedlings tested to determine which selected parent trees produce the fastest growing, well formed trees. The inferior growing parent tree grafts can then be removed from the seed orchard leaving only the best grafts for seed production.

Other Forest Improvement practices that can improve forest yield and quality are list below:

1. Thinning

   Thinning involves the cutting of a part of the forest so that growth will increase on the remaining tree. This is accomplished by eliminating the tree's competition for limited amounts of lights, water and food.

2. Weed Control

   There are various trees and shrubs in a forest which have no commercial value and they also compete for the light, water and food within the forest that the trees need for growth. These undesirable trees and shrubs can be eliminated through the use of chemicals or by mechanical means. Sometimes, large areas of land may be covered with these undesirable plants and, in such cases, bulldozers may be moved in to clear than away and a new crop of trees started through planting. At other times, these plants may grow faster than a new crop of trees and they can then be eliminated with a chemical spray applied either by helicopter of by a small back-packed spraying machine.

3. Pruning

   Knots in lumber come from limbs that grow out from the center of the tree. If limbs are pruned, the stub ends grow over and clear wood is produced. This makes a high quality (and more valuable) lumber. In close grown forests this pruning occurs naturally but hand pruning can sped the process.

4. Fertilization

   When applied at the proper time, fertilization of the soil can improve the yield of a forest by increasing tree growth. Fertilization can also improve the quality and color of trees grown to produce Christmas trees.

Station #8

"OUT OF THE WOODS"

Forest products by Black Mountain Forestry Center

WHAT COMES "OUT OF THE WOODS"? – YOU MIGHT BE SURPRISED AT THE VARIETY OF PRODUCTS THAT COME FROM WOOD AND TREES!

Just look around your home and school. More than 5000 products in everyday use are made from trees! Houses, schools, churches, and other buildings are often made of wood. So are furniture, garden mulch, fences, and newspapers – even clothing, carpeting, cologne, milk shakes, and toothpaste. The average person uses 18 cubic feet (a cubic foot is a piece of wood 1 foot long, 1 foot wide, and 1 foot high) and 749 pounds of paper – That equals a 100 foot tall tree 18 inches in diameter – each year.

Plus, we eat fruits and nuts produced by trees, we burn wood to heat our homes, and we make toys from wood. Trees are used to produce the paper for the books we read, the Christmas lists we write, the boxes we ship, and the cartons that hold our milk and cookies. And, don't forget that essential item – toilet tissue!

WHEW! What would we do without a renewable resource like wood, trees, and forests?

ALSO "OUT OF THE WOODS" comes some unusual products:

CHEWING GUM is made from sap of the Central American "chicle" tree.

Pictures "Out of the Woods"? Right, PHOTOGRAPHIC PAPER AND PRINTS are made from cellulose, the long, slender fibers that are a major constituent of wood.

Cellulose, after chemical modification, is also used to make ICE CREAM AND SALAD DRESSINGS thick, smooth, and creamy.

A glycerol ester of wood ROSIN is used to preserve flavor and freshness of soda, specifically SQUIRT, ORANGE CRUSH, AND FRESCA.

VANILLA FLAVORING, the natural version, is produced from beans of a tree. Less expensive kinds are manufactured from pulping by-products. Regardless, vanilla flavoring comes "Out of the Woods"!

RAYON, MODAL, AND TENCEL clothes and textiles all originate from trees. Cellulose, after chemical modification, is dissolved, forced through fine spinnerets, and then solidified to produce the fibers that are woven into fabrics.

Plant stanol esters, the active ingredients in CHOLESTEROL FIGHTING MARGARINES, are derived from pulping by-products. Imagine - Medicine coming "Out of the Woods"!

OXYGEN – The substance we breathe is produced by trees and plants. In the process of photosynthesis, trees capture carbon dioxide from the air and convert it to wood as they grow. The carbon is stored in roots, stems, and branches, with much of it retained in lumber and other products, while the oxygen is released to the air for us to breathe.

Even materials not converted directly to products for consumers are used. By-products from pulping and papermaking, and other forest products factories that are not otherwise used are burned to recover chemicals and produce heat, steam, and electricity, making the industry one of the most efficient in the world.

Finally, don't overlook the many services that forests provide. What about wilderness hiking, camping, snow shoeing, bird-watching, and other recreational activities? And, there are some very practical services – for example, three mature, well-placed trees around your home can reduce air conditioning costs by 10-50 percent!

MANAGED FORESTS. Because trees live a long time, we often think of them as being permanent. But, they really aren't. If they don't succumb to natural threats such as fires, insects and disease, or wind storms, trees eventually die of old age. Instead of allowing them to die, why not harvest and use some of them and replace them with new ones?

Indeed, careful, responsible forest stewardship allows us to harvest trees for products needed in our everyday lives while ensuring that our forests will thrive for generations. With planning, carefully engineered roads, management of special habitats for various plant and animal species, and replanting trees, we can provide useful products for people, while sustaining our forests and ensuring their future.

And, by planting seedlings bred for vigorous growth, more wood can be grown per acre in a shorter time than would otherwise be possible. Growing 10 percent more wood per generation means that less land is used for growing trees and that more land is available for wilderness, recreation, and other purposes.

Trees and wood have unique properties that make them one of nature's ideal products. For example, trees are the only building material that can be regrown or renewed. Wood products, whether lumber or paper, can be recycled, and many such items are recycled everyday everywhere. Another advantage: When a tree is harvested, virtually every part is utilized – even the bark. And, wood is more energy efficient than steel, aluminum, or petroleum-based plastics. Wood products require less energy to produce, and are better insulators – 400 times better than steel and 1000 times better than aluminum.

Thanks to careful stewardship and sound management, North American forests are more abundant today than at any time in recent history and they are growing faster than they are being harvested or lost to insects, disease, and fire.

Every winter and spring, over 200,000 seedlings are planted per day on private forest land in Washington – at least three new trees for every one harvested. This ensures that our forests will be sustained over generations and will continue to yield useful products.

Nearly all these seedlings are grown in tree nurseries right here in Washington. Most are grown from seed collected from trees having desirable genetic qualities, such as vigorous growth, and from the same area where the seedlings will be replanted.

Visit our website (www.blackmountainforestry.com) or call 360/599-2623 for information about us as well as links to seedling nurseries, forest products companies, forestry schools, and other sources of information on forestry and forest products.

Courtesy of Black Mountain Forestry Center – A nonprofit organization dedicated to natural resources education.

Ron Dinus – 02/05/04

SUMMARY OF FOREST CONSERVATION TOUR

Have you learned something new about forest today? We hope you have learned that forests are dependant upon good soils, water, air, and a balanced living community of many plants, animals, and nutrient recyclers. We hope you know how important it is to protect and use forest lands wisely, so that healthy forests will be here forever.

Forest Protection: Insects, animals, disease, and fire are all part of the natural forest ecosystem and can be both beneficial and harmful to trees and the forest. By understanding their role in the ecosystem, land managers can help maintain their balance to protect forest values. Wildfires have the greatest potential for widespread forest destruction and are often caused by our carelessness with fire.

Forest Life: Forest life is dependant upon minerals, water, sunlight, and a balanced system of producers, consumers, and recyclers. Each has a role to play. Example: trees depend on fungi to transport nutrients to their roots and fungi gain sugars from the tree roots to survive. Competition and predation are very important in keeping life systems in balance.

Water: Pure water is absolutely essential for all living things. Water is recycled through evaporation and precipitation. Water is stored in glaciers, snow packs, lakes, and soils. Rotting logs and humus on forest floors act as sponges, releasing water slowly during dry periods.

Soils: Soils are the base of our food supply and forest growth. There are many types of soils. Some are better for farming, some for building homes, and a variety of soil types allow for a rich diversity of forest life. Soils are formed very slowly, but can be quickly eroded if we misuse the land.

Forest Recreation: People enjoy forest in many ways - for scenery, studying wild plants and animals, hunting, fishing, hiking, and solitude. In using the forest for recreation we must respect the rights of other people and land owners. Some forest areas are in the Wilderness status, where there is no human development and natural systems come first.

Forest Regeneration: Foresters seek ways to make harvestable trees grow better. Seeds selected from fast growing trees are spread on logged off areas or are raised in nurseries for two to five years and then planted by hand. Timber managers are now leaving selected seed trees on logged sites so natural seeding can take place.

Forest Stand Improvement: Thinning and limbing is often done in crowded new plantations so trees can grow faster with fewer knots. Fertilizers are sometimes used to help trees get a better start.

Summary: Forest lands and the watersheds they support have been a main source of human livelihood in the northwest throughout the ages. As forest land shrinks, it becomes all the more precious to us and the many wild forms which make a forest. We must understand what keeps a forest healthy and balanced so that we may harvest from it and enjoy it without destroying it. You are the future. Please do a good job!

Did you know?

The oldest tree:

The oldest recorded living tree is a bristlecone pine on Wheeler Peak in Eastern Nevada. It is 4,900 years old!

The tallest tree:

The tallest tree is named "National Geographic Tree" in Redwood National Park, California. It is 364.3 feet tall, or as tall as a 30-story building! ++

Georgia-Pacific "Educational in Nature" pamphlet. Vol. 5-"The Forester's Job" 8/97

Chemicals from trees:

How can we create so many different chemical products from trees? When chemicals are removed from the tree and mixed with other chemicals, a reaction occurs. The energy from this reaction can create a completely different chemical. This is how chemicals from trees can be used to make products as different as artificial vanilla favoring and frames for your eyeglasses.

Georgia Pacific "FROM THE FOREST", Education in nature pamphlet Vol. 1-11/97

Wood Words to Know:

Cellulose - wood fiber
Lignin - a glue-like chemical that holds a tree's wood fibers together
Synthetic - not found in nature

Cubic Feet, Cords, Boards and other Materials:

A cubic foot of anything (including wood) is 1 foot by 1 foot by 1foot

Besides talking in cubic feet, foresters also talk in board feet: that's a piece of wood measuring 1 foot by 1 foot by 1 inch. Sawtimber is commonly measured by the thousands board feet. 12 board feet equals 1 cubic foot.

Foresters also talk in CORDS: A pile of wood 4 feet by 4 feet by 8 feet. That takes up 128 cubic feet, but since trees are round and irregular, there are air spaces between the sticks. Thus, a cord of wood actually has only 80-90 cubic feet of solid wood.

1,000 Board Feet of Wood Makes:

15,000,000 toothpicks
2,000-4,000 pounds of paper (depending on the process)
1,884 – one-pound books
122,740 #10 envelopes
8,768,000 commemorative-size postage stamps
920,000 personal checks
179,740 sheets of letterhead bond paper, 8.5"x11"
2,400 copies of National Geographic
60 Boston Rockers
24 dining room tables (with eight chairs)

How much wood will you need in your lifetime?

In one year, each man, woman and child in Washington State uses the equivalent two trees 75 feet tall and about 18 inches in diameter.

Just how old is an old-growth forest?

Although it sometimes is defined by age, the term "old-growth" usually refers to a particular set of characteristics common to forests that have grown without significant change from fire, disease, or humans, for a long time - maybe 200 years. Because trees live a long time, we often think of them as permanent. But they really aren't. If they don't succumb to natural threats like fires, insects, or wind storms, trees eventually die of old age.

How do you recognize an old-growth forest when you see it?

After all, a stand of second-growth Douglas-fir just 70 years old can include trees up to 3 feet thick and 170 feet tall. Impressive as this is, it's not old growth. In old-growth areas, look for an abundance of big trees, with complex layers of branches, and foliaged at the crown. You'll also notice lots of dead and decaying wood on the forest floor, both in the form of logs and standing dead trees.

Replanting forests:

Throughout winter and spring, over 200,000 trees per day are planted on private forest land in Washington - about three trees for every one harvested. Altogether, it comes to 35 million new trees each year.

Where do seedlings come from?

Nearly all come from tree nurseries, right here in Washington. Most seedlings are grown from seed collected from trees that have desirable genetic traits, such as fast growth, and are cultivated from the same area where they will be replanted. Strong seedlings help ensure our third-growth forests will be strong and healthy. Visit the Black Mountain Forestry Center web site for some nursery locations in Washington State. (http://www.blackmountainforestry.com)

American Trees

Trees growing in the United States are these:

Acacia, False
Alder, Red
Alder, Oregon
Alder, Western
Arborvitae, Eastern
Arborvitae, Grant
Ash, American Mountain
Ash, Basket
Ash, Biltmore
Ash, Black
Ash, Blue
Ash, Brown
Ash, Green
Ash, Hoop
Ash, Oregon
Ash, Red
Ash, River
Ash, Smallseed white
Ash, Swamp
Ash, Water
Ash, White
Aspen, Bigtooth
Aspen, Golden
Aspen, Largetooth
Aspen, Quaking
Aspen, Trembling
Baldcypress
Baldcypress, Common
Balm-of-Gilead
Balsam, Canada
Balsam, White
Basswood, American
Bay, White
Bearberry
Bearwood
Beech
Beech, Blue
Beech, Water
Bigtree
Bilsted
Birch, Black
Birch, Canor
Birch, Cherry
Birch, Gray
Birch, Oldfield
Birch, Paper
Birch, Poplar
Birch, Red
Birch, River
Birch, Silver
Birch, Swamp
Birch, Sweet
Birch, Water
Birch, Wire
Birch, Yellow
Bitterbark
Bitternut
Blackgum
Bodark
Bois-d'arc
Bowwood
Boxelder
Buckeye, California
Buckeye, Fetid
Buckeye, Large
Buckeye, Ohio
Buckeye, Sweet
Buckeye, Yellow
Buckthorn, Cascara
Bull-bay
Bullnut
Butternut
Buttonball-tree
Buttonwood
California - laurel
Cascara
Cascara Buckthorn
Cascara sagrada
Catalpa, Hardy
Catalpa, Northern
Catawba tree
Cedar, Alaska Yellow
Cedar, Atlantic White
Cedar, California Incense
Cedar, Canor
Cedar, Coast White
Cedar, Eastern Red
Cedar, Northern White
Cedar, Oak-barked
Cedar, Oregon
Cedar, Port Orford
Cedar, Swamp
Cedar, Western red
Cedar, Yellow
Cherry, Black
Chestnut, American
Cigar tree
Coffeetree, Kentucky
Cottonwood, Balsam
Cottonwood, Black
Cottonwood, Eastern
Cottonwood, Southern
Cucumbertree
Cypress, Alaska
Cypress, Arizona
Cypress, Arizona smooth
Cypress, Bald
Cypress, Gulf
Cypress, Lawson
Cypress, Monterey
Cypress, Red barked
Cypress, Sitka
Cypress, Southern
Cypress, Tidewater red
Cypress, White
Cypress, Yellow
Dogwood, Flowering
Dogwood, Mountain
Dogwood, Nuttall's
Dogwood, Pacific
Dogwood, Striped
Dogwood, Western
Douglasfir
Elm, American
Elm, Cork
Elm, Gray
Elm, Red
Elm, Rock
Elm, Slippery
Elm, Soft
Elm, White
False-cypress, Lawson
False-cypress, Nootka
Fir, Alpine
Fir, Amabalis
Fir, Balsam
Fir, Bristlecone
Fir, Cascades
Fir, Douglas
Fir, Downy-coned
Fir, Eastern
Fir, Fraser
Fir, Fringecone
Fir, Golden
Fir, Grand
Fir, Lowland white
Fir, Noble
Fir, Pacific silver
Fir, Red
Fir, Red barked
Fir, Santa Lucas
Fir, Scotch
Fir, Shasta
Fir, Silver
Fir, Southern balsam
Fir, Subalpine
Fir, White
Fir, Yellow
Gingko
Gum, Black
Gum, Cotton
Gum, Red
Gum, Sour
Gum, star leaved
Gum, Swamp
Gum, Sweet
Gum, Tupelo
Hackberry
Hackmatack
Haw
Haw, Red
Hawthorn
He-balsam
Hemlock, Black
Hemlock, Canada
Hemlock, Carolina
Hemlock, Eastern
Hemlock, Mountain
Hemlock, Pacific
Hemlock, West Coast
Hemlock, Western
Hickory, Bigleaf Shagbark
Hickory Bitternut
Hickory, Carolina
Hickory, Mockernut
Hickory, Oval pignut
Hickory, Red
Hickory, Redheart

Hickory, Scalybark
Hickory, Shagbark
Hickory, Shellbark
Hickory, Swamp
Hickory, Upland
Hickory, White
Hickory, Whiteheart
Holly, American
Holly, White
Honeylocust
Honeylocust, Common
Hophornbeam, Eastern
Hophornbeam, American
Hornbeam, American
Horsechestnut
Incensecedar, California
Ironwood
Judas-tree
Juniper, Alligator
Juniper, Bigberry
Juniper, Checkered-barked
Juniper, Red
Juniper, Rocky Mountain
Juniper, Sierra
Juniper, Utah
Juniper, Western
Kingnut
Larch, Alaska
Larch, American
Larch, Black
Larch, Eastern
Larch, Montana
Larch, Mountain
Larch, Western
Laurel, California
Linden, American
Locust, Black
Locust, Honey
Locust, Honey shucks
Locust, Yellow
Madrona
Madrona, Pacific
Madrono
Magnolia, Cucumber
Magnolia, Cucumbertree
Magnolia, Great flowered
Magnolia, Southern
Magnolia, Sweetbay
Maidenhair tree

Maple, Ash-leaf
Maple, Bigleaf
Maple, Black
Maple, Black sugar
Maple, Boxelder
Maple, Broadleaf
Maple, California
Maple, Goosefoot
Maple, Hard
Maple, Mountain
Maple, Norway
Maple, Oregon
Maple, Red
Maple, River
Maple, Rock
Maple, Scarlet
Maple, Silver
Maple, Silverleaf
Maple, Soft
Maple, Striped
Maple, Sugar
Maple, Swamp
Maple, Sycamore
Maple, Vine
Maple, Water
Maple, White
Moosewood
Mountain-ash, American
Mulberry, Red
Myrtle, Oregon
Myrtle, Pacific
Oak, Barren
Oak, Barren
Oak, Basket
Oak, Black
Oak, Blackjack
Oak, Bottomland red
Oak, Bur
Oak, California live
Oak, California white
Oak, Canyon live
Oak, Chestnut
Oak, Chinquapin
Oak, Cow
Oak, Darlington
Oak, Eastern red
Oak, Elliot
Oak, Emory
Oak, Forkleaf white
Oak, Garry
Oak, Grey
Oak, Iron
Oak, Jack
Oak, Laurel
Oak, Laurel leaved
Oak, Live
Oak, Mexican blue
Oak, Mossycup
Oak, Northern red
Oak, Oregon
Oak, Oregon white
Oak, Overcup
Oak, Peach
Oak, Peach-leaf
Oak, Pin
Oak, Possum
Oak, Post
Oak, Red
Oak, Ridge white
Oak, Rock
Oak, Rock chestnut
Oak, Scarlet
Oak, Schenck
Oak, Shingle
Oak, Shumard
Oak, Shumard red
Oak, Smooth bark
Oak, Southern red
Oak, Spanish
Oak, Spotted
Oak, Stove
Oak, Swamp-chestnut
Oak, Swamp laurel
Oak, Swamp post
Oak, swamp red
Oak, Swamp Spanish
Oak, Swamp white
Oak, Tan
Oak, Tanbark
Oak, Valley
Oak, Virginia live
Oak, Water
Oak Water white
Oak, Weeping
Oak, White
Oak, Willow
Oak, Yellow
Oak, Yellowbark
Oak, Yellow chestnut
Oil Nut
Osage-orange
Paulownia, Royal
Recan
Pepperidge
Pepperwood
Persimmon
Pine, Arkansas
Pine, Austnan
Pine, Balfour
Pine, Banksian
Pine, Bay
Pine, Big-cone
Pine, Black
Pine, Blackjack
Pine, Bird's eye
Pine, Bishop
Pine, Bottom white
Pine, Bristlecone
Pine, Bull
Pine, Cedar
Pine, Choctawhatcher
Pine, Colorado pinyon
Pine, Coulter
Pine, Dell mar
Pine, Digger
Pine, Dwarf marine

Pine, Eastern white
Pine, Finger-cone
Pine, Foxtail
Pine, Georgia
Pine, Gray
Pine, Grayleaf
Pine, Hickory
Pine, Idaho white
Pine, Insignis
Pine, Jack
Pine, Jeffrey
Pine, Jersey
Pine, Limber
Pine, Lobiolly
Pine, Lodgepole
Pine, Lone
Pine, Longleaf
Pine, Longstraw
Pine, Marsh
Pine, Mexican Nut
Pine, Monterey
Pine, Mountain
Pine, North Carolina
Pine, Norway
Pine, Nut
Pine, Obispo
Pine, Ocala sand
Pine, Old held
Pine, One-leaf
Pine, Oregon
Pine, Pitch
Pine, Pocosin
Pine, Pond
Pine, Ponderosa
Pine, Poor
Pine, Prickly
Pine, Purple-cone sugar
Pine, Red
Pine, Rocky Mountain White
Pine, Sand
Pine, Scotch
Pine, Screw
Pine, Scrub
Pine, Shortleaf
Pine, Shortstraw
Pine, Slash
Pine, Soft
Pine, Soledad
Pine, Southern
Pine, Southern Yellow
Pine, Spruce
Pins, Stoneseed
Pine, Sugar
Pine, Swamp
Pine, Table-mountain
Pine, Tamarack
Pine, Three-leaved
Pine, Torrey
Pine, Virginia
Pine, Walter
Pine, Western white
Pine, Western yellow
Pine, Weymouth
Pine, Whitebark
Pinyon
Pinyon, Colorado
Pinyon, Mexican
Pinyon, Singleleaf
Planetree
Planetree, American
Planetree, Arizona

Poplar, Balsam
Poplar, Bay
Poplar, California
Poplar, Carolina
Poplar, Eastern
Poplar, Lombardy
Poplar, Tocamahac
Poplar, Trembling
Poplar, Western Balsam
Poplar, Yellow
Quercitron
Redbud, Eastern
Redcedar, Eastern
Redcedar, Pacific
Redcedar, Rocky Mountain
Redcedar, Western
Redgum
Redwood
Redwood, California
Redwood, Coast
Redwood, Sierra
Rowan-berry
Sabina
Sassafras
Sequoia, Giant
Shellbark, Big
Shinglewood
Sorrell-tree
Sourwood
Spice-tree
Spruce, Black
Spruce, Blue
Spruce, Bog
Spruce, Brewer
Spruce, Canadian
Spruce, Cat
Spruce, Coast
Spruce, Colorado
Spruce, Colorado blue
Spruce, Columbian
Spruce, Douglas
Spruce, Eastern
Spruce, Engelman
Spruce, Hemlock
Spruce, Mountain
Spruce, Norway
Spruce, Red
Spruce, Shortleaf black
Spruce, Sitka
Spruce, Skunk
Spruce, Swamp
Spruce, Tideland
Spruce, Weeping
Spruce, White
Spruce, Yellow
Sugarberry
Sumac, Elder-leaved
Sumac, Mountain
Swampbay
Sweetbay
Sweetbay, Southern
Sweet bean tree
Sweetgum
Sweetgum, American
Sycamore, American
Sycamore, Arizona
Sycamore, California
Tamarack
Tamarack, Western
Tanoak
Thorn
Thorn-apple
Tuliptree
Tupelo, Black
Tupelo-gum
Tupelo, Water
Virgilia
Wahoo
Walnut, Black
Walnut, White
Whitecedar, Atlantic
Whitecedar, Eastern
Whitecedar, Northern
Whitecedar, Port Orford
Whitecedar, Southern
Willow, Black
Willow, Swamp
Wine Tree
Yellow-cedar, Alaska
Yellowwood, American
Yew, Douglas
Yew, Pacific
Yew, Western

What are trees used for?

Fuel
Rayon
Cellophane
Photographic film
Wax for carbon paper and polishes
Space craft reentry shields
Book paper
Telephone casings
Newspaper
Alcohol
Roofs
Pencils

Acetate
Football helmets
Piano keys
Ping pong balls
Fishing floats and tackle
Lacquer
Flashlight cases
Washing machine impellors
Camera cases
Artificial snow
toilet seats
Adhesives
Leather tanning
medicine
Poultry feed
Artificial vanilla flavoring
Vinegar
Cosmetics
Oil well drilling compounds
Fertilizer
Gummed tape
Dust palliatives for roads and oars
Water treatment
Foundry cores
Adhesives in plaster
insecticides
Oiler water treatment
Ceramics
Sausage casings
Asbestos replacement
Fungicides
Cleaning compounds
Algicides
Disposable medical clothing
Diapers
Railroad ties
Power poles
Pellets
Acetic acid
Acetone
Flagpoles
Steering wheels
Clocks
Rakes
Swings
Barrels
Charcoal
Wine racks
Anionic and Cationic collectors for ores
Rubber tires
Foam rubber
Anti-foaming agents
Enamel and wood stain
Particle board
Plywood
Panel board
Hardboard
Lumber
Cider
Activated carbon
Boat Caulking
Typewriter stands
Displays
Desk pads
Baking cups
Bread wrapping
Skis
Decorative paneling
Wood house foundations

Gift boxes
Candy Boxes
Chocolate cups
Industrial toweling
Price tags
Tax forms
Environmental impact statements
Beer cartons and labels
Restaurant doilies
Garment bags
Record covers
Award certificates
Waste receptacles
Masking tape
Fiber tubes
Shelf paper
Vacuum bags
Flypaper
Gangplanks
Pontoons
Sewing Machine tables
Stirrups
Rafts
Glasses frames
Corks
Metronomes
Tambourines
Name tags
Gift boxes
Movies
Parallel bars
Polo Mallets
Decoys
Snowshoes
Candlesticks
Hockey sticks
Basketball courts
Cribs
Shade
Toothpicks
Humidors
Art pens
Easels
Hammers
Fence posts and fencing
Shuttles and picker sticks for fabric weaving
Insoles and heels for shoes
Facial and bath tissues
Paper towels
Hair spray
Liquid nail polish
Laxative
Fruit and nuts
Linoleum
Tires
Medicated hog feed
Fish feed
Soil additive
Buckets
Surveyor stakes
World globes

Atlases and maps
Poultry houses
Kennels
Seesaws
Novelties
Taffy sticks
Popsicle sticks
Barkdust
Fire ladders
Umbrella handles
Snow fences
Trellises
Cement dispersant
Flooring
Kitchen cabinets
Gunstocks
Darning eggs
Knife handles

Golf club heads
Bowling alley lanes
Grocery sacks
Milk containers
Egg cartons
Buttons
Oxygen
Magazines
Bowling pins
Ash tray bases
Photographic slides
Apple storage warehouses
Automobile instrument panels
Draperies and bedspreads
Stadium seats
Trailers and mobile homes
Marine instrument panels
Cutting boards
Billiard tables and pool cues
Diving boards
Puzzles
Toys
Birdhouses
Creosote
Turpentine
Gum
Shipyard timbers
Docks and dolphins
Doors
Mirror backs
Cable reels
Ceiling timbers
Schools
Signs
Baseboards and moldings
Fireplaces

Guitars
Display cases
Axe handles
Broom handles
Fruit and vegetable crates
Pulpits and Podiums
Hi-fi cabinets and speakers
Railroad crossing gates
Wagons & wagon tongues
Manure spreaders
Cistern covers
trunks
Riot sticks
Canes
Carpenter vises
Crutches
Loading platforms
Shovel handles
Cranberry scoops
Can labels
Billboard posters
Rolling pins
Clothes racks
Pipes
Mousetraps
Venetian blinds
Planters
Lacrosse rackets
Freight cars
Observation towers
Croquet balls & mallets
Arrows
Garden & marking stakes
Fine printing papers
Aircraft propellers
Caskets
Elevator cabs
Shoe trees
Boot jacks
Lobster pots & lobster floats
Missile & radar domes
Oars & paddles
Roof gutters

Apartment houses
Pipe racks
Hurdles
Horse jumps
Sandboxes
Crepe paper
Confetti
Gun racks
Truck bodies
Salad sets
Salt and pepper cellars
Bridges
Tent poles
Yeast
Chairs and tables
Desks
Bookcases
Jewelry
Models
Industrial patterns
Toboggans
Sleds
Park benches
Window frames & shutters
Beauty & wildlife
Golf tees
Log houses

Diplomas
Asphalt
Hardboard tempering oil
Hand cleansers
Lubricants
Printing ink
Paint remover
Pine oil disinfectant
Paper size
Penetrating oil
Phenolic resins
Rubber addition agents
Waterproofing
Tar remover
Roofing compound
Paint
Telephone books
Seeding pots
Epoxy resins
Auto body undercoating
Varnish
Putty & caulking compounds
Highway surfaces
Oil & gas well fracturing
Corrosion inhibitors
Liquid soap
Sawhorses
Radio & television panels for electrical circuits
Nitrating pulp for artillery
Ammunition
Stationery
Parking tickets
Agricultural chemical for lemon orchardists
Safety & wooden matches
Luggage
Cattle feed
Paper plates & cups
Napkins
Paperboard houses
Reservoirs & reservoir covers
Flumes & piping
Hog troughs
Feed bins
VIP cases
Bibles
Postage stamps
Handrails
Bar tops
Pianos
Lighting fixtures
Bookends

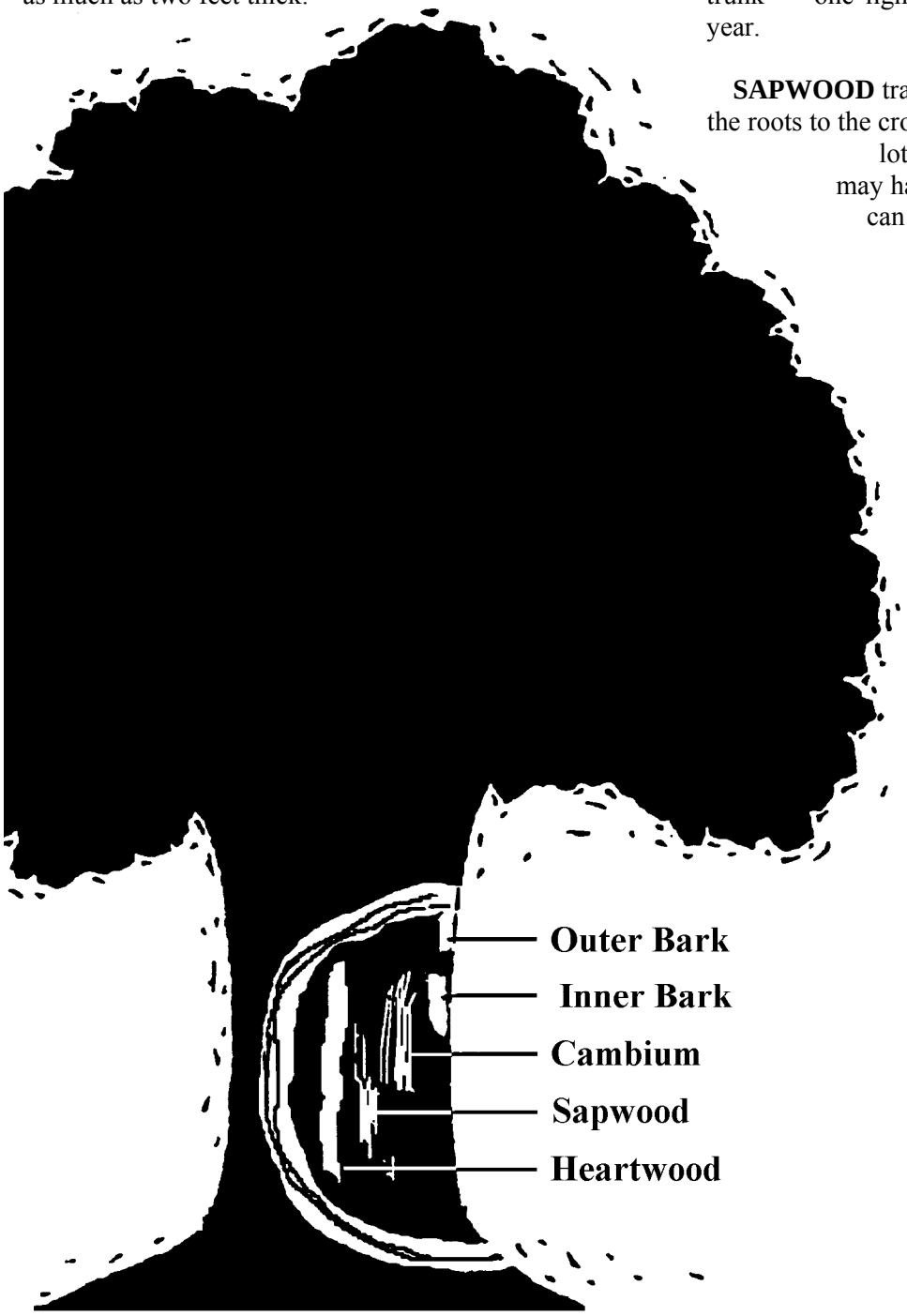
Church pews
Altars
Organs
Violins
Drums
Cellos
Tripods
Rulers
Curtain rods
Frozen food packages
Corrugated cartons
Adding machine rolls
Javelins
Tennis racquets
Gavels
Bats

Goal posts
Safety papers for checks
Medical stretchers
Concrete forms
Boats or canoes
Stairways
Beds
Ceiling tile
TV trays
Sleighs
Map tubes
Tripods
Kites
Masts
Bowsprits, boomkins & yardarms
Industrial cooling towers
Statuary
Christmas trees
Planters
Coasters
Work benches
Scythes
Corn cribs
Windmills
Barns & sheds
Greenhouses
Tobacco barns
Picture frames
Blackboards
Telephone stands
Electrical receptacles
Cooking utensil handles
Casters
Kegs
Cider presses
Vacation cottages
Exercise boards
Window screen frames
Flooring
Bakers poles
Bean poles
Stage sets
Piling
Stables
Art pads
Dollhouses
Plaques
Windbreaks
yardsticks
Game pieces & cartons
Maple syrup
Clipboards
Sailboats
Yachts
Cruise ship decks
Garden furniture
Carpeting
Wall carvings
Totem poles
Race track fencing
Incense
School desks

The Secret Tree Behind The Bark

From the outside, it's all leaves and bark, but inside there are five kinds of wood hard at work.

OUTER BARK protects the tree from weather, insects, disease, fire and animals just as your skin protects you. The bark of a birch tree may be as thin as 1/4 inch, while a giant sequoia's bark may be as much as two feet thick.



INNER BARK carries food down from the leaves to branches, the trunk and roots for growth and storage.

CAMBIUM is a layer of cells that divide and grow to produce new layers of bark and wood each year. Thanks to the cambium, you can tell the age of a newly cut tree by counting the "annual rings" of its trunk — one light and one dark will be made each year.

SAPWOOD transports minerals and water up from the roots to the crown of the tree. Sapwood can hold a lot of water. The African baobab tree may have a trunk up to 90 feet around and can store up to 25,000 gallons of water. The chemicals in sap determine the color leaves turn in fall. Each tree has different chemical mix, so each has its own fall color.

HEARTWOOD is the hard, inactive center of the tree that gives strength to the tree so it can stand straight.

TEACHER RESOURCES

Evergreen Learning Grounds
http://www.evergreen.ca/en/lg/plans_listing.html

Recycling
http://teacher.scholastic.com/lessonplans/recycling/
http://www.paperrecycles.org/school_recycling/index.html

Society of American Foresters (Directory of sites)
http://www.safnet.org/education/educators.cfm

American Forests Organization
http://www.americanforests.org/

Washington Forest Protection Association
http://www.wfpa.com/

Washington Trails Association Online
http://www.wta.org/~wta/index.html

4-H Forest of Fun Resource Links Page
http://www.4-hcurriculum.org/projects/forestry/teacher_sites.html

FUN WEBSITES TO LEARN ABOUT FORESTRY

Dichotomous Tree Identifier
http://oregonstate.edu/trees

OMSI - Forest Puzzles
http://www.omsi.edu/visit/life/forestpuzzles/menu.html

Environmental Kids Club
http://www.epa.gov/kids/

Smokey The Bear for Kids
http://www.smokeybear.com/kids/default.asp

EXTENDED PROJECT LEARNING OPPORTUNITES

Hands on the Land
http://www.handsontheland.org/profiles/profiles.cfm

Washington Nature Mapping Project (U of W)
http://depts.washington.edu/natmap/

Watershed Master/Beach Watcher Programs for the Classroom
http://whatcom.wsu.edu/environ/water/bw.htm

SPONSORS WEBSITES

Lincoln Timber/The Campbell Group — http://www.campbellgroup.com

Sierra Pacific — http://www.spi-ind.com/

Whatcom County Farm Forestry Association — http://www.wafarmforestry.com/

WSU Whatcom County Extension — http://whatcom.wsu.edu/

WASHINGTON STATE UNIVERSITY
WHATCOM COUNTY EXTENSION