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American Nature Study Society
President's Letter
Steve Melcher

It is with a burdened heart that I fill the position of president. The passing of Bill Sharp came as a shock to us all. I became close to Bill in recent years finding mutual friends around the world, a passion for sailing, and a love-hate relationship with computers. Bill appointed me vice-president only a few months ago. We had frequent e-mail and telephone communications concerning the past and future of the society. As he wrote in the president's letter of the past issue: "The focus of my presidency over the next two years will be to work with the Board of directors to strengthen and expand ANSS membership." Dr. Sharp was able to light a fire under that board. We were motivated to form new committees, personally bring in new members, and even create our own website. I hope to keep fanning the flames over the remainder of the term and keep membership growth and quality journal publication at the top of the society's agenda.

It is also my hope to have the journal received in the mail by a seasoned naturalist who will then share a story or activity in that issue with a friend, colleague or offspring. One way of increasing our membership is to share this issue with someone you know.

The American Nature Study Society has a grand history. I am humbled to be listed along with a long line of distinguished grandfolks of nature study. Charles Mohr (president 1944-46) was my mentor while I was living in Delaware. Mr. Mohr encouraged me to pursue studies in nature education. We spent many noisy hours in the back of school busses working on a 'View from the Bus' series.

I am leaving on a trip to Ireland soon, the country with the least percentage of forest cover in Europe (only 6%). There I will be tracing the steps of our first president, Liberty Hyde Bailey, who made a journey there over fifty years ago. I'll be carrying with me, part of a cane that was given to him while in Ireland. A cane whose composition stumped the botanists at a recent board meeting. I hope to have some tales to spin for the next issue of 'Nature Study'.

THIS ISSUE

Forests are very special to me. I am raising a small one at home now. And like my three year old daughter, Forest, other forests need protecting. New preserves are being formed every year by volunteer conservation organizations as well as government agencies. While living in India, my host Dr. V.P. Agrawal, showed me trees that were tattooed and being protected by the government. Peacocks strolled alongside armed guards who leaned against numbered trees.

In Belize, Jerone Tut, showed me the result of a recent slash and burn carried out to clear land to grow oranges for a major American beverage company. He convinced his family not to sell their land to that company but instead start an ecotourist business. Many ANSS members have visited his 'Crystal Paradise Lodge' in western Belize. As president, I am urging members to support his families' ecotourism efforts by establishing an ANSS field station at his facility.

Visit a forest with someone. One can only care about that which one knows and understands. One can only know and understand a forest by spending time in its realm. You then, as educated naturalists who now know, understand and have visited a forest, will be more inclined to take steps to preserve that forest. We must identify and protect vast areas of forests through out the world not only for the survival of the forests and their inhabitants but also for the survival of those furless creatures now walking upright that once sought safety among those trees.

Steve Melcher

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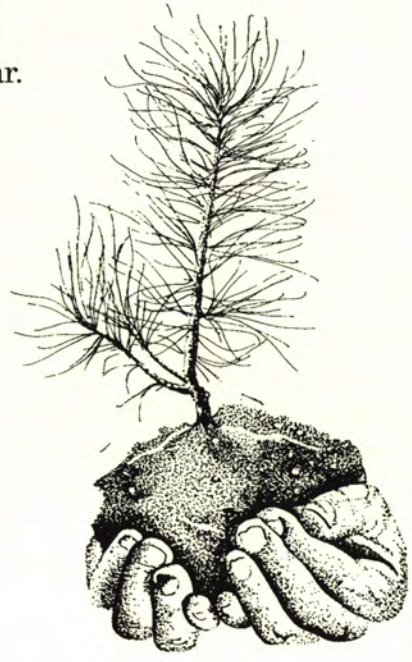
Cover photo: *Rod Hawkes*
Inside back cover: Naturalist's Notebook - *Showing Your Age. John Wiessinger* ©

FROM THE PAST:
Forests - Anchors of the Hills

by: Hugh Hammond Bennett

Two Hundred millions dollars a year washed away! One hundred and twenty-six billion pounds of plant food wasted annually! We have been in the habit of turning to other countries for examples of lands, denuded of their timber, their soil washed away by the unleashed waters. We are urged to look at the bleak wastes found over vast areas of China and Asia Minor and to see them as the kind of heritage America will surely pass on to future generations unless she speedily changes her practice of cutting timber from steeply-sloping areas and of permitting needless fires to destroy soil-binding vegetation. But was do not have to look afar. In this youthful country of ours we have only too many examples of what happens when land is unwisely used. There is urgent necessity for a national awakening to the importance of combating the destructiveness of this sinister form of land wastage. Reforestation is one of the synonyms of soil conservation, and, accordingly, public-spirited men and women in all walks of life should give support to those engaged in worthy efforts of forest protection and reforestation on the watersheds and on all those types of soil which are unsafe for cultivation or even for pastoral use by reason of steep slope, shallows oil or other deficiency.



Excerpts from: Nature Magazine June, 1926

GUEST EDITOR'S NOTES

How does one create a tapestry large enough to cover the world's forests? The editors of 'Nature Study' knew this couldn't be done, so we've chosen some of the squares of the forest quilt to feature in this issue.

Forests Today and Yesterday

A stone wall one finds in the middle of the woods today means a farmer once hoed his row of beans or corn where now trees shade the earth. It is true that there are more forested lands now in the east than 200 years ago. However, perhaps 400 years ago, 'a squirrel could travel from Maine to Kentucky without ever touching the ground.' A true greenway!

Forest Health: the Indicators

When asked to name a forest creature, most naturalists place squirrels and deer at the top of their list. Studying a well known organism such as the squirrel may help us understand ecological relationships (including our own) found in the forests.

We need a way of seeing the forest as a whole, but looking at the big picture can be overwhelming. We need to simplify to understand so we break the whole into parts. However when we simplify and disjoin we are in danger of not seeing the forest for the trees.

Where Are the Forests?

I hope the reader will feel the sense of being dwarfed by the magnificent giant sequoias as well as feeling awed by the ancient forests of Gilboa, New York. The world's oldest living things, the Bristlecone pine trees are featured as well as the new growth found after a forest fire. We wanted to inform the reader that there are rainforests other than those found in the lush tropics.

Forest Fires

Satellite images show major fires in Indonesia, Brazil, Mongolia, Philippines, and many other countries. Many of these fires are caused by methods of slash and burn used to clear the forests for farmland. This age old technique may have been useful for our early survival but today the land is cleared to grow hamburgers. More people needing to feed their growing families, more burgers in fast food chains, combined with general global warming and the recent El Nino phenomena are combining to cause disaster for the world's forests.

New in This issue

In trying to move into the next century we have entered the onramp of the information highway by providing websites concerning forests. This issue will also feature a 'Naturalist in the Field' and an article 'From The Past.' Hopefully this will enable us to get a sense of how far we've come and far we may yet have to go.

Steve Melcher and daughter Forest amongst the Seqoias of southern California

We hope we've provided enough background information, contacts, and ideas about what you, your family or classes can do to help preserve the 'lungs of the earth': our forests.

I'd like to thank interns Tamara DiVasto, Judy Skupsky, and Sarah Walsh for spending many hours in front of a computer while the sunny days of summer's nature beckoned outside.

Acknowledgments

ANSS wishes to thank the following individuals for their roles in producing this issue of Nature Study:

John Lutz for his work gathering articles and resources of forests.

Steve Melcher for taking on the task of Guest Editor.

Dean Thomas Bohn and staff of Park School of Communication at Ithaca College for providing student interns and facilities to support this journal.

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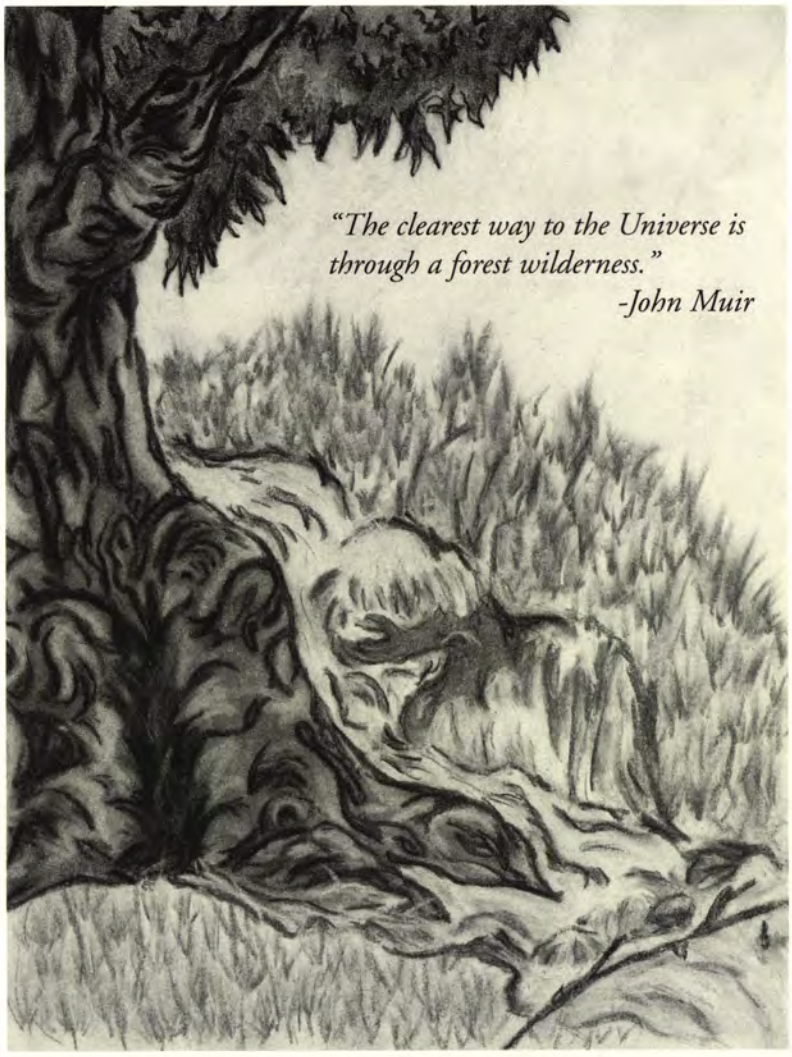
Susan Spear for providing page layout and graphic design support.

What is a Forest?

by: Tamara DiVasto

Answering the question, "What is a forest?" is a daunting prospect. Even the most seasoned forester has difficulty providing a clear and concise answer. Roughly 30% of the earth's land surface is covered by forests. A "forest" is best described as an ecosystem comprised of living and non-living components that are forever changing, in which trees are the dominant life form. A tree is defined as a woody stemmed plant, which when mature, is over twelve feet tall with a single main stem (or trunk), and with a more or less distinct crown of leaves. Forests are classified into various categories. The dominant type of tree in a forest usually determines the classification of that forest.



Eileen Crowley

The forest consists of five layers. The tallest trees form what is called the canopy, trees under twelve feet tall makeup the understory, the shrub layer is formed by many stemmed, smaller plants, the herb layer is comprised of any green plants that have soft rather than woody stems, and the forest floor is composed of "everything that drops" (leaves, twigs, branches) and topsoil. A forest's soil is dependent on the climate, vegetation and underlying rock form. The soil is both living and non-living; consisting of things such as microbes and rocks.

The forest is home to a wide variety of animals, such as birds, amphibians, and microbes. Inhabitants of the forest vary depending on the climate, construction, and age of the forest. Some inhabitants are widely visible, while others may be only glimpsed once in a lifetime.

The forest's life, like life in all ecosystems, is cyclical. Forests can be damaged by fire, disease, insects, natural disasters and also by man, but if left to its own resources will return to a healthy state. All parts of the forest are interconnected and ultimately dependent on the sun as a source of energy.

It is important to gain an understanding of the technical definition of a forest. However, anyone who has spent time in a forest understands that forests extend well beyond technical definitions.

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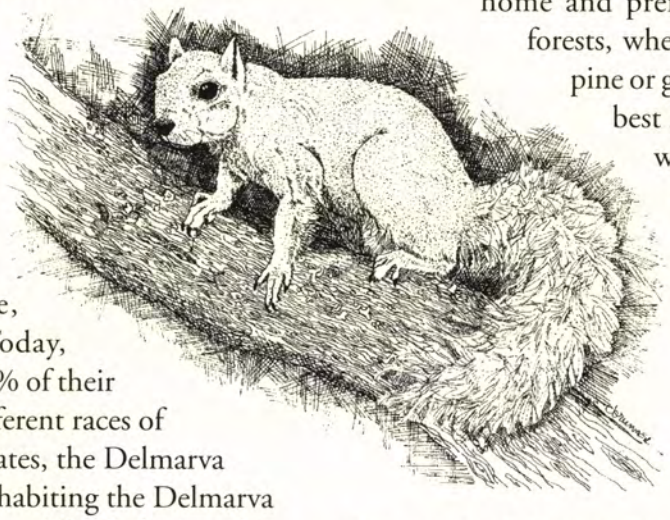
United States Forest Service.

Tamara DiVasto is currently a graduate student at Ithaca College. She is from Albuquerque, New Mexico.

Big Squirrels: Phantoms of Delaware Forests

by: Dorothy Abott-Donnelly

To some they are only an illusion, a glimpse of our parting heritage, or a photo pasted in a regional wildlife chronicle. Looking deeper with a more persistent glance into old woodlands in lower Delaware, one can uncover these shy rodent's survival skills.



Cindie Brunner

Named in 1758, the Delmarva fox squirrel (Sciurus niger cinereus) once roamed freely through vast incorporated woodlands from southern New Jersey, Pennsylvania, Delaware, Maryland, and Virginia. Today, they survive in only about 10% of their native range. One of nine different races of fox squirrels in the United States, the Delmarva fox squirrel is the only one inhabiting the Delmarva peninsula. With populations rapidly declining, this fox squirrel was finally listed as Federally Endangered in 1967, and remains so today. Changes in land use, which result in a drastic reduction and fragmentation of large wooded parcels, claims another victim.

Viewing this incredible creature is now limited to only four counties in Maryland and lower Delaware. Efforts are underway to transplant healthy fox squirrels into areas where they can survive and increase their populations. Unfortunately, competition with their notorious and well-adapted cousin, the gray squirrel, has had a negative impact on the efforts.

Unlike the gray, the Delmarva fox squirrel favors the forest floor for travel. Possibly because of their size, swinging between tree tops is bothersome. They will actually descend a tree, scurry across the forest floor, and hasten-up another trunk rather than leap while suspended above ground. Most activity occurs in the morning and early evening.

Their large two-pound whitish-gray upper body is striking against a full fluffy tail. When startled or trying to look larger, their tail can be fanned to six inches wide. During summer months, the whitish body color fades to a buff shade. This agile, slow-moving squirrel steps out on white feet. The top of its head, snout, cheeks and ears exhibit a whitish display. Its long tail is striped with black and white fur bearing a white margin. At first glance, this phantom-of-the-forests looks like a large gray squirrel or an adult cat.

The Delmarva fox squirrel is fussy over its home and prefers to live in over-aged forests, whether full of giant loblolly pine or grand hardwood trees. The best home is near streams and wetlands, or at the edge of agricultural fields. A favorite room is a cavity or crevice about 40 feet above the ground where large trees may tower beyond 200 feet and the underbrush is sparse and open. They make their nest from dried leaves. Twigs are knit snugly to insulate from winter winds and protect young siblings. Leaf nests are sometimes constructed on the outer limbs of trees as small day shelters and feeding platforms.

Defenseless young are born between February and April, with some new families in July and August. They are blind and hairless and number around four per litter. Female Delmarva fox squirrels raise offspring by themselves for three to five months, then the young are on their own.

Enjoying a fall breakfast from mast-producing hardwoods (such as hickory, walnut, oak, beech, and sweetgum), this squirrel will spend the remainder of the day munching on berries near the forest floor and grain—corn planted by a neighboring farmer. When trees bring forth tender leaf buds and flowers in the spring, the Delmarva fox squirrel hurries to fatten-up on these delicacies. This rodent will even feed on mature green pine cones during late summer and early fall. They have been observed eating fungi, insects, fruit, seeds, and occasionally young birds and eggs.

Being a typical squirrel, nuts are forever being buried as a winter food source. Squirrels use odors to relocate their underground banquet. If food becomes scarce, these animals suffer severe weight loss, and may lose their fur to mange and even die.

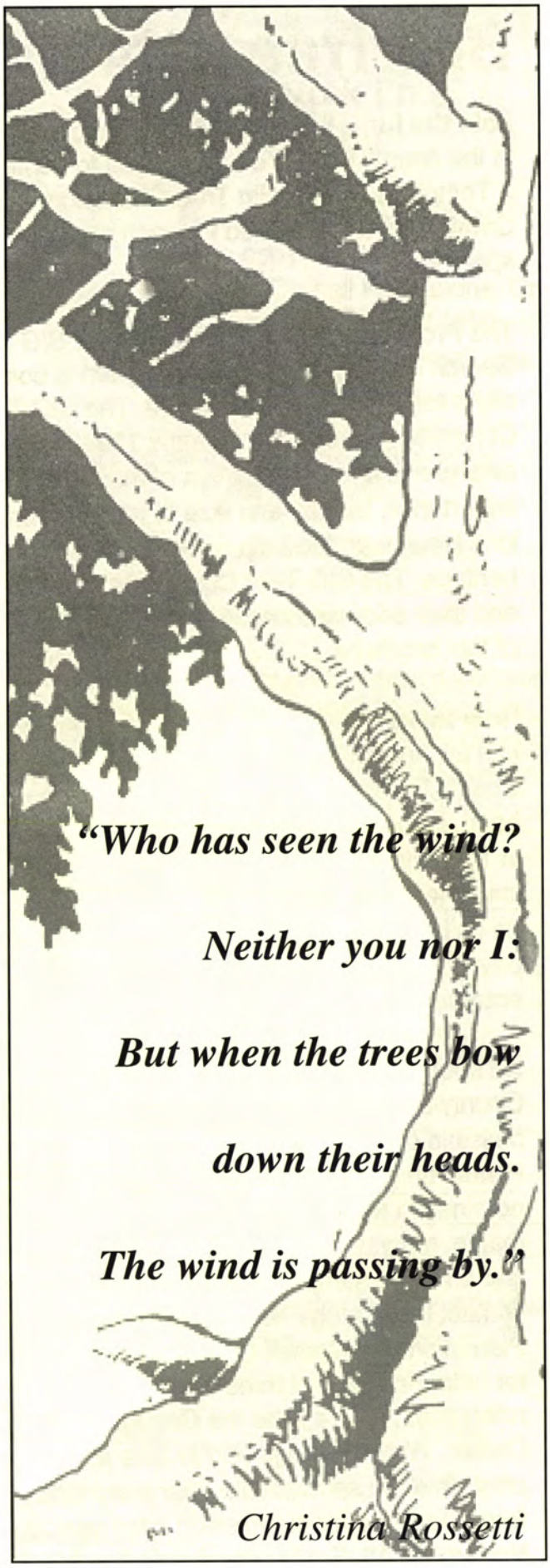
During hot summer months, the Delmarva fox squirrel retreats to a cool and refreshing interior wetland forest. As they travel through the woods, adults continually are on guard for predators such as the red or gray fox, weasels, minks, Great Horned Owls, Bald and Golden Eagles. Young squirrels may succumb to attacks by raccoons, opossums, rat snakes, and domestic cats and dogs. These squirrels are known to leave a tree and run for cover on the forest floor, instead of climbing higher in the tree for protection.

Over-hunting in the past, and death from automobile mishaps, has contributed to the population decline. The Delmarva fox squirrel continues to be in peril as forestry practices in this part of the country favor intensive short-rotation pine monoculture and conversion of large, old-growth hardwood forests for open fields, roadways, and urban communities. Gypsy moth infestations over the past few years and the current outbreak of Southern pine beetle have devastated their already shrinking habitat.

Next time you visit Sussex County, Delaware, travel the back roads quietly and slowly always keeping a watchful eye on the edge of dense woodland. You may just find yourself snatching a glimpse of a Big-gray as it travels on it's quest for food and shelter.

Dorothy Abbott-Donnelly would like to thank Ken Reynolds of Delaware Department of Natural Resources and Environmental Control and Division of Fishland Wildlife.

Dorothy Abbott-Donnelly, B.S. F. West Virginia University, is the New Castle County Forester, State of Delaware, Department of Agriculture, Forest Service. She has 14 years experience with USDA-Natural Resources Conservation Service as a Soil Conservationist, District Conservationist, State Public Affairs Specialist, and State Volunteer Program Coordinator, and two years as County Forester and State Biomass Program Coordinator.



The World's Oldest Living Things: Bristlecone Pine Trees, Inyo National Forest, California

U.S Forest Service

by: Judi Gerber

"While on the roughest ledges of crumbling limestone are lonely old giants, five or six feet in diameter that have braved the storms of more than a thousand years. But whether old or young, sheltered or exposed to the wildest gales, this tree is ever found to be irrepressibly and extravagantly picturesque, offering a richer and more varied series of forms to the artist than any other species I have yet seen." John Muir

Do you know what the world's oldest living things are? It might surprise you that the oldest living things on earth are believed to be the ancient bristlecone pine trees located within the Inyo National Forest in California, between 10,000 and 11,000 feet elevation in the White Mountains, east of the Sierra Nevada.

Here in the White Mountains, two miles above sea level, the ancient trees have survived more than 40 centuries. This exceeds the age of the oldest Giant Sequoia by 1,500 years! One of these trees, named Methuselah, is estimated to be 4,700 years old. However, it is thought that some of these magnificent trees are nearly 5,000 years old.

These stunted, aged, bristlecone pine trees have survived in spite of and perhaps because of, their harsh environment. They have survived under the most adverse conditions imaginable: high winds, cold temperatures, limestone soil, arid land, and the harshness of their 10,000 foot elevation. Yet amazingly, the bristlecone pine has fought hard and ultimately adapted to the brutality of nature.

Although the world's oldest are in California, bristlecone pines can be found atop the arid mountains of the Great Basin, stretching from Colorado to California. Until 1970, it was believed that all bristlecones belonged to one species, Pinus aristata. However, a thorough investigation by Dr. Dana K. Bailey, showed that the Colorado bristlecone (those scattered in the most desolate, bare and high mountains of the Rocky Mountains of Colorado), and the Great Basin bristlecone (Eastern California, Nevada, and Utah) are distinctly different, yet closely related. Therefore, he renamed the Great Basin species Pinus longeava.

What exactly does a bristlecone look like? Bristlecone pines have needles that are characterized by clusters of five and not surprisingly, have cones with bristles. They are easily recognized due to their often twisted, gnarled appearance. This appearance leads to the moniker: "stunted."

The bristlecones are stunted pines of upper timber, growing only to heights of 20 to 40 feet, while across the Sierra, the giant sequoia grows 200 to 270 feet in height.

Part of the secret to the bristlecone's longevity is its ability to delay its growth. In adjusting to the limits of moisture and food availability, only a small portion dies so that a part of the tree may continue to live. Therefore, when you come to White Mountain, you will find many trees in beautiful shapes and formations that appear to be composed of dead and eroded wood. However, upon closer inspection you will find that there is a small strand of bark, the tree's "life line," twisting around the tree to the one living side or branch.

In fact, bristlecone pines can stay intact for thousands of years in the dry, cold climate of the White Mountains. Due to the resinous wood and extremely cold and arid environment, decay of dead wood is extremely slow, and wood on the ground in some stands is over 10,000 years old.

As a result, these ancient pines yield sensitive tree-ring records. Every year trees grow a new layer of wood just under the bark. In wet years, the growth ring is usually wider than in years of drought. The combination of longevity and sensitivity provide a

perfect record of the climatic conditions (particularly moisture), of the past 40 centuries. This information is vital to researchers who are studying ways to address California's water issue. By studying the record of wet and dry years in the past, scientists can help plan the need for aqueducts and water storage, and solve the problem if current water sources become unstable.

Exactly how was the age of Bristle Cone Pine Trees identified and determined? It wasn't until 1953 that the great age of the bristlecones was discovered. It was Dr. Edmund Schulman's studies of cores from 1953 to 1957 that proved these bristlecone pines of the White Mountains of California were the oldest of the ancients. Dr. Schulman, a dendroclimatologist at the Laboratory of Tree-Ring Research at the University of Arizona, hunted for 20 years for long-lived trees as part of his research. His work was a continuation of the work begun by Dr. A.E. Douglass, the originator of tree-ring study as a way to discover past climatic changes.

While working on his studies of long-lived trees, Dr. Schulman made a trip to the White Mountains, acting on a "rumor" he had heard that old trees would be found there. Despite his skepticism and belief that such tips are often untrue, he made the long, arduous trip up the mountain anyhow. Upon his arrival, Dr. Schulman found a multi-stemmed bristlecone, an astonishing 36 feet in circumference. This tree had been named "Patriarch" by a local ranger. After taking initial samples, Schulman discovered it was "only" 1500 years old, showing typical ring growth of the upper tree line. However, he realized that the bristlecones kept a better record of drought conditions than the limber pines he had been studying.

Continuing his research in the White Mountains, Dr. Schulman made another exciting discovery when he found nearby old trees on even drier sites. These results convinced him of the need to plan a return field trip for the next year.

In his laboratory, Dr. Schulman conducted a comprehensive analysis of his collected samples and data. The result: he proved the "rumor" was true and Schulman became convinced he needed to study the bristlecone stands. During 1954 and 1955, Dr. Schulman and his assistant, C.W. Ferguson, conducted an extensive search from California to Colorado.

They found the oldest trees at elevations of 10,000 to 11,000 feet, usually growing in what seemed like impossible locations. These trees had large areas of dead wood along with thin strips of living bark. Surprisingly, the trees growing in the most extreme conditions, with little soil and moisture, were the oldest!

Although he discovered several trees ranging from 3,000 to over 4,000 years old, only one was found outside the White-Inyo Range. Thus, Dr. Schulman decided to devote his studies to this area. The first tree he proved to be over four thousand years old, he named "Pine Alpha". Eventually, in 1957 "Methuselah" was determined to be 4,723 years old and it still remains as the world's oldest known living tree.

For several months after his discovery, Schulman openly talked about being awed by these trees, often speaking with amazement about their ability to live so long with so little. He wrote: "The capacity of these trees to live so fantastically long may, when we come to understand it fully, perhaps serve as a guidepost on the road to the understanding of longevity in general."

Dr. Schulman's data was reported in a 1958 issue of National Geographic, bringing the White Mountains worldwide attention. Unfortunately, at the age of 49, Edmund Schulman had a heart attack and died shortly before his article was published.

It was also in 1958 that the U.S. Forest Service established the 28,000 acre Ancient Bristlecone Pine Forest. In addition, they named a magnificent stand of bristlecone, Schulman Memorial Grove, in honor of his contribution to the world.

What was so awe-inspiring to Edward Schulman, and continues to be to the countless number of visitors that have followed him each year, are the stories that the bristlecones tell. Each bristlecone pine, from young seedling to the oldest tree, has its own distinct character and shape. Each tells its own story, the seedling with its shiny green needle-covered branches speaks of the freshness of youth, as their bristlecones trickle with pine scented sap. The elders, battered by nature, stand for centuries until they are sculpted into a unique piece of art, demanding respect and awe. One cannot help but stand in wonder, at meeting

these venerable trees, at the fact that for centuries they have clung to life.

Coming to this place you enter a new world; it is remote and unearthly, resembling a lunar landscape. When all life of a bristlecone finally stops, the remnants stand like ghosts for a thousand years or more. Wind-driven ice and sand continues to polish its wood.

Fred Richter

The White Mountains are located in east central California just north of Death Valley, and on the western edge of the Great Basin. The White-Inyo Range extends from Montgomery Pass south-southeastward to Malpais Mesa in the Owens Lake area, a distance of 110 miles. They reach an altitude of 14,246 feet, remaining in a rain shadow of the Sierra Nevada located a few miles west. The Sierras take the majority of moisture, as Pacific storms move eastward. This leaves the White Mountains with nothing but strong dry winds.

Therefore, annual rainfall is less than 12 inches, most of which is snow in winter. On a summer's day the amount of moisture in the air is about half a millimeter, the lowest ever recorded anywhere on earth. However, it is these hardships that contribute to these mountains producing such beautiful trees.

The White Mountains are made up of quartzitic sandstone and granite bedrock. A large portion of the earth on these slopes have been washed away by the extreme conditions. The mountains also contain large amounts of dolomite (limestone), a very ancient rock. Numerous fossils can be found in this ancient rock. Because these soil types inhibit the growth of other plants, they provide an exclusive environment for the slow-growing bristlecones.

The bristlecone pines have survived for unknown centuries, seemingly unthreatened by nature. However, they are under threat from all the people who come to visit them. For example, "Methuselah", the oldest tree, is not marked due to the threat of vandalism, and the exact location of the tree is kept confidential in order to protect it.

Despite this fragility, you can walk through the grove of ancient bristlecone pines along Methuselah Trail, a 4 mile round-trip hike from Schulman Grove. There are two self-guided nature trails at Schulman Grove. Along the Discovery Walk is Pine Alpha. The oldest living trees, including the 4,723 year-old Methuselah tree, grow along the Methuselah Trail.

The following information comes from the U.S.D.A. Forest Service: "Because the Ancient Bristlecone Pine Forest is a very special place, fragile and irreplaceable, everything possible must be done to maintain its environmental integrity. The following regulations apply within the boundaries of the forest. These are not meant to detract from enjoyment, but to protect the ancient trees and their setting. The Ancient Bristlecone Pine Forest is classified as a Botanical Area and is set aside for scientific research and public enjoyment."

For more information contact: White Mountain Ranger District, 798 North Main Street, Bishop, California 93514, (619) 873-2500

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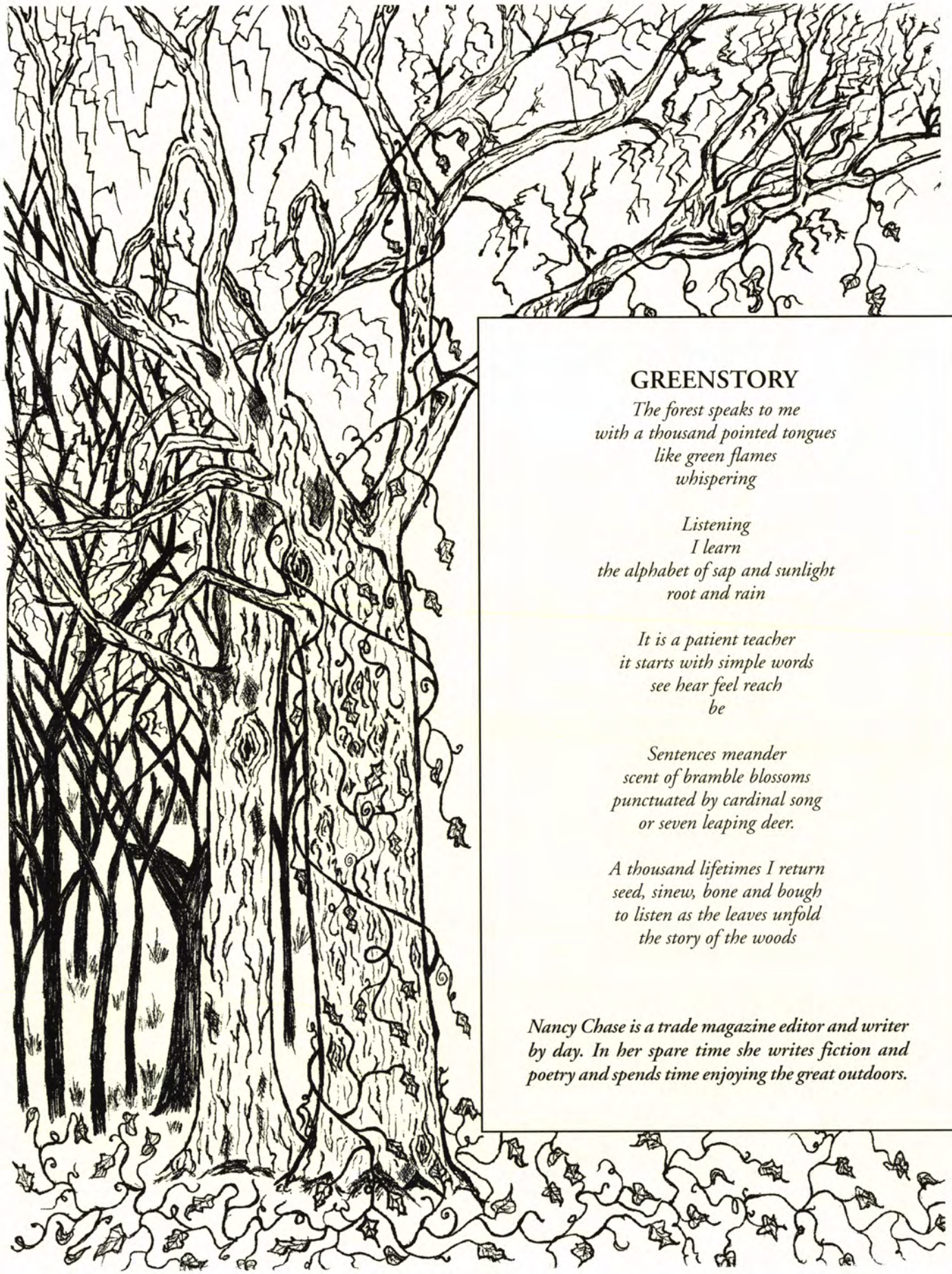


GREENSTORY

The forest speaks to me
with a thousand pointed tongues
like green flames
whispering

Listening
I learn
the alphabet of sap and sunlight
root and rain

It is a patient teacher
it starts with simple words
see hear feel reach
be

Sentences meander
scent of bramble blossoms
punctuated by cardinal song
or seven leaping deer.

A thousand lifetimes I return
seed, sinew, bone and bough
to listen as the leaves unfold
the story of the woods

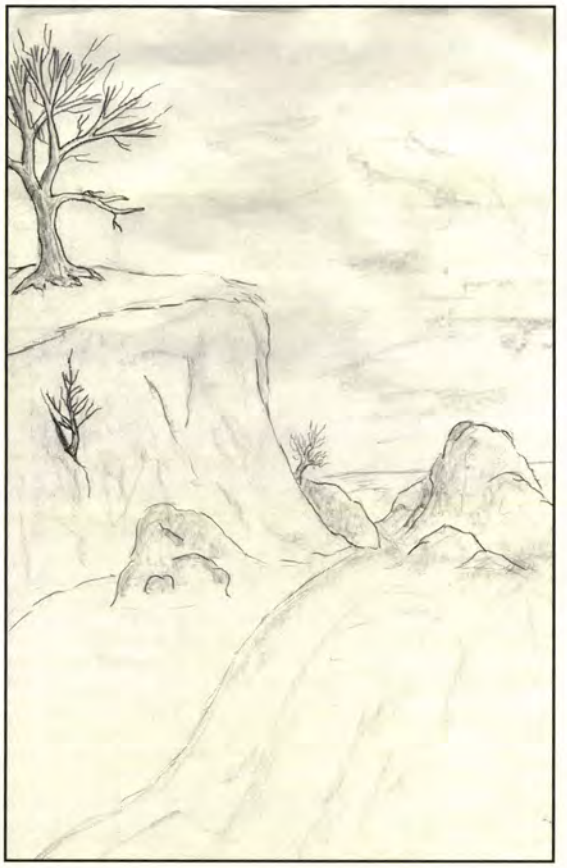
Nancy Chase is a trade magazine editor and writer by day. In her spare time she writes fiction and poetry and spends time enjoying the great outdoors.

Eileen Crowley

Island Forests of Maine

by: *Karen Roberts Jackson*

The story of island forests is one to delight the child in everyone. For in the beginning, 'once upon a time', there was a reliance on algae and fungi, elfin carpets of mosses and lichen, excreting mild acids breaking down stone to create soil. It is a fairy tale akin to David and Goliath where a tiny spruce seed, blown by the wind, lands in a crack of shoreline granite. With the help of fog, rain, ice, and organic acid exuded by the plant's root system, the crack slowly widens, crumbles, and produces a thimbleful of growing medium enough to sustain a seedling. Over twenty-thirty-forty years of time of twisting and bending, being slammed by waves and wind, a tree is anchored by horizontal roots stretching out across stone, often with nothing more than a 'tap root' connected to a pocket of soil on the bank.

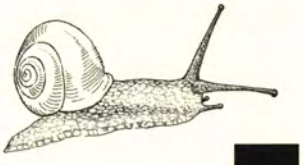


Many factors combine to make island forests the unique entity they are. Not surprisingly, it is the same factors that serve to make these island dwellers the rugged individualists they are. Trees of island forests have the ability to carve an existence, sustenance and nourishment, out of barren stone; the ability to hang tough despite a life of extremes in weather and ecological conditions.

When explorers first ventured to the 3,000 or so islands of Maine, they were struck by the prominent, nearly untouched forests of conifers and hardwoods. The vegetation which covered these biological microcosms was the result of uninterrupted evolution from glacial till to climax forest. As the glaciers retreated, a tundra-like landscape of exposed bedrock, sandy outwash plains and rocky till were left behind. As the region warmed and soil accumulated, trees began to move north. Island inhabitants prior to the arrival of European settlers, the true island "natives", had utilized the abundant and mixed woods of walnut, oaks, beech, maple, chestnut, hickory, ash, yellow birch, hemlock, white pine, balsam fir, white birch, tamarack, and the preponderant spruce and all its cousins.

Native American usage included canoes, baskets, dwellings, foods, medicines, fish weirs and certainly firewood. Early British explorers recognized the potential military significance of Maine's supplies of mast timbers, and further noted the availability of all varieties of shipbuilding materials. It is difficult to state how much timber was harvested for the shipbuilding trade. It is estimated that it took 2,000 oaks, not counting other lumber for floors, planking, spars, oars, etc., to build one ship for the British fleet. In the early 1800's shipyards on a handful of Maine islands launched 185 schooners, averaging 100 tons each, along with vessels of every size, from fishing boats to full rigged ships. By 1850, most huge hardwoods had been cut. At that time, one-third of the nation's entire tonnage of vessels had been launched from Maine coastal and island shipyards.

Island lumber was easily harvested and easily transported, making island forests especially susceptible to over harvesting. Remaining stands of hardwoods were felled for use as barrel staves, clapboards, firewood and kilnwood for the lime industry. Islands with good anchorages were visited routinely, loading the decks with 20 to 30 cords of wood to be transported for



either heating wood in Boston, or the lime kilns on the mainland. Mature spruce forests now make up approximately 90 percent of the remaining island woods and are harvested primarily for pulp wood for the paper industry. "Pulping" of islands began in the 1920's and continues to this day. Island hardwoods, unable to reestablish themselves, have all but disappeared.

Spruce and fir mixed with cedar, tamarack, hemlock, maple, and birch now dominate much of coastal Maine and her many islands. Even on the islands that have had several generations of conservation efforts, oaks, beech, walnut and hickory have been unable to reestablish themselves. This is due primarily to the heavy seeds which rarely float out and establish themselves on islands. Even when cultivated, they need the protection of shade as seedlings. Birch and aspen, which do grow well in sunny areas, have lightweight seeds which cannot move through grassy cover and move into the soil. It is only after fire, blowdown or logging create a window of light and space that raspberries, aspen, and white birch begin to move into an area.

Natural disasters such as the recent epidemics of spruce budworm, and man-made disasters such as fire and clear cutting, eliminate all or nearly all trees in a given area and produce an even-aged stand. Even-aged forests reach maturity nearly simultaneously and are vulnerable to disturbances that level the forest all at once. Even though carpets of Lilliputian like forest of spruce and fir rapidly reappear, they will also be even-aged. The cycle will continue until centuries pass, or human intervention replaces part of the woods with trees of many different aged classes. It is not uncommon, as one walks through an island forest to see wind swept areas of 40-60 foot spruce tumbled over like a row of dominos, as if a mighty giant had strolled through.

Even in their demise they are objects of fascination with their many twists and often gigantic burls — massive growths that surround an irritation such as salt or disease. Often, branches will shoot up from the fallen mother tree, and will, themselves, grow to an impressive size. "Cat spruce", actually white spruce whose sap smell strongly like a male cat's scent, is the most salt-tolerant of the spruces and is found along the edges of the islands. Red spruce and balsam fir, with their famous scent of Christmas wreaths, crowd the interiors. Tamarack, also called larch, with its slender, sparse and feathery, clear green summer crown contrasts with the darker green foliage of the other conifers. In September or October, tamarack leaves turn golden and fall. Commonly found growing in swampy areas, it is known to be rot resistant, and was once prized for boat building. Of the shrub-like trees are the mountain ash, with its brilliant red berries, also known as a rowan tree with a folklore history or warding off evil spirits. There are the alders, whose slippery bark provided many a whistle for pioneer children. And, not to be diminished, hundred year old lilacs and apple trees, planted near now vacant cellar holes and foundations, evidence in themselves of the stalwart folks who bent and swayed and twisted with the elements, and who carved a life out of salt and stone, clearing the virgin forests and setting up a new ecology.

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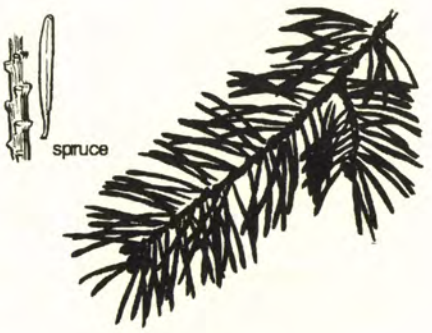
Karen Roberts Jackson writes, homeschools, and homesteads on a small island off the coast of Maine. Her daughter Hope, sons Tristan and Dylan made an Outside Magazine sponsored trek across Baffin Island this summer.



"The forests,
with their myriad of tongues,
Shouted of liberty....."
Henry Wadsworth Longfellow

The Effect of Forest Fragmentation on Migratory Birds

by: *John Gustafson*

In recent years there has been growing concern over the possible relationship between fragmentation of forested land and the decline in numbers of several species of migratory song birds in North America.

More than half of our nesting songbird species (which include warblers, vireos, flycatchers, tanagers and thrushes) migrate to Central and South America for the winter months. At first, their decline was thought to be caused, in part at least, by the timbering of tropical rainforests. But censuses of nesting songbirds in North America over the past several years have indicated that nesting success, as shown by young birds fledged, has been in decline.

One cause of this decline is that cowbirds, which are brood parasites, have become more prevalent and more successful in their negative impact on nesting songbirds. Cowbirds are birds of open country. Before there were cows to hang out with, they followed herds of bison as they moved about. This behavior tends to keep them from penetrating very deeply into forest stands, limiting their impact on forest nesters to woodland borders. With the break-up of large tracts of forests into "back woodlots" surrounded by croplands, cowbirds have access to larger numbers of nests than before. Their preference for birds smaller than themselves makes species such as warblers particularly vulnerable.

The phenomenon of forest fragmentation is most pronounced in mid-western states and provinces, where the land and climate are conducive to large-scale farming. In eastern regions of North America there are still large tracts of relatively unbroken forests, lessening the impact of cowbird predation. In this area there has also been extensive reforestation of abandoned farmland during the past seventy-five years, which somewhat compensates for the spread of urban development.

The decline of neotropical bird species is probably due to several factors, some of which are related to human activity. Continuing research is needed to keep us from making unnecessary and inappropriate management decisions.

John Gustafson is an Emeritus Professor of Life Sciences at S.U.N.Y. College at Cortland, NY. In the past, he served as ANSS President and Treasurer for more than two decades.

LOST IN WONDERLAND

Sharona von Perlstein

I began my journey following
a brick road and ended in knee-high grass.
As soft as blue velvet on a winter afternoon.
I could not see the blueness of the sky
but rather the green rustling clouds.
I could not hear a single bird cry, but
rather the bellow of flocks.
I could not smell the pollution
for the air was uncontaminated by man's
laziness, "transportation."
The flowers were scattered like pebbles on
pavement.
The Squirrels leap into the air
bouncing limb to limb.
Deer in the daytime, "how rare."
Prancing freely, Bambi would be proud.
I know that I am lost
but a wonderful land I have discovered.
A forest that is pure
unharmed and unfortunately due
to me and my friends virtually unattainable.
I truly am sorry that I have taken you for
granted.
Your beautiful greenery and nature is
"Heaven" on Earth.

A Wonderland

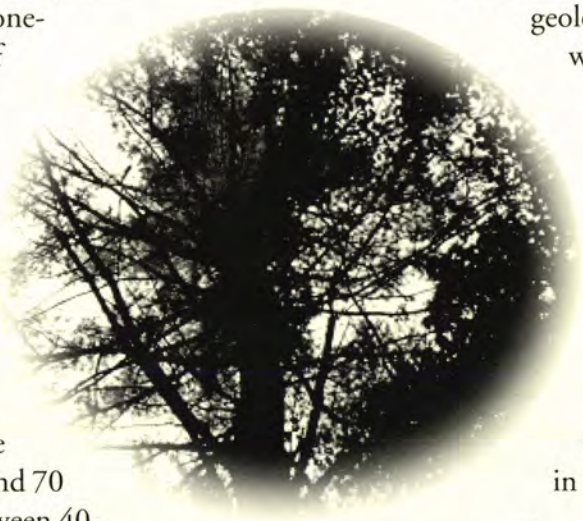
Sharona von Perlstein is a native of Rochester, NY. She is a graduate of Nazareth College, currently working on her Master's in education. She has written two children's books and is currently engaged.

The Green Wall of Russia

by: *Olga Kouptsova*

When I hear the word "forests", with great love and pride I recall gorgeous Russian silvery birch groves, the severe, almost gothic austerity of fir and spruce, shadowy and friendly maple and oak forests, and picturesque meadows scattered among them. The dear memories of the vast and beautiful country.

Russia boasts a rich, complex and varied organic world which constitutes an essential element of the geographical environment and satisfies the economic needs of the nation. Among flora found in the former Soviet Union are 68, 000 species of sporic plants and only about 17,500 (one-eighth of the total number) of floral plants, including 15,000 species of trees and bushes (including a mere 568 different trees). Most of the country is covered by thick coniferous forests(fur, spruce, larch, pine trees) called "taiga", which spread from the Finnish border to the coast of the Okhotsk Sea at the Russian Far East (between 56 and 70 N latitude in the West and between 40-45 and 75 N latitude in the East). To the North of the taiga belt lies forest-tundra, to the south there are mixed forests: broad-leaf (European deciduous zone) and small-leaf (Eurasian mildly continental and continental climatic zones); further to the South the forest gives way toaforest-steppe and steppe floristic communities. As for Siberia, more then 3/4 of the area is covered by light larch taiga, while the Far East is represented by unique Manchurian forests (the deciduous and coniferous species of trees replaced by analogues, like Manchurian walnut, ash, lime).



Since Slavic tribes first entered the southern Russian Plain in the 9th century, agricultural activities have dramatically changed the landscapes of most of the region's wide strip of tundra, forest-tundra, taiga, broad-leaf forests, and forest steppe ecosystems. Deforestation has been a leading factor for alterations in landscape structure and loss of ecosystem resilience. Agricultural practices have also led to extensive erosion, the desiccation of thousands of rivers, lakes, wetlands, and groundwater supplies, and mass extinction of local populations of wildlife. However, the country still enjoys the endless magnificent green wall.

There are few places in the world where forests grow north of the arctic circle (66.5 N latitude). The Kola peninsula is one of such areas in Russia. The Kola Peninsula, the northeastern tip of Fennoscandia covers the area roughly half of the size of Finland. It is washed by the waters of Barents and White Seas in the north and east, respectively. This is a region of Northern Russia uniquely diverse in geological features, vegetation and wildlife. Unlike much of the Russian Arctic, the region has a relatively mild climate, due to the Gulfstream's warming the port of Murmansk and the whole Barents Sea coast. The natural riches of the area and proximity to Western Europe attracted development of the extracting industry earlier in the 20th century.

U. S. Forest Service

Over half of the Kola Peninsula is covered with forests. The landscape here has been shaped primarily by glaciers, the last of which melted away about 8 millennia ago. Following recession of the glaciers, the sparse vegetation of the tundra zone was replaced by the Scotch pine and birch forests. Most likely, the species arrived here from neighboring Finland. Much later spruce came from the east, forcing the pine out onto the dry rocks and cliffs, and pushing the birch north to the tundra border where the spruce can barely survive in the severe conditions.

As a consequence of the natural history of the area unlike in most other areas in the Russian North, it is birch, not conifers, which makes up the northernmost forests in the Kola Peninsula. Some scientists attribute this to the mitigating impact of the Gulfstream, washing the northern shores of the peninsula. It

U. S. Forest Service

makes the overall climate milder, without drastic seasonal changes of the temperature. It would not be overestimating to say that forests can grow in the region only because of the Gulfstream.

It is well known that the most precious forests are the areas which have not been clear-cut since the last glaciation. Such areas still can be found in the Murmansk region, as well as in other parts of Russian North where timber production never was as intensive as in Western Europe. Regrettably, most other parts of Europe, including the Russian European part, lost their virgin forests centuries ago.

The old-growth stands in a virtually pristine state still occupy about 5 to 10% of the whole forested area on the Kola Peninsula. Spruce forests became a shelter for a variety of rare species. Only here, for example, grows the endangered orchid of taiga, Calypso bulbosa listed in the Red Data Book of Russia (the list of rare and endangered species). Although not fully studied, the flora of mosses and lichens of the dark-needle (spruce) taiga present a great interest. Many of theses species have long ago been listed as protected in the neighboring Scandinavian countries.

Nowadays, the virgin priceless riches are threatened by the development of international contacts between Russian and Finnish timber producers and also by rapid developing of the mineral extraction industry in the region. Unfortunately, this problem faces more and more natural areas everyday and not only in Russia. The modern environmentally concerned society should stand up for the protection of our nature in order that those who inherit the planet may enjoy and appreciate the diversity and beauty of life on Earth.

Olga Kouptsova recently graduated from Moscow Pedagogical State University in Russia; majored in Geography and English language. A native Russian, she came to the USA in February 1997 to work as an Environment Education Instructor and Development Intern at Pocono Environmental Education Center, in Dingman's Ferry, PA.

Plant More Than You Harvest

Plant more than you harvest,
sun and water, earth and seeds
Plant more than you harvest, give the earth all that it needs.
Clear the meadows and the highways, but plant stout trees between.
Let the forests hold the hillsides, cover the earth with green.
Plant the grains to feed every woman man and child
Some for all the beasts and birds, and some to just grow wild.
Tall cedar and spreading oak cool all that dwell below.
And the fallen trunk helps seeds reveal the secret that they know.
Some seeds fall by the wayside, but some will make it through,
On the water or wind or loving had the cycle starts anew.
Plant more than you harvest.

Lyrics by Jim Scott

The Practice of Forestry in the Mountains of Kentucky

by: *Duane Bristow*

To "make sense" of Forestry it is necessary to define the terms used in the discussion and to determine the objectives of forest management.

Forestry is the management of the forest or lands to be converted to forest to most efficiently produce the maximum benefits to the human community from the forest. These benefits are usually defined to include aesthetics and recreation, wildlife, protection of soils and watersheds, wood products, and, in some cases, forage for livestock. They can also include minor forest products such as nuts and berries, greenery, medicinal herbs, etc.

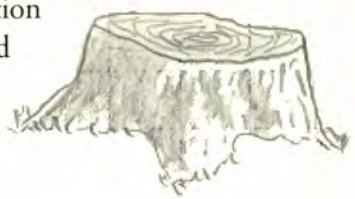
Forestry is usually practiced by planning how to most efficiently utilize existing resources which include soils, climate, topography, and existing vegetation. Forest practices then include seeding, planting, or otherwise reproducing stands; practices to improve forest stands such as release cuttings, pruning, cleanings, thinnings, and sanitation cuts; and harvests which may also be of several types. How these are done will determine species composition and structure of the forest. The resulting forest may be all aged, even aged, or multiple aged. It may be very productive of desirable forest products or not very productive.

The forest products to be emphasized in a forest management plan will vary depending on the objectives of the owner. Depending on whether the forest lands are publicly or privately owned, owned by an absentee or local owner, and depending on the economic needs and ownership philosophy of the owner, short-term economic benefits may override aesthetic, community, social, or long-term benefits.

It should be noted that the overall long term results of various forest management plans will have both environmental and economic consequences. Practices which would result in damage to the environment such as significant pollution of streams and soil quality degradation should never be included in any responsible plan by a professional forester. However, short term economic needs of landowners may sometimes override long term benefits or may cause frequent harvests of wood products to be given precedence over aesthetic and other intangible values. This means that often the objectives of individual landowners may not be those which will result in the maximum long term benefits to the community as a whole.

Usually public opinion does not make a distinction between environmental and economic consequences of forest management. For instance, heavy cutting is associated with environmental degradation although, if stream pollution and soil erosion is minor, no environmental degradation may, in fact, take place. On the other hand clear cutting is usually not distinguished from "high grading". Clear cutting is an accepted harvest method used in stands in which the objective is to maintain pre-climax stands of usually shade intolerant species or in which the objective is even aged management. Much more common is "high grading", the practice of harvesting the best and most valuable timber leaving cull and low quality timber in the woods. Although fewer trees are cut than in a clear cut, the timber stand is left in far worse condition.

Ideally Appalachian hardwoods would be all aged stands growing on high quality sites and owned by enlightened landowners whose objective is to produce high quality hardwoods in the long term while at the same time protecting the environment and providing productive wildlife habitat. They would be harvested by selective cuts about every 30 to 40 years with a timber rotation age of 60 to 100 years. In practice, due to the topography and to past management including overcutting, erosion and repeated forest fires much of the land is not high quality sites for forest production. Landowner's objectives are more likely to be short term economic gain and the quality of the forest environment is often given little consideration. Low quality, "high graded" stands of young small trees are the rule rather than the exception and they are usually harvested too small and too soon.



Existing forest industries, as well as forest ownership patterns, usually determine the local forest management.

There are very few professionally trained foresters available, so little actual forest management takes place. In managing forests it is necessary to have good markets for small wood products (such as pallet mills) so that there will be a market for the trees removed during improvement cuts or intermediate cuts such as cleanings, thinnings, etc. However, in the absence of forest management the presence of these markets usually leads to overcutting and short term rotations. For harvests of larger higher quality wood products, such as furniture quality oak, markets such as grade sawmills and veneer mills are necessary. However, these markets alone in the absence of forest management often lead to "high grading" of the forest.

John Wiessinger

For maximum economic benefit to the community secondary wood products industries such as furniture factories are also necessary. These not only provide added value to the wood resource but also are an additional labor market for the community and a great stimulus to the local economy. Forest Management combined with the right markets will provide the best outcomes for the natural and human communities.

A 1968 University of Georgia Forestry school graduate, Duane Bristow has eleven years experience as a forester with the Kentucky Division of Forestry and nineteen years as a consulting forester. He owns a southern Kentucky farm, including 450 acres of woodland, which has been in his family for over half a century.

"When I write stories I am like someone who is in her own country, walking along streets that she has known since she was a child, between walls and trees that are hers."

- Natalia Ginzburg

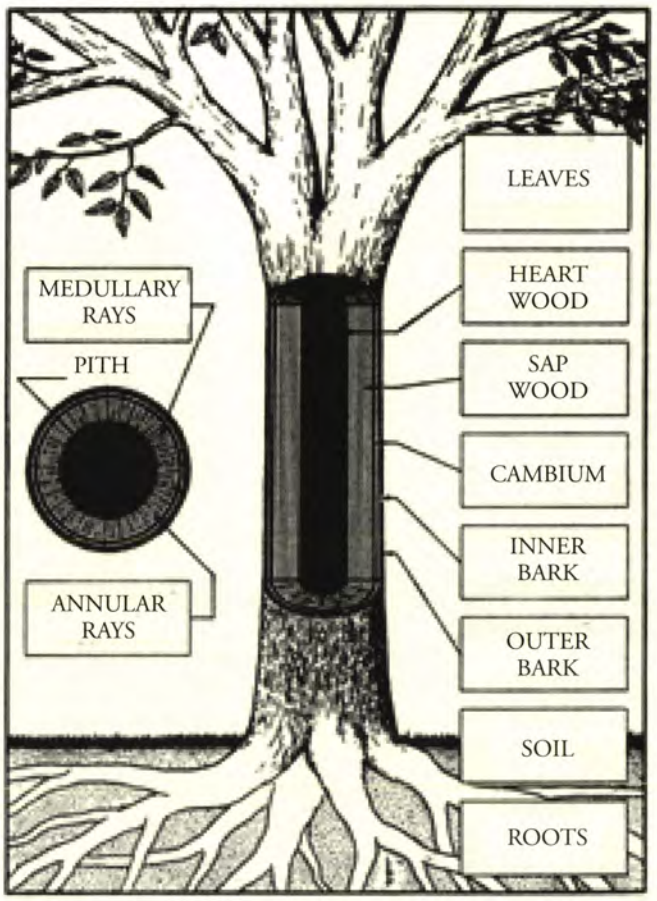
Forest Pool

by *Eleanor Allen*

Reprinted from 1939 issue of Nature Magazine

Jeweled pools where shadows creep
Over water fast asleep;
On the pool of patterned sky
Drifts and floats where lilies lie
Resting in the water's shade
With cups of white and leaves of jade;
Only silence lives and broods
In these forest solitudes;
Breath of wind through little ferns
Quickens as the evening turns
Purple-blue, and moon and stars
Flood the sky with crystal bars!

Parts of a Tree Trunk



Atlantic White-Cedar in a Changing Landscape

by: *Charles J. Newlon and Dorothy Abbott-Donnelly*

When the first European settlers traversed the Delaware Bay, they saw large, dark, blue-green evergreen conifer thickets rising to 90 feet among the hardwoods and lighter green pines. It was damp and cool inside these groves. They offered relief from a hot summer's day. The ground was usually blanketed with moist sphagnum moss. Travelers and settlers could easily find refuge inside Atlantic white-cedar (*Chamaecyparis thyoides*), or AWC, forests. Quickly the landscape began to change due to timber harvests, draining of swamps for agriculture and mosquito control, and changing land values became economic motivators. Throughout the entire range of the species, heavy cutting for many commercial purposes during this century has so reduced even the largest stands that the total volume of the growing stock is not known.

Distribution of AWC

AWC grows in small pure stands within a narrow belt 50 to 130 miles wide along the Atlantic coast. The largest commercial stands originally occurred in southeastern New Jersey, southeastern Virginia, eastern North Carolina, northwestern Florida, and southwestern Alabama. Historically on the Delmarva peninsula (a region comprised of Delaware, eastern Maryland, and eastern Virginia), 57% of the Chesapeake Bay Watershed, and 43% of the Delaware Bay Watershed nurtured Atlantic white-cedar. Today, pure stands of Atlantic white-cedar only dot the Delmarva. In 1986, 80 sites on the Delmarva peninsula were recorded where pure stands grew naturally. Delaware claimed 46 sites, Maryland had 32 sites, while Virginia's eastern shore had only two. These remnant stands are a mere fraction of those frequented by Native Americans in pre-settlement forests.

Throughout the entire coastal range today, only small, scattered groves are found from Maine to Florida and along the Gulf Coast to southeastern Mississippi. Despite the heavy cutting for commercial purposes, and the great reduction of the original acreage, AWC is still considered commercially important in North and South Carolina, Virginia, and Florida.

Habitat

Atlantic white-cedar is found most frequently in freshwater swamps and bogs in small, dense stands. The soil is generally acidic, ranging from 3.5 to 5.5 pH. AWC survives on the edge of coastal lowland woods and swamp forests. It can be found from sea level to 1650 feet.

AWC thrives in pure, dense even-aged stands, but because of its great latitudinal range, it has been found growing with a number of other commercially important species. This species grows with red maple in all parts of its range.

A dense stand chiefly of Atlantic white-cedar. Note scarcity of understory vegetation and shrubs.

Common Names and Associations

Native to the eastern coast of the United States, AWC is locally known by many names including swamp cedar, boat cedar, post cedar, southern white-cedar, white cedar, juniper, false-cypress, or green cedar. Native Delaware Indians called it "talala."

Throughout the Delmarva peninsula, name association, at many geographical locations, pinpoints the existence of AWC. The tree is the reason for names such as: Cedar Branch, Cedar Creek, Cedar Hundred, Cedar Gut, Cedar Height, Cedar

Hook, Cedar Neck, Cedar Point, Cedar Swamp, and Cedar Cripple. The Cypress Swamp, located mostly in the lower portion of Sussex Co., Delaware, earned its name from the massive number of Atlantic white-cedar growing throughout the high, but level, basin. Water from this area flows out in all directions into the Delaware and Chesapeake Bay watersheds.

Characteristics

The trunks of mature AWC trees grown in moderately dense stands are long, cylindrical and clear of branches for about three-quarters of their length. The Atlantic white-cedar is self-pruning, which makes it ideal for pole or post timbers. Potentially, Atlantic white-cedar is a relatively long-lived species. According to one source, some trees have reached 1000 years of age, although stand age rarely exceeds 200 years.

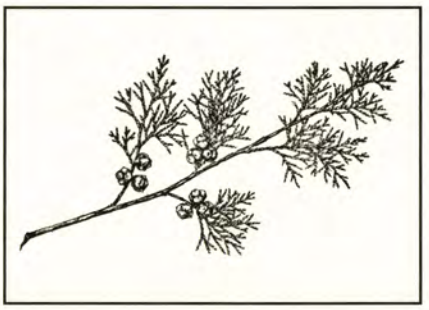
The tallest AWC recorded was 120 feet tall and 5 feet in diameter. The 1998-1999 National Register of Big Trees maintained by American Forests lists the current champion Atlantic white-cedar at 88 feet tall and 4.9 feet in diameter. It reigns in Brewton, Alabama.

The blue-green crowns are small with slender limbs and somewhat droopy branches. The evergreen leaves are scale-like, glandular, and about 1/16 to 1/8 inch long. The bark on a young tree is thin and ashy-gray to reddish brown. Older trees have thicker bark that is irregularly furrowed into narrow, flat connected ridges that separate into loose, elongated, plate-like scales that peel off in long fibrous strips.

Under favorable conditions, some 3-year-old AWCs bear mature cones. Natural reproduction in open stands starts bearing seeds at 4 or 5 years, in dense stands at 10 to 20 years. Fully developed cones are about 0.2 inches in diameter and contain 5 to 10 seeds. The seeds are about 0.1 inches in diameter and rounded, have marginal wings. They are so small it takes about 460,000 seeds to weigh a pound.

Properties and Uses

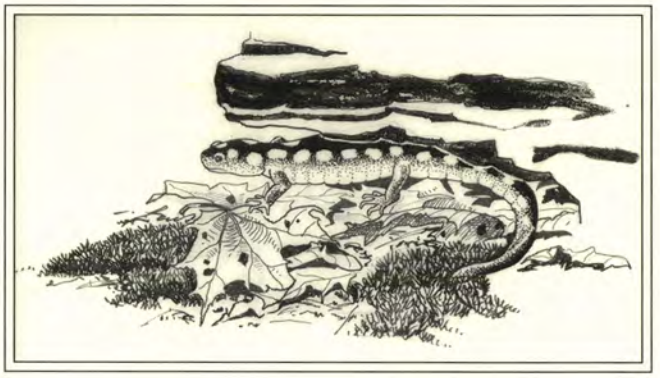
Atlantic white-cedar wood is very light, soft, even-grained, fine-textured and wonderfully fragrant. Although comparatively weak, the heartwood is extremely durable and resistant to moisture, decay, and insects. Native Americans hollowed the easy to work AWC logs to use as canoes. They made serviceable lacings and cordage from the easy-to-strip bark.



In the late 1600s, the Delaware River was nicknamed "Timber River" due to the great floats of oak, ash, pine, chestnut, and cedar logs moving toward Philadelphia to support a growing shipbuilding industry. The first Friendship Methodist Church, New Castle County, Delaware, was built exclusively from Atlantic white-cedar logs.

In the 1800s, most of the houses built in Philadelphia, PA and Wilmington, DE were roofed with white-cedar shingles from southern New Jersey's swamps. With the onset of American chestnut decline, AWC became the staple for telephone poles. Today the wood is still in demand for posts, poles, pilings, siding, shingles, shakes, boat building, cabin logs, canoes, and duck decoys.

Occasionally, ancient trees lying beneath peat bogs and salt water swamps are still being located and pulled out or "mined" to be sawn. Their wood remains valuable and decay resistant. The practice was common about the turn of the century up to the 1930s. George Pierson reports that he has a pencil made from a mined cedar log carbon dated at 5,000 years old.



John Wiessinger

Damaging Agents and Diminishing Growing Sites

According to Silas Little and Peter W. Garrett in the USDA Forest Service, Agriculture Handbook 654, ***Silvics of North America***, crown fires kill white-cedar; however, few fungi attack AWC, and damage is usually not serious. It has no serious insect enemies, although the larvae of the common bagworm, *Thyridopteryx ephemeraeformis*, may feed on the foliage.

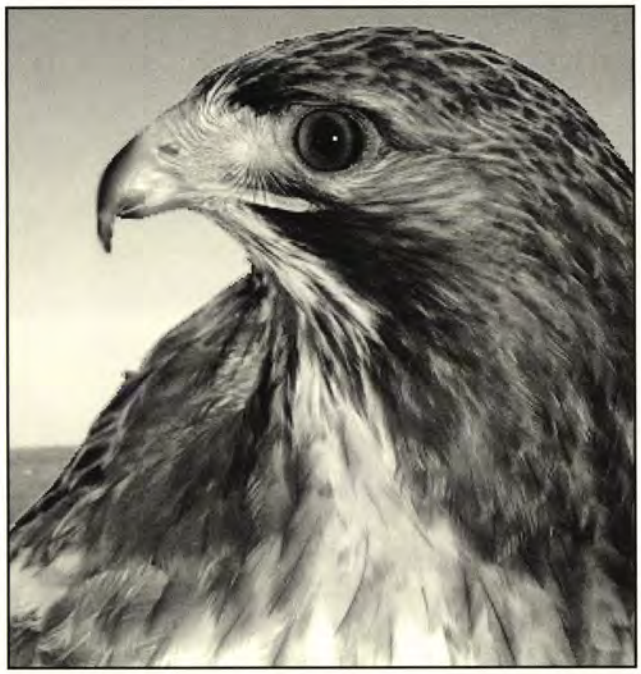
The decline of the Atlantic white-cedar can be traced directly to diminishing habitats. Human intervention in a changing landscape is a leading factor. After the first European settlers claimed the land, they set about to remove the forest and drain Delaware's lowlands for agricultural fields, and to drain the lands to help control mosquitoes by re-channeling natural waterways, and by digging drainage ditches. This activity altered the balance from a freshwater to brackish conditions by encroachment of salty tidal waters.

Survival and Management for Restoration

Survival of the species depends on freshwater wetlands. Any encroachment of salt water will alter the habitat and cause the death of AWC. These salt-intolerant trees grow in even-aged, pure stands. Red maple, *Acer rubrum*, quickly establishes itself where AWC has been lost. Atlantic white-cedar does not survive under a dense cover of old growth and needs openings for germination and seedling growth.

According to Pierson and Zimmerman, as a cedar stand develops, it maintains a closed canopy at tree-top level and an open understory lower down. As it matures, openings occur in the canopy and a hardwood understory develops. Research has shown that if Atlantic white cedar is left alone, it is replaced in time by hardwoods. It requires natural disturbance or human intervention to continue its existence.

On typical swamp sites AWC is shallow rooted and subject to wind throw, especially in stands which have been opened by partial cutting.



Forest management strategies to reestablish this species include clear-cut harvests (opening large areas to the sun), eradication of competing red maple and sweet gum, and protection of AWC reproduction from browsing by white-tail deer.

According to Dill, Tucker, Hull, and Whigham, because wet sites are not economical for timber harvest, and because of its general decline, there are no forest management practices required on the Delmarva peninsula that are geared specifically to reestablishing Atlantic white-cedar stands. Their value as a wetland species has had an overwhelming impact on the ecosystem.

The Atlantic White-Cedar Steering Committee formed by the New Jersey Forest Service provides forest management information to those interested in restoration efforts. Human intervention by over harvesting, channel alteration, point and non-point source pollution, wildfires and land-use changes for subdivisions, agriculture, highways and malls, have reduce Palustrine vegetated wetlands where the Atlantic white-cedar once thrived. Best management practices for land use are now becoming "the way of doing business." As we continue to educate ourselves on our environment, forest management efforts to restore the Atlantic white-cedar are increasing. It is important to maintain an even-age environment through clear-cut harvest, reduction and removal of slash, control of

competing hardwood species, prescribed burning, and natural regeneration techniques.

AWC Emotions, Research and the Internet

According to George Pierson and George Zimmerman, two of the many New Jersey proponents for restoring Atlantic white-cedar:

"What is it about Atlantic white-cedar that arouses strong emotions? Opinions about managing AWC have ranged from leaving it alone entirely to converting its habitats to other uses entirely. At times, people's responses to the potential loss of white-cedar trees have been violent. Proposed harvests have been spiked with large nails driven into trees to inflict harm to sawmills and their operators. On the other hand, areas where research to re-establish the trees is taking place have been vandalized, as if for some devious purpose."

Towards a better understanding of this species, the New Jersey Forest Service formed an Atlantic white-cedar Steering Committee in 1995 that was comprised of research scientists, college educators, state foresters, consulting foresters and others.

One New Jersey conference spin-off is the Atlantic White-Cedar Information Repository, providing Atlantic-white-cedar information for professionals and nonprofessionals on the Internet. Questions regarding AWC can be directed via email to wcedars@loki.stockton.edu.

Information and Management Assistance

Most of the acreage where Atlantic white-cedar grows is privately owned. In Delaware, the state forester offers management information and a stewardship program for private landowners. This program usually offers an on-site planning program depending on what landowner's goals may be for management of their forest lands. Similar programs are offered in other states.

For more information about Atlantic white-cedar or seedling sources, contact your local State Forester, Cooperative Extension Office, Natural Resources Conservation Service (formerly the Soil Conservation Service), or try the Internet at the Richard Stockton College in New Jersey.

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Top Ten Forest Websites

1.*ww.vt.edu:10021/forestry/wildlife/stein/insectdata.html*
Virginia Poly Tech School of Forestry Homepage.

2. *www.pacificorp.com/belize/1belize.html*
PacifiCorp's Program for Belize

3. *www.fs.fed.us/outdoors/naturewatch/educate.html. The Nature Watch Program*

4. *www.metla.fi/*
Finnish Forest Research Institute.

5. *forests.org/worldfor.html*
Directories of Forest, Rainforest & Biodiversity Conservation Materials

6. *forests.org*
Information on Rainforests, Forest Conservation and Biodiversity

7. *www.amfor.org/afmain2.htm*
Plant The Future

8. *www.canadian-forests.com*
Forests and Forestry in Canada.

9. *www.powerlink.net/fen*
Working to protect the native forest environment of Maine.

10. *www.gn.apc.org/LivingEarth/RainforestDB/index.html*
The Rainforest Database from Living Earth

Photo supplied by Jonathan Rich

VIRGIN'S BOWER

Petal-like child peace,
blooms only a decade in a century.
Only a flash of color. A glimmer of innocence.
So aware and so unaware.
One bloom only days long.
Drops to the brown earth.
Withers.

The wildflowers of the spring woods,
briefly, silently, bursting forth.
A narrow strip of days.
Too early — they hold back.
Too late — they are gone.

But for a brief pause they pass through you:

Trout lily,
meadowsweet
coral honeysuckle
yellow star grass
moccasin flower
virgin's bower.

A narrowness in time.
Early spring woods explorers
focused on hurried trail followings
barely notice the pause between movements,
when wildflowers sing unheard songs.

Jonathan Rich

Jonathan Rich is an English teacher. He teaches at R.I.T. and St. John Fisher College. When not locked in a classroom teaching, Mr. Rich is outdoors searching out patterns in nature, which sometimes mimic patterns in life.

Low Impact Forestry Gaining Ground in Maine

by: William Sugg

To the Future Through the Past

Members of the Forest Ecology Network (FEN) are visiting a tree harvesting operation in Piscataquis county. But it's not a protest, they like what they see. Ideally they are looking at the future of forestry in Maine — Low Impact Forestry.

Photo courtesy of William Sugg

Low Impact Forestry (LIF) could be considered a window to the past of forest practices as well as to its future. Many landowners in Maine have been using LIF on their woodlots for decades. This time honored technique leaves behind something industrial forestry does not — a functional forest.

Mel Ames has been harvesting wood from his 600 acre woodlot since 1947. When he purchased the land, there were about 17 cords of wood per acre standing there, fifty years later he estimates there are about 35. "Now let me just tell you," Ames warns FEN members on a tour of his property, "when you cut trees sometimes it's just not that pretty." But an inspection of the recent cutting reveals a few large stumps in a small area, with barely an opening in the canopy and most adjacent trees left carefully in place for a future generation of the Ames family. In contrast to the huge clearcuts and forest devastation many FEN members have witnessed, Mel's warning hardly seems necessary.

"Those large landowners are not just cheating themselves out of making more money over the long run," notes Ames, "when you cut all the trees you lose lots of warblers that eat your pests like spruce budworms" and he adds with a trademark grin, "plus the birds keep me comp'ny here in the woods."

The Ames property holds great diversity of wildlife and plants. Species richness (number of species per unit area) is much higher here than in the sprayed, monoculture, even-aged stands created by industrial forestry.

Forest Aesthetics, Ecology, and Wood Production Are All Priorities

At the heart of LIF is the goal of maintaining a healthy and diverse native forest environment while extracting high quality wood from it — forever. Sometimes called "sustainable forestry" or even "ecoforestry", Low Impact Forestry might best be described as 'thoughtful forestry', as demonstrated so well in a recent FEN tour of a harvesting operation run by logger Sam Brown in Piscataquis county.

"See this small ash?"asks Sam as he gently shakes the small tree, "This tree represents several years of growth already, and in forty years or so it will really be worth something." Most loggers would not take the time to save such a tree because they are already making so little money that any decrease in efficiency, especially for the profit of someone decades in the future, is unacceptable. "You see," Brown points out, "if I just lead the cable on the fallen tree 2 feet this way, this little tree will survive to be marketable."

Sam is rightly proud of his tree harvesting equipment, "This rig is easily repairable using common tools, and all the parts are available locally from auto parts stores, salvage yards, and Radio Shack." The less than six foot wide 'forwarder' is made by a company in Canada, and Sam has added some innovative accessories, including a garage door opener. Not so he can park it inside beside the family wagon,

rather Brown uses the device to allow his grapple winch to drag a fallen tree about 75 feet from the main logging trail while he remains where the tree was felled. The tree is limbed in the forest: this 'slash' is purposefully left to rot and nourish future tree growth. Sam then starts the winch with a switch in his shirt pocket and the log is carefully dragged to the forwarder and loaded up.

The rig cuts a narrow, closed canopy path through the woods. From the air you would not even see this logging trail. The trail is purposefully covered with arm-sized logs that protect the soil from significant damage. The trails are spaced out 75-150 feet apart, and the logs are yarded in small areas, greatly minimizing the damage to the forest caused by the yard. No swath of damage is created when Sam has filled the forwarder with the one and one half cords that make up a full load — instead of turning around, he sits in a seat facing away from the load and drives his load to the yard. Powered tracks on the log trailer also minimize damage, as the load is not dragged across the trail.

Photo courtesy of William Sugg

Show Me the Money

Earlier in the day of the visit to Sam's operation, FEN members were treated to a presentation at the North Woods Arts Center, a 10,000 acre educational facility and demonstration forest in Atkinson, Maine by noted author and forest policy analyst Mitch Lanksy. His book ***Beyond the Beauty Strip: Saving What's Left of Our Forests*** is the definitive critique of industrial forestry. If this book could be considered as an expose on how forestry should not be done, Mitch's work with the newly established Low Impact Forestry Institute might be considered a work in progress on how it should be done.

"This logging system has low impact on the environment and is economically viable, when taken in context of long term forest management," said Lansky. He described how operations like Sam's work technically, ecologically, and economically. "It's forestry as if the future mattered. Under this model, the landowner receives a financial benefit over time while allowing the natural system to develop in height, volume, complexity and quality."

Mitch explained that when analyzing the economics of LIF, it is important to examine the returns from a long-term, holistic perspective. "A proper evaluation looks not at just the value of what is cut, but also the value of what is retained. Without such an accounting, one runs the risk of calling capital depletion 'income.' Removing more than what can be sustained over time becomes a cost, because it reduces reduces future yields and values."

He also pointed out that while a LIF managed site could produce more income over time, when calculated using a high discount rate (economists discount future costs and benefits to calculate what they are worth today), "even the yields obtained from Low Impact Forestry decades into the future are not sufficient to beat the costs of cutting heavily over the short term. Trees just don't grow fast enough. Calculations involving multi-generational discounting do not send a very pleasant message to our children or grandchildren. We are saying in effect that consumption of aquifers, old-growth, fisheries, or topsoil now is better than availability of these resources to future generations. This is economics without a sense of cultural continuity."

More Jobs, Community Stability, and Forested Land

Low Impact Forestry could be considered a jobs creation program, as it employs around three times the number of loggers as mechanized high-grade and clearcutting operations. Industrial forestry has yielded

a near 50% decline in forest-related jobs in Maine over the past decade.

The higher quality wood from LIF-managed forests is more appropriately used for products like furniture and lumber, which require more labor to produce than if the wood was pulped. If the harvested wood is then processed locally, more dollars remain in the community and more jobs are created. If "no fish should leave Maine with its head on", no raw logs should leave the state for value-added processing either.

The higher valued residual wood (read: a forest) on LIF-managed sites produces greater opportunities for recreation. The forest is not only attractive to people and wildlife, but the numerous trails on a LIF site are great for hikers, hunters, snowmobilers, and cross country skiers. This helps support a vibrant tourist economy.

High-graded and clearcut areas not only decrease the biodiversity (number of all species of plants, animals, and fungi), water quality, and wilderness experience, they give the impression that a community is not concerned about its environment, or future. Correspondingly, property values adjacent to destroyed forests plummet, further compounding community instability and despair.

The Beginning

Implementing Low Impact Forestry in Maine remains a great challenge. Although the economic and ecological arguments are persuasive, the reality is that they are not yet loud enough to be heard over the din of feller-bunchers that are currently on the ground clearcutting tens of thousands of acres of Maine's forests annually. LIF is clearly an attractive proposition to the smaller landowner who has a well-stocked forest and a long-term commitment to their land, community, and future generations, but what about the landowner that makes decisions based on quarterly profits and may never set foot in Maine?

It is difficult to lobby for future generations. They have no voice and no money, but they should have the same right to enjoy the natural beauty and economic bounty of Maine's North Woods, and the rest of the Earth, as we have today.

William Sugg is the editor of The Maine Woods, a publication of the Forest Ecology Network. He can be reached by email at FENMaine@aol.com.

Photo courtesy of William Sugg

"Our crude civilization
engenders a multitude of wants,
and law-givers are ever
at their wit's end devising.
The hall and the
theater and the church
have been invented,
and compulsory education.

Why not add compulsory recreation?
Our forefathers forged chains of
duty and habit, which bind us
notwithstanding our boasted freedom,
and we ourselves in
desperation add link to link,
groaning and making medicinal
laws for relief.

Yet few think of pure rest or of the
healing power of Nature."

John Muir

US Forest Facts

There are 737 million acres of forest land in the United States, about 67% as much as there was in 1600, which is one third the area of the country.

Each year about 1.4 billion tree seedlings are planted—roughly four million a day—more than making up for those that are harvested. If you include naturally regenerated trees, the net growth exceeds the harvesting by 33%, because of forest management.

The average American uses about 749 pounds of paper every year and 95% of the houses built are done so using wood. That means that the average person uses the equivalent of a tree 100 feethigh, 16 inches in diameter each year for their wood and paper needs.

The forest industry ranks among the top 10 employers in 40 of the 50 states.

Three well-placed mature trees around a house can cut air conditioning cost by 10 - 15 %, while trees and other landscaping can increase property values by 5 - 10%.

One mature tree absorbs approximately 13 pounds of carbon dioxide a year.

Today, the United States has about 3% more forest (737 million acres) than there was in 1920, despite the 143% increase in population.

U.S. forest are owned by private individuals (59%), public agencies (27%), and private industries (14%).

John Wiessinger

Source

US Forest; Facts and Figures 1995, American Forest and Paper Association.

Canadian Forest Facts

There are 417.6 million hectares of forest land in Canada which represents nearly half of Canada's landscape.

Thirty-seven percent (37%) of the forest land in Canada is open forest.

Fifty-six (56%) of the forest land in Canada is considered commercial forests.

Approximately 199 million hectares (28%) of Canada's forests are managed for timber production.

Fifty million hectares (12%) of Canada's forests are protected from harvesting by legislation or policy.

Two-thirds of Canada's estimated 300,000 wildlife species live in the forest. Of those, 117 species are listed as threatened or endangered included 41 forest-dwelling species.

The volume of wood in Canada's commercial forest increased by 4% or 940 million cubic meters between 1978 and 1992.

Seventy-one percent (71%) of the total volume of Canada's commercial forests are in old forests (mature, over-mature and mixed-aged).

Most of Canada's forests are publicly owned. The provincial governments are responsible for managing 71% of Canada's forests, federal and territorial governments oversee 23% of the forest lands and 6% of the forests belong to more than 425,000 private landowners.

Source

The State of Canada's Forests - 1995 Natural Resources Canada, Canadian Forest Service.

What You Can Do to Save Frontier Forests

As voters and consumers are partly responsible for the fate of the world's last large intact forests, you should: ensure that decision-makers manage forests with the general public's needs in mind (at least in countries where citizens have voting power and can directly influence their leaders); keep informed about policy issues affecting frontier forests; and voice your concerns — through protests and boycotts, if necessary — when governments mismanage these forests.

Especially within wealthy countries, as a consumer you can create a demand for products that come from well-managed forests if you: purchase only wood, paper, and other forest products that are independently certified as sustainably harvested; demand that retailers make such products available; and reduce pressure on frontier forests by recycling and limiting consumption — not only of wood and paper, but also of energy and mineral resources from forested regions.

In many countries — from the Congo Basin, Amazonia, Mainland Southeast Asia, the South Pacific, Indonesia, Central America, Siberia, Alaska, and beyond — forests are one of the most valuable resources on which a sustainable economy can be built.

Against a backdrop of population growth and mounting human needs, preventing further frontier forest losses will require a new and balanced approach to forest management — one that protected forests' biodiversity and other assets while simultaneously providing for people and ecosystem services. Industry leaders have shown that with adoption of appropriate technology, best practices, and better forest policy, logging and improved land-use planning can generate long-term employment and much-needed revenue with reduced environmental impact.

You can promote sustainable forest management by supporting activities which emphasize the value of forest resources.

Source

Bryant, Dirk, et al. 1997. The Last Frontier Forests: Ecosystems and Economies on the Edge

"THE EARTH DOES NOT BELONG TO US, WE BELONG TO THE EARTH."

CHIEF SEATTLE, 1854

Forests of the South

by: Steve Nix

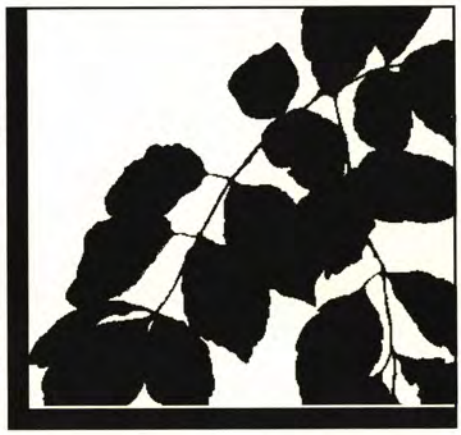
The South's Diverse Forest

In the southern temperate climate, abundant rainfall and availing topography, the nation's richest plant community thrives. There are more than 400 woody species of plants in the South, many of which have some commercial value. This 200 million acre forest plant community is increasingly being describes as the nations "wood basket".

Approximately 40% of the United States timberland is located in the south. The South grows 23% of the nation's softwood timber and 44% of the hardwood timber. In a recent survey the thirteen southern states harvested 43% of softwood sawlogs and 53% of hardwood sawlogs produced nationally. These states also accounted for over half the plywood, roundwood, and two-thirds of the pulpwood. Latest U.S. Forest Service data indicates that there are over 100 billion trees (1 inch in diameter or larger) growing in the southern forests. This equates to a stocking level of approximately 500 growing stock trees per acre. Twenty-seven percent of these trees are soft wood and 73% are hardwood. The most abundant southern species, by volume, is the Southern Yellow Pine, making up one-third of the total inventory. The most abundant hardwood species, the red and white oaks, make up one quarter of the inventory. The southern forest is composed of eight major forest type groups, which are areas named for species making up the major portion of live-tree stocking. The major southern forest type groups are: longleaf-slash pine, loblolly-shortleaf pine, white-red-jack pine, oak-pine, oak-hickory, oak-gum-cypress, elm-ash-cottonwood, maple-beech-birch. The most abundant timber type group is the oak-hickory type which occupies 39% of the forest followed by the loblolly-shortleaf type which occupies 24%.

The Southern Forest Owner

The southern forest is predominantly privately owned. Approximately 179 million acres, or 90% of this forest is either owned by industry or by a nonindustrial private owner. The remaining 21 million acres, or 10%, are owned by a collection of federal, state, and local public owners. The National Forest system controls 11.6 million acres, or slightly over half the public timberland. Among the private owners, corporate non-forest industry owns 16 million acres of timberland; farmers, 39 million acres; forest industry, 39 million acres; and other private owners, 85 million acres. Though public land represents only a small percentage of the total ownership, the amount has increased 15% since 1952.



Many of the 5 million private owners of forest land in the South have small holdings. Estimates indicate that 92% of the ownership units are less than 100 acres. The South is really a patchwork of many forests, with mixed forest management practices that make for its broad diversity. The overall average size of a southern private forest is 38 acres. Louisiana has the largest average size at 85 acres, while North Carolina has the smallest size at 24 acres.

Wood Volume, Growth and Removals

Although the southern forest has not expanded in size during the last half century, wood volumes have

"More and more as we come closer and closer in touch with nature and its teachings are we able to see the Divine and are therefore fitted to interpret correctly the various languages spoken by all forms of nature about us."

George Washington Carver

significantly increased. Both the hardwood and softwood growing stock inventory increased by 60% since 1952. Proper forest management in the South fueled much of this tree volume expansion. In 1952 there was an estimated 148 billion cubic feet of timer having some commercial value. By 1992, the inventory had increased to 251 billion cubic feet. This increase occurred while nearly nine billion cubic feet of wood was harvested annually in the South. The southern forest inventory has been sustained for the last 40 years despite significant levels of removal. The southern forest loses approximately 1% of its timer to fire, insects and disease each year. This two billion cubic foot annual mortality equates to one-fourth of the harvest volume. State and federal fire protection and health monitoring programs are being carried out to reduce this loss. The relationship between the net growth and removals of each species is represented as the growth to drain ratio. This ratio helps define present pressures on the forest and can predict future changes in its composition if all things remain consistent. Overall, the ratio of net growth (total growth minus mortality) to removals for all growing stock is 1:1:1. This means that the south is growing 10% more wood than is being cut.

Pressures on this resource are growing. The southern forest is harvesting more softwood volume than is being grown. The growth to drain ratio is .88:1 (softwood removal exceeds growth by 12%). The southern hardwood forest, on the other hand is growing over 50% more wood than is being cut.

Southern Forestry Frequently Asked

Q: How much forest land does the south have?

A: Forests are the south's greatest land use. They cover 200 million acres (81 million hectares). Approximately 40% of the United States' timberland is located in the south.

Q: Who owns the south's forest land?

A: There are five million owners of the southern forest land. Private, non-industrial landowners own 62% of the south's forest land; forest products industries own 20%; corporate, non-forest industry owns 8%; and the public owns 10%. The overall size of a southern private forest ownership is 38 acres.

Q: Are the south's forests maturing and producing?

A: The south grows 23% of the nation's softwood timber and 44% of the hardwood timber. In a recent survey, the 13 southern states harvested 43% of softwood sawlogs produced nationally. These states also accounted for over half the plywood, roundwood, and two-thirds of the pulpwood.

Q: Are trees planted back?

A: Each year the south's landowners (industrial and private) plant an average of 3,288,000 trees per day.

Q: What is the economic value of forestry to the south?

A: The impact of forestry and forest product industries on the south's economy in 1994 was in excess of $90 billion. The industry is a diverse group of establishments, both small and large, engaged in growing, manufacturing and marketing products.

Q: How many people do the South's forest industries employ?

A: In each of the 13 southern states, the forest products industry ranks in the top 10 among manufacturing industries in employment and payroll income. The south's forest products manufacturing firms directly employ more than 600,000 people, generating a payroll excess of $14.5 billion.

John Stephen Nix is a Forest Resource Analyst with the Alabama Development Office/Alabama Forestry Commission. He has worked in forestry for 27 years and is a graduate forester from the University of Georgia. He is the webmaster and guide for Forestry at the Mining Co. at: http://forestry.miningco.com.

Cindie Brunner

Pennsylvania Urban Community Forestry

by: Norman L. Lacasse

When the US Congress passed the Farm Bill in 1990, it directed the US Forest Service to initiate an urban forestry program across the country in cooperation with the state foresters of each state and it appropriated a significant amount of money to get the job done. Although urban forestry programs existed prior to this date, the level of funding was too low to allow states to implement meaningful programs. This bill provided the needed impetus to develop comprehensive programs. Each state was given the flexibility to develop a program to suit its needs.

The state of Pennsylvania developed a two prong approach. It formed a partnership with Penn State University to provide technical assistance to municipalities and volunteer groups through its Cooperative Extension Service and started a grant program. An advisory committee (Urban and Community Forestry Council) comprised of primarily private sector individuals was impaneled to oversee the operation of the program and the grants.

The grants program allows for communities to be involved in developing urban forests. The grants are primarily for tree planting projects, although they have been used for other purposes such as doing street tree inventories. There are two funding rounds each year, spring and fall, to coincide with the tree planting seasons. A tree maintenance grant was added two years ago to allow communities to perform needed maintenance on established trees. Additionally, a challenge grant is available for municipalities to plant trees along streets, greenways and parks. This allows municipalities to plant from ten to fifty trees or more depending on market conditions. A second grant, called a community improvement grant, is available to volunteer groups including schools, parent-teacher groups, student environmental clubs and others. The amount of individual grants ranges from $1,000 to $3,000. Several grants have been awarded to schools and school-related groups to landscape around school buildings, or plant trees in environmental education areas. Many exciting programs have been conducted with the help of these grant programs.

An example of a successful partnership between a school and a local club teaming up to create an environmental education center is the General Federation of Women's Clubs of Pennsylvania (GFWPCA) Women's Club in Milton. The club applied for a grant from the Pennsylvania Urban and Community Forestry Council. Contact was also made with local industries, the electric utility and the highway department for donated services and equipment. Technical advice was provided by the state bureau of forestry and a private consultant. Local service clubs also pitched in to provide muscle power on the day of planting. The students in the high school building and trades class built tables with benches for an empty pavilion. Over half of the

Photo provided by Norm Lacasse

total elementary school population participated. Children were given a lesson on the benefits of trees and how to plant and care for the trees.

Photo provided by Norm Lacasse

Another successful school-related project was the John G. Herr Park. This project was a joint undertaking between the Penn Manor School District and Manor Township in Lancaster County. Their grant was used to purchase trees for a 22 acre park to be used as a passive recreation, environmental education and natural resource conservation center. The park was started in 1994 and is located adjacent to a recently built middle school. Cooperators in this project included Manor Township officials and Penn Manor teachers, students and administrators. The educational/conservation features are the primary components of the park.

The Environmental Club at the Huntingdon Area Middle School in Huntingdon County began a program in 1991 under the leadership of their social science teacher to plant trees in their community. Their objective was to beautify the community by planting trees in the uptown area where trees did not exist and to engage students in a local environmental stewardship activity. Students started by raising funds for their project by donating their own money on "donation days" by dropping coins in a collection can. Later the Student Council and Environmental Club conducted an environmental T-shirt sale, with part of the profits designated for the community tree planting project. The Pennsylvania Urban and Community Forestry Council then awarded the group a small grant for their spring 1996 planting. The students appreciated the opportunity to become involved in the community and this project made them feel like they were making a difference. The group's energetic work has not gone unnoticed. The club won a national 1997 Pledge and Promise Environmental Award of $5000 for a wetland construction project. In 1996 a Commonwealth of Pennsylvania Citation was also presented to the club members by the House of Representatives, and the Borough of Huntingdon also passed a Resolution of Appreciation.

The Philadelphia School created a different type of project in 1992. The school developed a curriculum in urban forestry, and students learned first hand how to plant and nurture trees. A grant was used to develop lessons for primary, junior and middle schools, and to purchase plant materials.

Urban forestry provides many opportunities, not only to beautify our communities, parks and playgrounds, but to educate our youths and give them ownership in their communities. The recipe is simple: caring adults who are willing to donate their time and energy in order to make a difference. The Pennsylvania Urban and Community Forestry Council is proud to be a part of this equation.

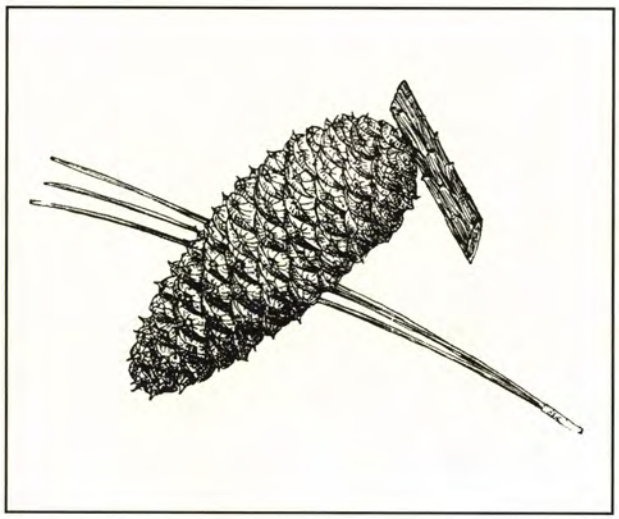
Norman L. LaCasse is the urban forestry coordinator for the Bureau of Forestry in the Pennsylvania Department of Conservation and Natural Resources. For more information please contact Mr. LaCasse at 717-787-2105.

Cindie Brunner

In Search of Old Growth

by Tim Kaden

For many of us, the term "old growth forests" brings to mind a picture of large majestic trees, with shafts of light penetrating through the forest canopy to the forest floor. This is our first and lasting impression of old growth forests. But what is old growth? How is old growth defined? Is old growth the redwoods and giant sequoias of the west coast or the ancient oaks of the east coast? Is old growth simply old trees, and if so, how old is old? Is old growth original pre-settlement forests? Do forests qualify as old growth if they have had some natural or human disturbance? Clearly the criteria for identifying old growth forests is ambiguous, and to complicate the process, the criteria vary from profession to profession. This was my dilemma when I was asked to look at a forest of Loblolly Pine in Delaware.



I have been a practicing forester in Delaware for the last twenty-eight years. I thought I had seen most, if not all, the forest types and stages of growth in the state. But, one day I was introduced to a forest I had not seen before; this day began my search for old growth.

I was with Pete Martin, ecologist with Delaware Wild Inc. a nonprofit conservation organization in Delaware. Delaware Wild Inc., owns the land on which this forest is located. When we first arrived at the site I began to catalog the characteristics of the forest using my knowledge of old growth forests. As I analyzed my observations I continued to ask Pete questions about the forest. Where did this forest come from? What is the history of this forest? Who owned it? Were the trees ever harvested? Was fire part of its history? There were also questions I kept asking myself. What makes this forest different? What am I seeing that I have not seen before? As I walked through the forest I took mental notes: Loblolly pine, large diameters, thirty plus inches in diameter, trees more than 100 feet tall; large, flat crowns flattened by wind and the lack of other trees to force the trees to grow taller, and large scaly plates of bark. Large mounds of pine needles had gathered at the base of every tree; telling me that many years have gone by to create piles that large. Is this what I think it is? Could this be? Is this a stand of old growth Loblolly pine?

John Wiessinger

It became obvious that to come to some conclusions I was going to have to match this forest stand characteristics with what scientists, researchers, and foresters recognize as traditional indicators of the structure of old growth forests. The indicators to consider are: an abundance of large old trees, canopy gaps, multiple growth layers, undisturbed soils with relatively thick humus layers, presence of lichen and fungi, and the absence of signs of human disturbance. Using these indicators as guidance and comparing them with my original observations, I concluded I was on the right track.

My search started by researching the literature to see what has been previously described as old growth Loblolly. Little was written about the characteristics of old growth Loblolly pine. Since Loblolly pine grows on a variety of sites (ranging from swamps to dry ridges) there is no common ground from which to make an evaluation. I decided to restrict my investigation to Loblolly pine characteristics within the coastal plain. This gave me the following guidelines: the oldest Loblolly recorded was 245 years old, stump diameters of fifty-four inches and heights from 135 to 165 feet.

I have been a practicing forester in Delaware for the last twenty eight years. I though I had seen most, if not all, of the forest types and stages of growth in the state.

Another setback was that the earliest literature found was 1915 and the author stated that logging of Loblolly pine started in 1880 and by the time his survey was completed, in 1915, most of the old growth Loblolly had been harvested. Therefore, they could not evaluate or document what an old growth Loblolly pine ecosystem looked like: it was gone by 1915.

I returned to the site and gathered the following information: these Loblolly pines have a stump diameter of more that thirty-two inches, the heights of these trees measure between 115 and 120 feet, and the average age of these trees is between 140 and 150 years old. If Loblolly pine is considered old when it reaches 200 years, does this stand at 150 years make it just passed middle aged?

The Delaware Natural Heritage program looked at the plant and animal habitats in the understory. I also asked that a birds survey be done to see what species of birds are using this type of stand structure. The approach I took was to compare the understory plant and animal habitats of younger Loblolly pine stands with the stand in question. I was curious to see if the same plant and animal species occurred in both stands or if there was an apparent shift of successional change to other species. The survey did not show anything to forward my thinking toward an old growth plant habitat. There were no plant indicators to suggest a successional pattern to old growth.

The bird inventory did provide important additional information. Forest stands invite certain bird populations. The avian inventory documented species of birds using this mature forest. I was hoping that the inventory would find species that were dependent on old growth or mature forests. The inventory revealed that twenty-eight species of birds inhabited the Loblolly pine stand and of those, four are notable residents of old growth forests. The rarest of the four is the Broad-winged Hawk. Additionally, the Brown-headed Nuthatch was a surprise find as was the Redheaded Woodpecker. The last of the four species was the Yellow-throated warbler: while uncommon in Delaware, it is common in old growth forests. I believe these bird species represented the first indicator that I was indeed looking at an old growth Loblolly pine forest.

A recently published book ***Eastern Old-Growth Forests*** by Island Press, suggests that the definitions for old growth vary so much that it boils down to an individual perception, and the selected criteria used to make that judgment. Perhaps each individual is left to make his or her own decisions about old growth. Is this stand old growth? You decide. I am in search of old growth.

Timothy A Kaden is a land preservation specialist with the Division of Parks and Recreation, Dover, Delaware. His e-mail address is tkaden@state.de.us

"We need wilderness
whether or not we ever set foot in it.

We need a refuge even though
we may never go there.

We need the possibility of
escape as surely as we need hope..."

-Edward Abbey
"Desert Solitair"

Alaska Rainforest

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Most people when they hear the word 'Rainforest' think immediately of the earth's tropical rainforests. But there are lesser known rainforests in locations such as the Pacific Northwest and Alaska. Here are some of the most frequently asked questions about Alaskan rainforests.

Q: Aren't rainforests found only in the tropics?

A: No. There are two kinds of rainforests: the more common tropical rainforests covering about 10 percent of the Earth and the less common temperate rainforests, covering just 0.2 percent of the Earth. Alaska's coastal rainforest is the northern half of the Pacific Northwest temperate rainforest. It is characterized by relatively mild winters, cool summers, and year-round precipitation. Rainfall averages 80-230 inches a year.

Janet E. Hawkes

Q: How much temperate rainforest exists?

A: More than half the world's original temperate rainforest has already been lost to logging. Alaska accounts for over 40 percent of the world's remaining temperate rainforest and the largest remaining intact forest tracts. Just 12 percent of the Alaska rainforest has been clear-cut to date.

Q: Isn't most of Alaska's rainforest already off-limits to logging?

A: No. The majority of Alaska's rainforest is within the Tongass and Chugach National Forests, the nation's two largest. The Tongass contains about six million acres of congressionally designated wilderness, a high proportion of which is non- or lightly forested. The majority of the most biologically and economically important areas of the Alaska rainforest are still open to logging. The Chugach has no designated wilderness.

While the Tongass and the Chugach encompass large land areas — more than 22.5 million acres combined — over three-fourths of their lands are not productive timberlands. In Alaska, rainforest stands are scattered between mountain ranges, vast wetland areas and glaciers. Only a small percentage of the forested lands themselves contain the large trees necessary for fish and wildlife habitat that are also used as lumber.

In Southeast Alaska, where most logging has occurred, over half of the most valuable ancient forest stands have been cut in the last 40 years, with most of that logging taking place in the last 10 years. Logging of these ancient trees in unsustainable at this rate. Only 12 percent of the Tongass is protected high volume ancient forest.

Q: Since trees grow back, isn't the rainforest renewable even if it's logged?

A: Approximately 20-30 years after clearcutting, the forest closes in and reaches a stage where very little light reaches the forest floor. This stage is persistent, lasting for 200 years before ancient forest conditions important for fish and wildlife return. Because most second growth stands will be cut again after 100 years, the forest will never regain the old-growth characteristics important to wildlife.

Q: Doesn't the Forest Service protect fish and wildlife on public lands?

A: No, not yet. A 1992 biologists' report, conducted to comply with the provision of the National Forest Management Act that requires maintenance of "viable" wildlife populations, found eight species in the Tongass threatened by proposed logging rates. These species include grizzly bears, wolves, mountain goats, goshawks, marten, great blue herons and boreal owls. The biologists recommended that larger tracts of

ancient forest be left intact to prevent extinction or decline of these and other species.

Q: Are any species endangered in the Alaska rainforest? Will there be another spotted owl showdown?

A: Endangered species confrontations can be avoided in Alaska if management strategies are adjusted now while there is still sufficient habitat to protect the species. Petitions have been filed to list two Alaska wildlife species, the Queen Charlotte Goshawk and the Alexander Archipelago wolf, as endangered or threatened. The March 1995, U.S. Fish and Wildlife Service stated that, "without significant changes to the Tongass National Forest Land Management Plan, the long-term viability of the Alexander Archipelago wolf is seriously imperiled."

Q: Are adequate provisions in place to protect Alaska's great salmon runs?

A: No. The Forest Service's leading fisheries biologist for the Tongass has reported declining water quality associated with logging in an increasing number of watersheds and characterized 12 percent of Tongass watersheds as showing stress comparable to that found in the Pacific Northwest 20 years ago. A 1992 monitoring study of the 100-foot buffers required on land logged in the Tongass found that 45 percent of the buffers on Prince of Wales Island were out of compliance. A Forest Service report released in April 1995 found that current logging practices would lead to declines or losses of Tongass salmon stocks.

Q: Would the local economy suffer if logging levels are reduced?

A: No. Despite declining timber harvest levels on Tongass, Southeast Alaska's economy has grown an average of 2.5 percent annually in recent years. Regionally, the timber industry is a poor indicator of overall economic health. Logging is only one of many forest-based industries and employs a relatively small percentage of local residents.

Tourism, sport fishing and hunting, commercial fishing, and subsistence depend on maintaining a healthy forest and provide the best growth opportunities in the long term. While changes in the timber industry can be disruptive to logging-dependent communities, the effect appears short-lived. Mill closures in Sitka and Haines in recent years were followed by rapid, vigorous economic recoveries.

Q: How can the forest products industry survive with a limited timber base?

A: Most wood harvested in Alaska is exported to Japan and other Asian nations with minimal processing. Logging in the Alaska rainforest could produce more jobs with less wood by increasing the value added to forest products through increased local processing. The number of workers directly employed per million board feet harvested in the Tongass has averaged between 3 and 4, compared to 11.9 workers per million board feet in California, Washington and Oregon. Reaching these levels of processing in Alaska could provide thousands more timber-related jobs, even with lower harvest levels.

Q: Where do the trees logged in Alaska go?

A: Almost all wood harvested in Alaska is exported, with close to 70 percent destined for Japan. The Japanese pay top dollar for round logs harvested from private lands which account for 66 percent of the dollar value of wood exports to Japan. Logs cut on public lands are required to be minimally processed in the United States.

Q: What is happening on private lands in the Alaska rainforest?

A: A significant percentage of the highest value forest land was selected by Alaska native corporations as part of the 1971 settlement of aboriginal claims, a total of about 1.7 million acres. These lands are almost all being logged, as quickly as possible, without protections afforded by most environmental laws, including even the rudimentary requirement to log sustainability. In Southeast Alaska the land will all be cut in another 10 years. In the rest of the rainforest it may take 2 decades to deplete the private land timber.

For more information regarding the Alaska Rainforest Campaign contact akrain@boo.net.

Susan Spear

Forest Green: The Temperate Rain Forests of the Pacific Northwest

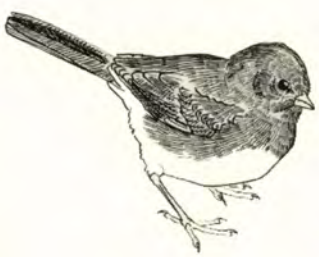
by: Julie Lockhart

December 25, 1805 - "...our Diner concisted of pore Elk, So much Spoiled that we eate it thro' mear necessity." — William Clark at Fort Clatsop, Oregon Territory

After a journey West over four thousand miles, Lewis and Clark's Corps of Discovery team wintered near the Columbia River in a mysterious forest of massive height and forbidding depth. Huddled inside their stockade built "of the streightest and most beautifullest logs" according to Clark, the men endured constant rain, colds and fevers, fleas, spoiled food, and rotten clothing. While Lewis documented new species and Clark drew maps, others hunted, boiled sea water for salt, and sewed 338 pairs of elk skin moccasins for their journey home. The winter of 1805-1806 was their first and only season spent in a temperate rain forest.

Coniferous rain forests grow in Northwestern North America from the panhandle of Alaska to northern California, and also in parts of Japan, New Zealand, Tasmania and China. Conditions for a "cool temperate" rain forest may include mean annual temperatures of six to twelve degrees celsius, and annual rainfall greater than 2000 mm.

In a South American rain forest, one hectare (2.5 acres) may contain up to 300 tree species while temperate rain forests usually comprise half a dozen species per hectare. Heat and termites hasten decomposition in tropical rain forests and available nutrients are used immediately. The cool maritime climate allows temperate rain forest trees to photosynthesize year-round and hence grow to immense size. Slower decomposition rates build up a thick carpet of necromass, snags and fallen logs. Northern rain forests literally outweigh tropical rain forests in sheer biomass seven to one.



A Pacific Northwest rain forest begins, after wind, fire, or logging disturbance to an area, with herbaceous plants (purple fireweed, yellow woodland groundsel, bracken fern and thimbleberry) followed by short-lived deciduous trees like nitrogen-fixing red alder and finally dominant conifers. Eventually, the forest comprises two basic "layers", the one to two meter understory and the canopy layer up to seventy-six meters overhead draped with epiphytes like mosses and liverworts. Hundred year old snags provide shelter for owls, woodpeckers and flying squirrels. Flowering plants take root in decaying logs, which also provide homes for epiphytes and invertebrates. It is not unusual to see several huge "soldier" trees growing in a line, former seedlings that took root on a fallen neighbor centuries before.

Janet E. Hawkes

Along the coast from Alaska to Oregon, coastal rain forests of cedar, western hemlock and the dominant Sitka spruce grow in a narrow band. Slightly inland with less rain, Douglas fir and hemlock grow. In Northern California redwood fog-belt forests grow, home to the world's tallest trees.

As of 1998, 5-10% of untouched old growth forest (over 250 years old) remains in Oregon and Washington, scattered in national forests, wilderness areas, and places impractical for logging. While it is clear that today's timber industry practices more environmentally sound logging than ever before, a central, unanswered, and possibly obsolete question remains. Where do old growth forests stand in current forest management philosophy and practice?

Today, upriver from Lewis and Clark's abandoned Fort Clatsop stockade, others research an old growth rain forest in the southern Cascade mountains of

U.S. Forest Service

Washington State. The University of Washington's Sean Thomas and other scientists at the Wind River Canopy Crane Research Facility are less concerned with rotten elk meat and moccasins than with gas exchange between the forest and atmosphere. A twenty-one meter industrial crane lifts the scientists high into the forest canopy to gather leaf (needle) samples for testing. In "olden" times a handful of years ago, sharpshooters blasted branches to the ground while researchers ran to collect them.

The huge crane helps Dr. Thomas study how forests absorb carbon from the atmosphere. Trees use carbon dioxide in photosynthesis and thus reduce the buildup of greenhouse gases (from fossil fuel and other pollutants) in the atmosphere.

In 1997, Congress passed a "forest health" bill giving the USDA and the Forest Service greater leeway in managing federal forests to encourage carbon accumulation. Current opinion favors younger, vigorous forests as better at storing carbon. Dr. Thomas's preliminary findings at Wind River suggest that old forests may hold their own in terms of carbon uptake. Dr. Thomas hypothesizes that, while not as vigorous as younger trees, older trees with greater woody structure may be buffered from water loss and can continue active photosynthesis during dry seasons. Cutting down remaining old growth forests would result in a massive loss of already "captured" carbon. Perhaps older forests should be managed as "carbon stores". The fact that they can continue to accumulate even more carbon undergirds support for their protection.

Should we "actively manage" old growth forests because they are "sick" ecosystems choked with insects, disease, rot and increased fire risk from snags? Or should we study them with care because they are a pinnacle ecosystem, stable and supportive of life in great quantities and variety and helpful in managing pollution? Science, politics, facts and emotion eventually will provide an answer, one with ramifications for rain forests worldwide. The United States risks hypocrisy when it points fingers at developing countries with hard decisions to make about the future of their tropical rain forests. Third world leaders "in the know" point back at our own rain forest management.

Dr. Thomas notes a different threat to complex ecosystems like rain forests from the scientific community. Universities stress molecular biology these days, not natural history. Naturalists possessing extensive knowledge of plant and animal life histories, a basic skill for scientists in Meriwether Lewis's day, are themselves an endangered species. Aging herbariums in museums and universities nationwide lie unused or are shut down. How can we conserve biodiversity if we no longer recognize what we have?

Pondering such troubling questions over a tin of "rain forest crunch" candy may be less conclusive than a visit to the Olympic National Park's Hoh, Bogachiel, Queets and Quinault rain forests in Washington State. Along the peninsula coast, where inches of accumulated needles and moss literally put bounce into each step, a hiker may wander the rain forest for a week and never cross a road. The "forest of mystery" does exist today in the forty-eight states, but like Lewis and Clark you may journey far to find it.

Thanks to Dr. Sean Thomas, Research Associate at the University of Washington's College of Forest Resources, for his assistance in researching and editing this article.

Julie Lockhart is a free-lance environmental writer and teacher. She lives in Webster, New York.

John Wiessinger

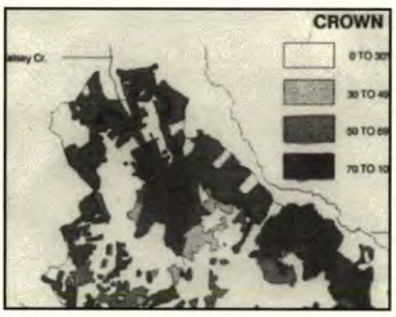
The Warner Creek Story

by: Students at Roosevelt Middle School in Oakridge, Oregon

In October of 1991, fires set by an arsonist burnt over 9,000 acres and second growth temperate forest near Oakridge, Oregon. Started in a roadless area, the Warner Creek blaze took two weeks to control and swept through areas set aside by Clinton's forest plan as protected spotted owl habitat.

An army of 2,000 fire fighters and over $12 million in tax payers money went to controlling the fire. An estimated 3,000 acres were burned by the United States Forest Service as they built a 22 mile fire line across the area. Cool, wet weather finally did what fire fighters tried to do for weeks and the fire was stopped. This was the second most destructive fire in the Willamette forest this century. After foul weather extinguished the flames the real fight began.

Parts of the Warner Creek Burn were receiving the highest level of protection under Clinton's forest plan and Option 9. Although this area was protected when it was untouched by fire, after fire it became available for salvage logging. Warner Creek salvage sales will be sold as pulp, at fire sale prices even though large quantities of lumber grade wood will be cut. Sold by the acre instead of board foot fire sale prices are great incentives for arsonists. Areas targeted for logging are stands containing the largest trees, which with natural fire protection were the least hurt by fire. These large trees provide prime wildlife habitat and if they survived the blaze, will aid in forest regeneration.



Thousands of acres of small, dead trees will be left untouched and will stand as prime fire starters for future blazes. Logging in remote areas requires new roads. Roads fragment forests, cause erosion and endanger wildlife. No roads were planned for Warner Creek, but 200 two acre clear cuts were proposed to provide safe zones for helicopter landing pads.

After four years Warner Creek is flourishing with new life. Over 40,000 new seedlings were counted per acre in some areas. Burned snags and dead twigs replenish the soil with nutrients and wildlife take shelter in downed logs. Elk herds, woodpeckers and spotted owls live in the rapidly growing forest. Warner Creek could provide us with a unique educational experience. Researchers could study the 9,000+ acres, ranging from complete fire kill to gentle underburn. If set aside for research and educational purposes Warner Creek and Yellowstone would become the only areas not logged after a major fire.

Images for this article were supplied by the Students at Roosevelt Middle School and the U.S. Forest Service

BOOK REVIEWS

PETERSON FIELD GUIDES ECOLOGY OF WESTERN FORESTS

by John Kricher. Foreword by Roger Tory Peterson, Published by Houghton-Mifflin $l6.95 paperback $24.95, cloth.

Did you know that besides Lewis's Woodpecker, there are over l40 species of birds in the Black Hills of South Dakota ranging from the American Dipper to Say's Phoebe?

Until I started reading this guide I didn't realize there were dozens of different types of forests in the western United States. Each is unique in its own way, and this guide outlines for you every major forest in the west.

Of special interest to me was the part about the Black Hills of South Dakota in my home state. It's listed under Great Plains forests, and I'll be using it as an example in this review. Each individual forest is divided into indictor plants, understory trees and shrubs, herbaceous species, grassland species, and indicator animals which includes birds, mammals and reptiles.

What this translates into, in the case of the Black Hills is common juniper, red fireweed, needlegrass, and blue jays, prairie dogs and bullsnakes, just to name a few. Oh yes, and under amphibians we must not forget the great plains toad.

The book is excellently illustrated with color plates of the forests, birds, animals and insects. Excellent line drawings help to identify strange plants like the pods and leaflets of the Screwbean mesquite which is found in southwest forests.

It's easy to use the book. Just turn to the beautiful color plates in the center, pinpoint your forest and go to the clearly written text. To begin, just page through the book to get the feel for it. Perhaps your looking for the scientific name of the Ponderosa pine; *pinus ponderosa.* At the same time you will find out there are 26 other kinds of pine in the western forests.

The book, however, is more than just identification. You will discover how different species interact, the effects of human and natural disturbances on the forest and what you can expect to see in the forest you are visiting. As a field guide to ecology you will also learn from this book why natural events and man-made happenings, like fire, are a necessary part of the forests life.

reviewed by **Steve Nelson**

A FIELD GUIDE TO WESTERN TREES

by George Petrides. Illustrated by Olivia Petrides, Houghton Mifflin Co. 1992, 308 pp. $15.95 paper $24.85 cloth

This Peterson Field Guide is exceptionally fine. The 47 beautiful colored plates illustrating 338 different trees grouped for similarities of leaf, fruit and flowers, each faced with a full page comparative chart providing general characteristics and specific details, provide excellent assistance and could be considered a book in itself.

In addition each specimen is referred to a textual page which includes scientific names, range maps, more information on identification, comparison with similar species, habitat and when available, remarks containing animal relationships and ethnobotanical information.

Appendices include a key to trees in leafless condition, and an outline of plant relationships. There is also a glossary, a list of references and an index. End pages illustrate the six main sections of the book.

Certainly, every library west of the Mississippi should have a copy of this book, as should the backpack of any naturalist planning a western trip.

reviewed by **Helen Ross Russell**

THE WOOD DUCK AND THE MANDARIN, THE NORTHERN WOOD DUCKS

by Lawson L. Shurtleff and Christopher Savage. University of California Press. 232 pages, $34.95

**All royalties from the sale of this book are being donated to the Nature Conservancy and Ducks Unlimited in the US, and to the Wildfowl and Wetlands Trust in England*

The Northern Wood Duck found in every one of the contiguous 48 states and the Mandarin Duck of Asia are the only members of the genus, *Aix*. Similar in size with the strikingly handsome "helmeted" males and almost identical beautiful females, the two ducks share a unique woodland habitat, nesting holes in trees. Both lead their young to water immediately after hatching, where they feed on aquatic plants.

By a strange series of human relationships the two ducks share the same habitat on Shurtleff's ranch in Sonoma County in Northern California. In 1968 when Shurtleff first owned the ranch he decided to build a pond. An old-timer running the bulldozer told him about the wood ducks that used to come to the area and suggested that nest boxes be built. This launched a 30 year adventure in learning about predators, food, relationships and behavior. In 1972 when Shurtleff was walking in the woods with a friend who lived 20 miles away, a Mandarin duck arrived at the ranch and perched on a nesting box.

What a fortuitous day! The friend not only identified the Mandarin, he told its story. Many years before, his father-in-law had a wild bird collection, and on at least one occasion wind blew a door off the duck's pen and the ducks escaped. These feral ducks had raised many generations of young in the area. Gradually more Mandarins arrived in the forest nest boxes and waterways on the ranch.

This is a ravishingly beautiful book with hundreds of exquisite color photographs. The story that it tells is exciting, sobering, challenging, touching and is based in U.S., Russia, Japan, China, Great Britain, weaving together art, culture and the environment.

The final sentence of the introduction, says it all, "The future is in large part in the hands of dedicated, individuals and organizations working worldwide to protect valuable forests and wetlands on which so much wildlife relies. By journey's end, the reader will be able to share with Christopher and me our insight into the workings of a well organized but little understood web of conservation world wide and our deep admiration and affection for two of the world's most beautiful waterfowl."

reviewed by **Helen Ross Russell**

IN COLD MARGINS: SUSTAINABLE DEVELOPMENT IN NORTHERN BIOREGIONS

by J.M. Jamil Brownson. Northern Rim Press, 333 South 5 St. East Missoula MT 59801, $14.95

Brownson presents the historical, social, political and economic story of the Northern Rim. The Rim is world wide, and is the transitional biozone between the cold artic and the warmer southern temperate zone. These special bioregions are marginal in agriculture; their major income is from the extensive woodland, mining, animal husbandry and the hardy inventive people that constitute the population.

The book explores the many ways that the people in this biozone can improve their standard of living. There are examples of small industries in Scotland and Sweden; design ideas and crafts from Denmark, Norway and Finland; and new housing for a northern climate in Hokkado, Japan.

Issues around renewable resources of woodland and fisheries are universal. These issues should be studied and changes made by the local peoples to ensure that natural resources will not be depleted for the next generation.

This book is a must for students and environmentalists that live in the Northern Biosphere. It is well written. I found the historical facts fascinating, and the problems of surviving in a hostile environment endless.

reviewed by **Robert Russell**

DIVERSITY AND THE TROPICAL RAINFOREST

by John Terborgh. A Scientific American Library book. Distributed by W.H. Freeman and Company 243pp.

"The primeval forests of the equatorial zone are grand and overwhelming by their vastness and by the display of a force of development and vigour of growth rarely or never witnessed in temperate climates." Alfred Russel Wallace in ***Diversity and the Tropical Rainforest.*** This beautifully illustrated book would be just as at home in the naturalist's library as on the coffee table. The hardbound book includes the tables and graphs that one might find in a scientific paper, but also includes wonderful photos and drawings of the inhabitants of the rainforests of the world. Dr. Terborgh, the director of the Center for Tropical Conservation at Duke University, begins the book with an overview of the results of evolution as expressed in the patterning of tropical vegetation on climatic gradients, the adaptation of plants to a wide range of soil conditions, and the contrasting degrees of diversity found in temperate versus tropical forests. He concludes with a discussion of conservation biology and its use in preserving the rainforests.

reviewed by Steve Melcher

THE TREES IN MY FOREST

by Bernd Heinrich. Cliff Street Books, 1997 $24.00

"Each of us has a forest." So begins this wonderful ramble through one of man's forests. Heinrich is the author of several natural history books, including ***A Year in the Maine Woods, Ravens in Winter, One Man's Owl,*** and the National Book Award nominee ***Bumblebee Economics.*** The book includes hand sketched maps, Heinrich's sketches of the flora and fauna of forests, and a few black and white aerial photos that show how the forest has changed since the 1950's. A professor of biology at the University of Vermont, Heinrich has the rare gift of being able to translate his scientific knowledge into the powerful and graceful words of a poet. The book is not just a collection of ruminations found in a naturalist's journal. I enjoyed Heinrich's exploration of the natural world of a forest through his use of personal and scientific terms. ***The Trees in My Forest*** also contains scientific facts and explanations of biological processes that would be useful not only to those lucky enough to own their own few acres of forest, but also to those of us who are forest ramblers on public lands or in the privacy of our armchairs.

reviewed by Steve Melcher

PETERSON FIRST GUIDE TO FORESTS

by John C. Kricher, illustrated by Gordon Morrison. A Peterson Field Guide. Houghton Mifflin, New York. 1995 128pp. $4.95

The First Guides are simplified versions of the Peterson Field Guides. The Forests guide is useful for the beginning naturalist. The colorful paperback fits in a shirt pocket. 49 different North American forest types are featured, covering the Eastern Deciduous forest to the Pacific Northwest rainforests. This guide is arranged with an ecological focus that explains the plants and animals found in a particular forest type. The illustrations include trees, birds, mammals, and other plant and animal species that are most likely found in each type. The guide provides a very broad, ecological approach to forest covering the entire continent of North America. The guide would be most useful if traveling to different parts of the continent and interested only in getting an overview of the species that might be found in a forest. The book would also be useful in an ecology class where the different forest types would be compared. Kricher writes a section, useful to beginning naturalists, that provides advice about identifying plants and animals in the field.

reviewed by Steve Melcher

NATURALIST IN THE FIELD

DR. MEG LOWMAN

by Sarah Walsh

Up in the canopy of the rainforest dangles a scientist, a conservationist, a woman, a mother. Dr. Meg Lowman is the Director of Research and Conservation at the Selby Gardens in Saratoga, Florida. Most of Dr. Lowman's work days are spent not behind the desk in her office, but rather in the treetops of rainforests around the world.

Photo provided by Meg Lowman

Dr. Lowman's research is devoted to the plant and wildlife species that live in the canopy, the upper layer of foliage, of a rain forest. The aim of her research is to identify and study the role of these species in order to assist in their conservation.

Growing up in Elmira, NY, Dr. Lowman was surrounded by an abundance of forests. However, it was in her junior high school, years after attending a science camp in West Virginia, that Meg Lowman found her future. The camp was run by a naturalist whom she still considers to be her mentor. From this inspirational experience, Meg's interest in science continued to flourish throughout her academic career. Beginning with her first prize won in the 7th grade for her plant collection, carrying through to Dr. Lowman receiving her Ph.D. in Botany, science has been a way of life since a very young age.

Dr. Lowman's work has taken her everywhere from dry, rural Australia to the most humid, tropical areas of Central America. During some of her most recent work, she was accompanied by her two sons, a writer, Kathryn Lasky, and photographer, Christopher Knight, to a rainforest in Belize. After observing Dr. Lowman's life and work while in the rainforest, Lasky and Knight produced ***The Most Beautiful Roof in the World,*** the third in a children's career series written and photographed by the team. The book focuses on Dr. Lowman's work in Blue Creek, Belize and examines her day to day activities. Accompanied by brilliant illustrations of the forest and Dr. Lowman in action, ***The Most Beautiful Roof in the World*** is a unique and informative look at an extraordinary career. Dr. Lowman says she enjoyed the experience. Her hope is that a series like this can open up a whole new world of possibilities to the of children it reaches.

Reaching a young audience is a goal of Dr. Lowman. As a woman in a male dominated field, she would like to see more encouragement geared towards young girls to enter the world of science. According to Dr. Lowman, "There have been advancements made for women is science but there needs to be much more.

I would like to see a stronger opportunity and enthusiasm for women in science." As a child, she found few female role models in her field to aspire to or to encourage her to continue what has proven to be a difficult and demanding occupation. Through hard work and perseverance, Dr. Lowman has attained a high status in her career and would like to see more women do the same.

Dr. Lowman has been motivated to write her own book synopsizing her experiences and struggles of being a woman scientist and a professional mom. Due for release in early 1999, Dr. Lowman's autobiography, ***Lady in the Treetops***, will be published by Yale University Press. This dream turned reality began as a hobby for Dr. Lowman as she journaled, discussing her life as a woman, mother and scientist. She includes the benefits and struggles involved with each of these three important aspects of her life. The drive behind this work came with the realization that virtually all of the texts published in relation to her field were written exclusively by men. Dr. Lowman wanted to change this situation in order to diversify the population and to be an example for young female scholars working to enter the world of science.

One of the most interesting components of Dr. Lowman is that her work as a scientist does not stop in the treetops or in the lab. She is an excellent example of a scientist involved with government legislation. Dr. Lowman sees the need for a greater collaboration of scientists at an international level in order to share, not compete for, new found knowledge. Using this as a platform, Dr. Lowman also encourages an increased awareness by all scientists in regards to an application of knowledge acquired through research. She would like to see scientists become more active in the legislation which mandates the findings of their research. Overall, Dr. Lowman supports an expansion scientific activism outside of the world of science.

Currently, Dr. Lowman is taking steps towards her many goals. She is involved with an educational project for children that will illuminate her work in science. The project is a satellite televised broadcast series for children teaching them about rainforests. Dr. Lowman is also teaching an international workshop in Peru for educators about the ecosystem. Additionally, she will be an active part in the 2nd International Forest Canopy Conference. This conference is a policy making session geared to encourage scientists to share their research and to involve themselves with the policy making surrounding it.

All of her work in the treetops and in the jungles of politics will be keeping Dr. Meg Lowman busy. Her work is her passion, which is evident in every aspect of her life. In ***The Most Beautiful Roof in the World***, Meg is quoted as saying, " Science is the machinery that runs the earth." Dr. Lowman feels that this analogous way of explaining the function of science will teach her audience of its importance. Through her work, her passion, and her drive, Dr. Meg Lowman will surely achieve her goals.

Sarah Walsh is a senior Corporate Communications major at Ithaca College in Ithaca, NY. She hails from Hamburg, NY and has future plans to attend graduate school or to begin work in the field of communications.

Janet E. Hawkes

RIGHT BEFORE YOUR EYES - Trunk Personalities©

John Wiessinger

A young apprentice went to a master of jade to learn all about the stone. The master put a piece of jade in the child's hand and talked all day of philosophy. The next day, the master put another piece of jade in his hand and talked all day of religion. The child, impatient, asked when he would talk about jade, but he master never answered. Day after day, the child held jade while the master talked of other things. Finally, one day, the master put a beautiful green stone in the child's hand and the child said immediately, "That's not jade!"

Tree identification is an important part of any nature lover's education. Leaf, flower, and fruit characteristics are relatively easy to learn from field guides, but a "feel" for bark is most easily learned from the trees themselves, along the way. Many people first learn the leaves of the trees in their area, then begin to relate certain hard-to-describe bark and branching patterns to the trees whose leaves they recognize. Finally, a leafless tree that in earlier winters was just another tree suddenly jumps out and announces itself, without the observer knowing exactly when or how his or her education took place.

Learning a tree by "feel" rather than by well-defined characteristics has its drawbacks. You may know, for instance, that in your area only beeches have smooth, light gray bark and grow among birches and maples. Half a glance, and you can identify a beech in a winter woods. But what if part of the picture changes? What if you're in a woods half a continent away, or in an arboretum or landscaped park? The leaf might tell you for sure whether or not you're seeing an old friend; the trunk may not. On the other hand, a feel for the ambiguous qualities of a tree family (maple, for instance, or oak) can help you to place an unknown tree in that family with some certainty even if you're far from home.

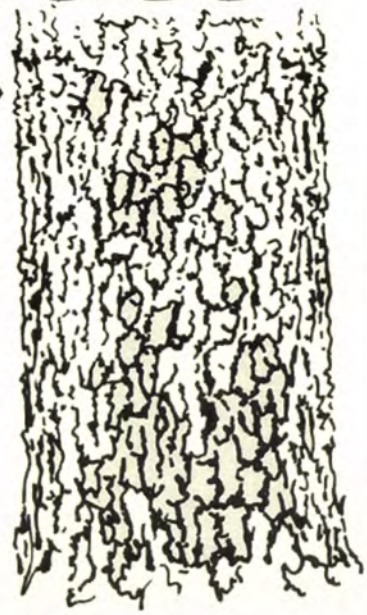
Other characteristics that help identify a tree are its branching pattern; the shape and angle of its twigs; the outline of the tree as a whole, if it's growing in the open; the shape and size of the buds; and whether some of its dead leaves stay on the branches through part of the winter. Some of these characteristics can be clearly described in writing, others cannot. Even photographs offer inadequate representations of many tree characteristics. As the saying goes, there's no substitute for experience. On the other hand, there's no more pleasant route to experience than a walk through the woods in different seasons. So take your field guides with you, but by all means, go out and enjoy the trees firsthand!

INDIVIDUAL ENVIRONMENTAL ACTION

Businesses sometimes try to capitalize on our environmental uneasiness. Use common sense when you evaluate their claims. Degradable trash bags, for instance, were a marketing ploy, and do not degrade well in landfills. In general, look for mechanical, not technological, solutions to environmental problems. The simpler, more straightforward solutions are most likely the better ones.

Trunk Personalities

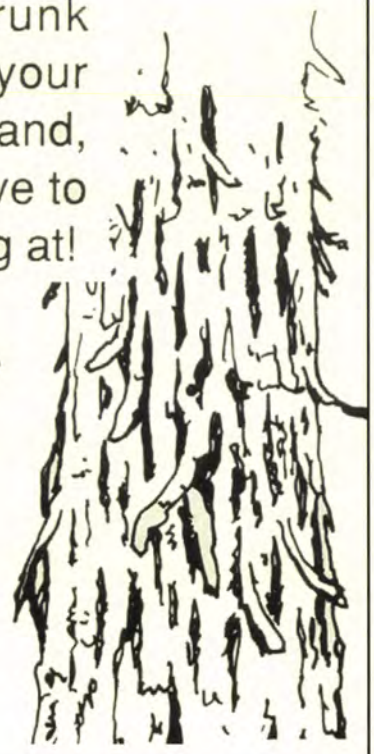
Black Cherry
mature tree's bark breaks into squarish scales



White Ash
mature tree's bark has intersecting ridges

In winter, even without leaves, tree identification can still be easy. Many trees have bark that is as distinctive as their leaves. The trees shown here are only a few of the many "trunk personalities" waiting to make your acquaintance. Learn them now and, come summer, you won't even have to look up to know what you're looking at!

Shagbark Hickory
mature tree has rough, shaggy, strips of bark



American Sycamore
mature tree has scaly and mottled bark

RIGHT BEFORE YOUR EYES - Don't Open 'Til Spring©

John Wiessinger

Unlike annuals — those plants that live for only one growing season and that are present only as seeds during the winter — trees are perennials and live from year to year. Thus, a tree in the North must be capable of surviving the winter months, whether or not growth is possible. The tough trunk and branches tend to be well protected, and have special mechanisms for coping with below-freezing temperatures, but the more delicate leaves are another matter. The thin, tough needles of evergreens however, are specially adapted to survive the winter and still remain functional the following spring. Deciduous trees have adopted a different approach: They discard all their leaves in the fall, and rely on an entirely new set for next year's photosynthesis. Obviously, both approaches work.

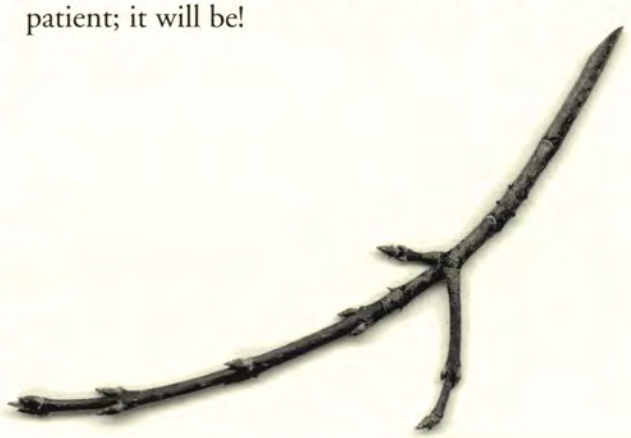
A deciduous tree's winter buds are made up of embryonic leaves or flowers ready to resume the growth of the tree once suitable weather returns. If you slice through a large bud with a sharp knife, you will see tiny "leaves" furled around still tinier segments of "twig". Once the weather warms and the protective scales are shed, both leaves and twigs are free to undergo rapid growth. On some trees, some buds contain only embryonic flowers. The Flowering Dogwood, for instance, has two very different types of buds. The slender ones contain next spring's leaves; the minaret-shaped ones produce flowers.

It's interesting to note that deciduous trees have a "backup system" available to them. During some spring seasons, trees that have already begun to sprout leaves are faced with a short-term return to freezing temperatures. Although the newly opened leaves are very tender and easily killed at such times, auxiliary buds that have not opened are available to take over the life-sustaining functions of the tree if the first set of leaves is lost.

One good way to get a "feel" for spring is to take a trip north or south in early spring and watch the change in the trees as you travel. If you are driving southward from the North just before "you" spring, at some point in the trip you will note a slight color in the trees as buds begin to swell. Farther south yet, the buds are even larger or beginning to open and even further south leaves and flowers are evident on the roadside trees. This "fast-forward" approach really makes spring's renewal process seem more real. Of course, if you travel northward from the South in early spring, the process is reversed — a depressing but temporary return to winter.

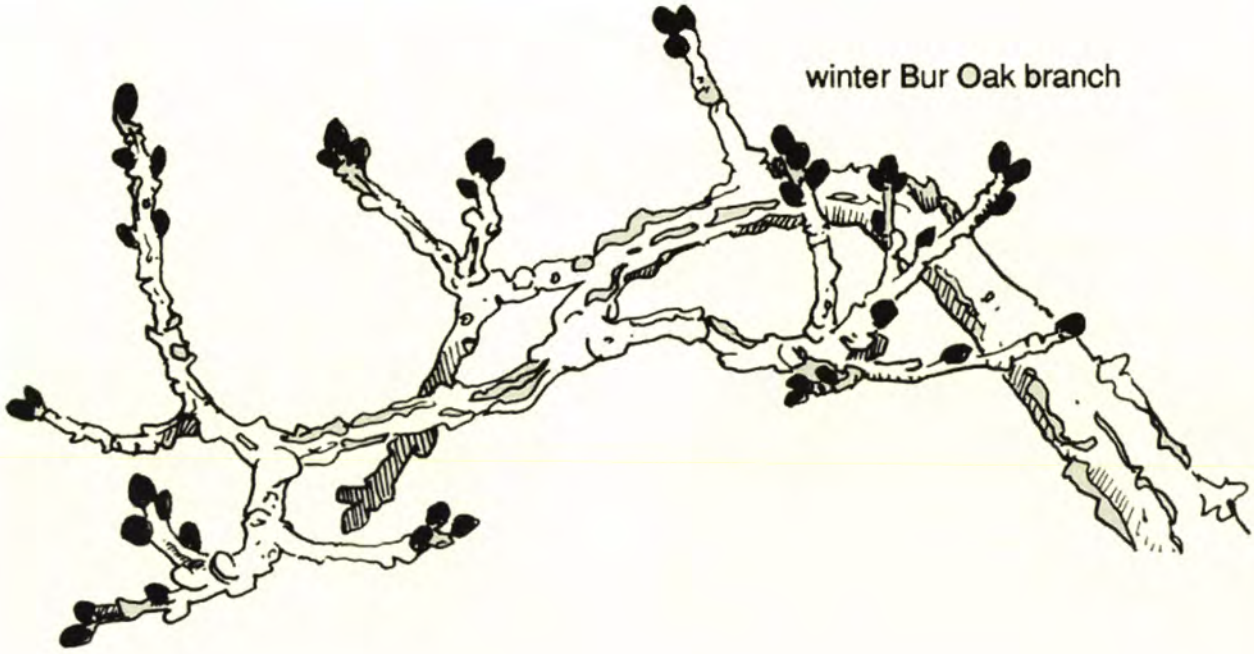
INDIVIDUAL ENVIRONMENTAL ACTION

Be sure to dispose of all hazardous wastes "properly", through a hazardous waste collection program. Among those substances that must be considered hazardous are: hair products and cosmetics, medicines, polishes, batteries, cleaners, dry cleaning fluids, fluorescent lamps (made before 1978 or lacking a "PCB-free" label), paint and paint removal products, mothballs, smoke detectors, automotive products, fertilizers, pesticides, herbicides, pool chemicals, insect and rodent poisons, and flea collars. If your community does not yet have a special hazardous waste collection day, these items are best kept until such a program is instituted. Be patient; it will be!



Don't Open 'til Spring

Every fall we watch tree leaves drop, then look forward to their return next spring. But next spring's leaves are already there; we just can't see them!



winter Bur Oak branch

All of those bare, winter trees are full of leaves packaged out of sight in buds. Each bud is a wrapped package of tiny leaves that will grow to full size when warm weather returns in the spring. So the next time you see a "bare" tree in January, remember: Leaves are there; they're just well wrapped for winter.

LOOKING AT LEAVES

Overview

Are leaves ever hairy? Do they have teeth? In this activity, your students will take a closer look at leaves and find out more about leaf characteristics and how leaves can be used to identify trees.

LEVELS

Activity: Grades K-4
Enrichment: Grades PreK-8

SUBJECTS

Science, Visual Arts

CONCEPTS

- Populations of organisms exhibit variations in size and structure as a result of their adaptation to their habitats. (10.1)
- Biological diversity results from the interaction of living and nonliving environmental components such as air, water, climate, and geo logic features. (1.1)

SKILLS

Comparing and Contrasting, Classifying and Categorizing, Identifying Attributes and Components

OBJECTIVES

Students will ① describe how leaf shapes, sizes, and other characteristics vary from tree to tree and ② explain how particular types of trees can be identified by their leaves.

MATERIALS

Tree leaves, pencils, leaf print supplies for "Enrichment" (Types will vary depending on print method used; see various "Enrichment" activities.), copies of student page 231 (for assessment)

TIME CONSIDERATIONS

Preparation: 20 minutes
Activity: 50 minutes

Getting Ready

Locate an area where the students can collect leaves (from the ground, if possible) from several different kinds of trees. You may want to collect a sample, including needles from coniferous trees. In temperate climates, this activity is easiest to do in the fall.

Doing the Activity

1. Take students outside. Have them collect two or three different kinds of tree leaves, and encourage them to pick leaves that have already fallen to the ground. Be sure to collect needles in the clusters in which they grow.

2. When back inside, have students examine their leaves.

- What are the differences between the leaves?
- What do the leaves have in common?
- Do any leaves have teeth?
- Do any have hairs?
- What do the leaves feel like?
- Who found the biggest leaf? the narrowest leaf? the smallest leaf?
- Have any leaves been eaten by insects? How can they tell?
- Can they trace the veins on their leaves with their fingers?

If no one collected needles, pass out some that you collected earlier or show them a picture of needles. Have students compare the needles to the other leaves.

3. Have students give one of their leaves to another student. Explain that they will go outside to find what kind of tree that leaf came from. How will they know when they've found the right tree? (It will have the same kind of leaves.)

4. Take students back to the same trees where they gathered leaves in Step 1. Walk from tree to tree, and have students compare their leaves with leaves on the tree. If one or more students has a leaf that matches a tree, stop and examine the tree more closely.

- Where on the branch do leaves grow?
- How are they attached?
- Do the leaves grow far apart from each other, close together, or in clumps?
- If the leaves are needle-like, how many needles are in each cluster?
- Are all the clusters the same? Are all the needles in the cluster the same length?
- Do all leaves on the tree match exactly?
- What color are the leaves?
- Also examine other characteristics of the tree. For example, what is the bark of the tree like?
- What color is the bark?
- Are flowers, nuts, or fruit on the tree? What do they look like?

5. Continue looking at trees until all students have identified the tree that their leaf came from. As they examine each tree, be sure to ask questions to make students compare trees that they've looked at. For example, ask:

- Are this tree's leaves larger or smaller than the last tree's leaves?
- This tree's leaves grow in a clump. Have we looked at any other trees that have leaves which grow in a clump?

■ What's similar or different about these two trees?

Enrichment—Leaf Art

Have students use the leaves they collected in Step 1 of "Doing the Activity" to create their own prints. Here are six "leafy" ideas for you to try, depending on the age of your students and the amount of time available.

Leaf Crayon Rubbings

Materials

Dark-colored crayons, plain drawing paper

Directions

Set the leaf on a smooth surface, preferably vein-side up; then cover it with a plain piece of paper. Rub a crayon sideways back and forth across the paper above the leaf. The margin of the leaf as well as its veins should begin to show on the paper as you rub gently.

Spatter Prints

Materials

9" x 12" (23 cm - 30 cm) wire, plastic, or nylon net screen; toothbrush; straight pins; tempera paint; paper

Directions

Place a leaf on a sheet of paper and secure it with pins. Then place the screen over the leaf and paint across the screen using a toothbrush. Afterward, lift off the screen, unpin the leaf, and carefully lift the leaf away.

Pressed Leaves

Materials

Iron, towel, wax paper

Directions

Place a leaf between two layers of wax paper and then cover with a towel. Press the towel with a warm iron, being sure to iron over the entire area of wax paper. (This will seal the leaf between the two layers of wax paper.) Afterward, you can cut out each leaf, leaving a narrow margin of wax paper around the entire edge of the leaf. Then you can punch holes through the wax paper at the top margin of the leaf and hang the pressed leaf. Use several leaves to make a hanging leaf mobile.

Leaf Print T-Shirts

Materials

Clean, poly-cotton-blend T-shirt; acrylic paints; paintbrush; piece of cardboard; wax paper; paper towels

Directions

Place the shirt on a clean, flat surface; then slide the cardboard between the front and back of the shirt to keep paint from soaking through. Place a leaf on a sheet of wax paper and coat it with a thin layer of paint. Make sure your fingers are clean; then carefully lift the painted leaf up and place it (painted side down) on the shirt. Cover the leaf with a paper towel and press it down. Lift the leaf straight off the shirt. Make as many more leaf prints on the shirt as you would like; then hang the shirt to dry.

NOTE—Do not use fabric softeners to clean or dry your shirt before you start printing. Also, to help make the prints last longer, rinse the finished shirt in a mild water and vinegar solution before washing it for the first time.

Cherokee Leaf Printing

Materials

A medium-sized, flat-headed hammer (a flat rock will also work); masking tape; a large, flat board; a supply of newspapers; wax paper; pieces of white cloth or clothing to print on (100% cotton or unbleached muslin works best); leaves from marigolds, tulip poplars, red or white oaks; carrot tops; strawberries.

Directions

The idea is to transfer the natural dyes from a leaf to a fabric, while retaining the design of the original leaf. Do this by beating the leaf's chlorophyll directly into the cloth, which will set the dye through natural chemical action. Use this technique to decorate any natural cloth surface such as table cloths, curtains, wall hangings, T-shirts, handkerchiefs, and headbands. Lay several thicknesses of newspaper on a flat board. Spread your cloth, right side up, on top of the newspaper. Put leaves on the cloth in a pattern of your choice. Place wax paper over the leaves and tape it around the edges. Use a hammer to pound

the leaf until the color transfers to the cloth. Pound evenly for a good print. If the leaf does not print evenly, crumple up another leaf, dip it water, and use it to "paint" the unstained spots. The dyes from the leaves must be set into the fabric to resist fading. This process also affects the color. For bright colors, soak the fabric in a solution of 3 tablespoons (44 ml) of ferrous sul-fate per gallon (3.8 liter) of water for 1-2 minutes (or use the same solution of alum for a less-brilliant color set). For rich, reddish-brown hues, use a solution of 1 cup (240 ml) wood ashes to 3 gallons (11.3 l) of cold water for 5 minutes. Rinse the fabric in clean water, and air dry it away from direct sunlight. To help retain the natural colors, you can soak the finished piece in 1/2 cup (120 ml) of salt to 2 gallons (7.5 l) of water for 10 minutes [or in a solution of 3 tablespoons (44 ml) of baking soda to 1 gallon (3.8 l) of water]. Rinse and dry as directed above.

Leaf Batik

Materials:

100% cotton cloth squares, pencils or pens, yellow and/or orange fabric dye, red and/or brown dye, household paraffin, hot plate, heavy saucepan, metal spoons, natural bristle paintbrushes, large glass or metal bowls, clothesline and clothespin, leaves for tracing patterns, newspaper, glass cups or dishes for melted paraffin, iron, rubber gloves for students and adults.

Directions

Trace a leaf pattern onto a cloth square with pencil or pen. Using yellow and/or orange dyes only, dip each square in dye. Hang squares on the clothesline to dry. After they have dried, "paint" the leaf shape on the cloth with melted paraffin, filling in the outline of the leaf you have traced. Constantly reheat the paraffin; if it is not sufficiently heated, it will turn white (cool) immediately after being painted onto the fabric and will not protect the fibers from receiving the final dye color. Ask students what they think will happen when they dip the cloth into the next colors of dye. (The dye will affect only those areas not covered by the paraffin.) Crumple the prepared cloth, then dip it into the red and/or brown dye(s). Hang the cloth on the clothesline to dry. When it is dry, iron the cloth between layers of newspaper. Change the paper when it becomes saturated with paraffin. When no more paraffin melts onto the paper, the batik is finished. You might display the finished squares of cloth as a quilt.

END NOTES . . .

ASSESSMENT OPPORTUNITY

Pass out a copy of page 51 to all students, and tell them that they have to identify which tree each leaf on the right side of the page came from. Explain that they should use the tree drawings on the left side of the page to make identifications. As they identify the leaves, have students draw a line from leaf to tree and then copy the tree name onto the line next to the leaf. Afterward, have students explain how they identified each leaf.

RELATED ACTIVITIES

Name That Tree, The Closer You Look, Bursting Buds, The Shape of Things, Adopt a Tree

Project Learning Tree's ***"Environmental Education Activity Guide Pre K-8."*** *The complete Activity Guide can be obtained by attending a Project Learning Tree workshop. For more information, call the National office at 202/463-2462 or visit our web site at www.plt.org.*

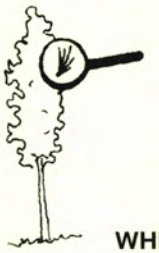
STUDENT PAGE©

A LOOK AT LEAVES

SASSAFRAS

SWEET GUM

PIN OAK



WHITE PINE

COTTONWOOD

1. _____

2. _____

3. _____

4. _____

5. _____

TREE LIFECYCLE

Overview

In this activity, students will discover that trees have a lifecycle that is similar to that of other living things. They will investigate a tree's role in the ecosystem at each stage of its life.

LEVELS

Activity: Grades 3-6
Variation: Grades PreK-2

SUBJECTS

Science, Language Arts, Visual Arts, Performing Arts

CONCEPTS

- Organisms change throughout their lifetimes. Species of organisms change over long periods of time.(13.1)
- While every organism goes through a lifecycle of growth, maturity, decline, and death, its role in the ecosystem also changes. (13.3)
- Ecosystems change over time through patterns of growth and succession. They are also affected by other phenomena such as dis ease, insects, fire, weather, and human intervention. (13.4)

SKILLS

Ordering and Arranging, Representing, Identifying Relationships and Patterns

OBJECTIVES

Students will " diagram the lifecycle of a tree, ? compare a tree lifecycle to a human lifecycle, and ¬ explain the role each stage of a tree's life plays in the forest (or other) ecosystem.

MATERIALS

art materials, copy of student page 305.

TIME CONSIDERATIONS

Preparation: 15 minutes
Activity: 50 minutes

Background

One of the best ways to learn about trees is to look at their life history. Trees, like all living things, have a lifecycle that includes birth, growth, injury and disease, aging, and death. As trees go from birth to death, their physical form changes, as well as their role in the forest ecosystem. You can learn about past changes in environmental conditions by looking at the growth rings in a cross section of a tree. Even more can be learned about the tree's lifecycle by observing the tree from birth as it grows and develops throughout its life.

Most trees begin as seeds. Generally, trees are put into flowering and nonflowering categories. The angiosperms are flowering plants, including wildflowers, shrubs, and many trees. Angiosperms are pollinated by insects, bats, birds, and the wind. Plants that have flowers also protect their seeds inside a fruit. Maple, oak, and all other broad-leaved trees are angiosperms. Gymnosperms (from Latin "gymno-," meaning "naked") have seeds that are not enclosed in fruit or flowers. Rather, most gymnosperms produce their seeds in cones and are pollinated by the wind. The most common type of gymnosperms is the cone-bearers, or conifers, like redwoods, firs, pines, and other trees with needlelike leaves.

If a seed lands in an area with favorable soil, climate, and nutrient conditions, it will germinate (some remain dormant for long periods before sprouting). Usually, many more seeds will be produced than can possibly survive. Most seeds will be destroyed by fungi or other decomposers, or eaten by birds or mammals, leaving only a few sprouts to survive and become mature members of the forest community.

As part of the understory, young saplings must compete with other trees and plants for sunlight, nutrients, water, and space. In dense forests, many young trees must wait for years for older trees to fall and leave openings in the canopy for them to grow into.

The length of time it takes a tree to reach maturity depends on the species of tree.

Trees have many different roles in the forest community depending on their age and size. Their leaves, bark, seeds, flowers, fruit, and roots provide food for many kinds of animals. Trees also provide roosts, shade, and shelter to many living things. For example, holes in older trees and around their roots provide shelters for nests and dens.

Like all living things, trees are subject to disease and injury. Physical damage may not kill the tree, but may provide holes and openings in which animals and insects can live and feed. Eventually, trees weakened by injury and disease will die, fall down, and be decomposed. When they die, trees return their nutrients and other elements back into the soil to be recycled through the forest ecosystem.

Getting Ready

Select a few books on trees from the school library including field guides and stories. Start a "Tree-Source" center, so the students have easy access to materials for researching trees. Make a copy of the Tree Lifecycle Student Page (page 55) for each student.

Doing the Activity

1. Discuss the idea of lifecycles by asking students to describe the lifecycle, or history of a person. Make sure students include childhood, teenage years, young adulthood, and so forth, in the

discussion. Write these stages on the chalkboard. Ask students to identify the different jobs, roles, or things that a person might do in each stage of the lifecycle. Next, ask them to describe the lifecycle of a tree in similar terms (see diagram below).

2. Distribute art materials and ask students to create the lifecycle of a tree, from birth through death and decomposition. Students should include at least three stages or events in their lifecycles (e.g., a forest fire or insect invasion). Encourage them to research a particular species of tree for accuracy in life characteristics, climate, and environment. Remind students that one event that affects the tree (e.g., insect damage) is likely to clear the way for another event (e.g., a hole for nesting birds). The lifecycle could be represented by a circle on the page, with illustrations and a label for each stage or event, or could be shown in a line on a long, narrow piece of paper taped together at the ends.

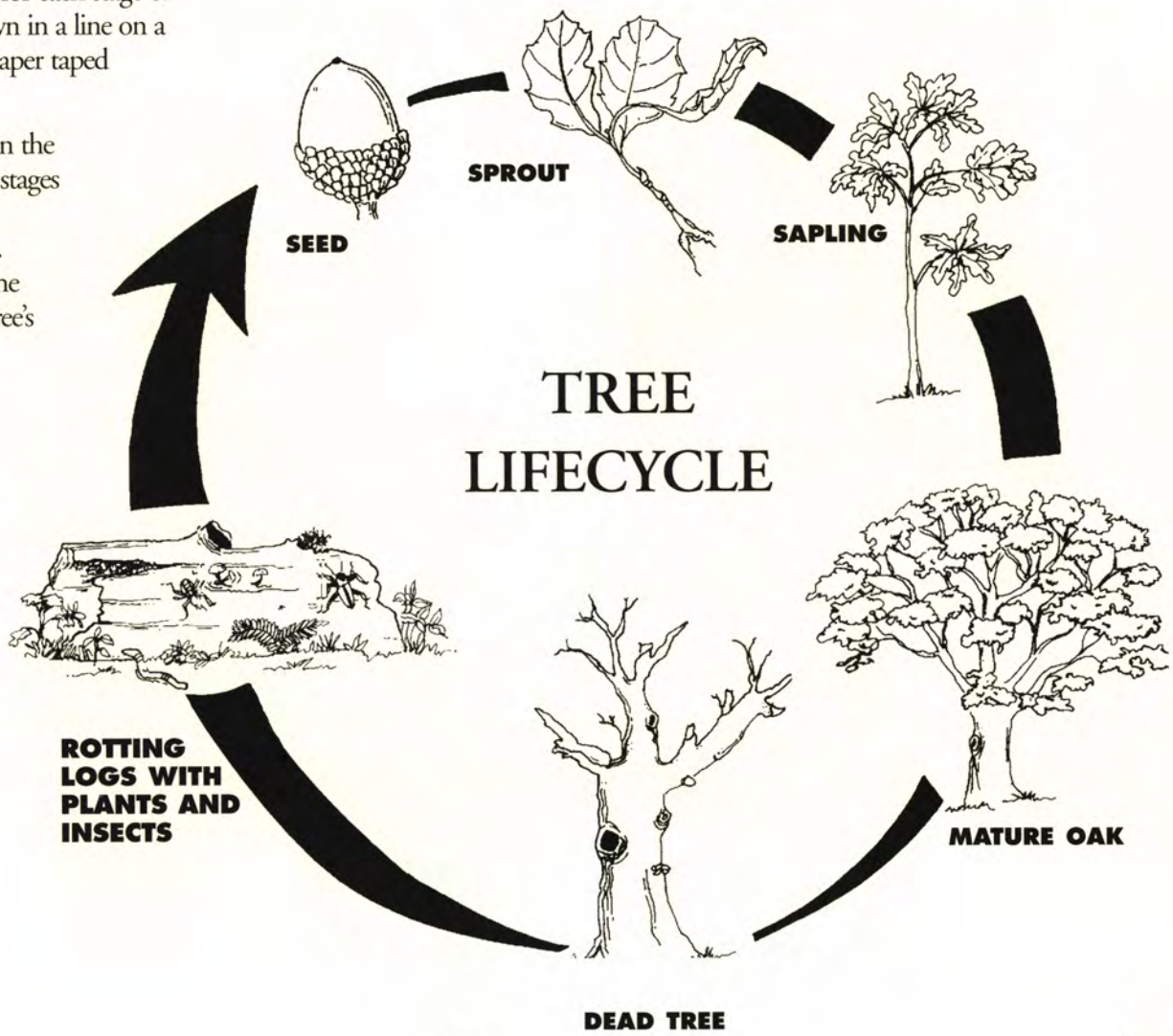
3. Students should fill in the details for at least three stages or events on the "Tree Lifecycle" student page. Some items may stay the same throughout the tree's life.

4. Give students the opportunity to share their lifecycles in small groups or with the entire group. Create a "History of the Forest" exhibit by mounting all the lifecycles around the classroom.

VARIATION—PLANT PERSONIFICATION

1. Ask students if trees are alive. How do they know? (They grow.) How are trees born? (from a seed) Do they die? (Yes, but they can live a long time.)
2. Ask students to imitate your movements as you enact the life of a tree.

- Curl up in a tight ball— you're a seed.
- Uncurl and kneel—you've sprouted.
- Stick up one arm (fist clenched)—you've grown a branch.
- Stick up the other arm—you've grown another branch.
- Wiggle your fingers—you grow lots of leaves.
- Stand up (feet together)—you grow tall.



■ Spread feet apart—you spread out lots of roots.

■ Wiggle your toes—you grow lots of little roots (rootlets).

■ Start scratching all over—you're attacked by insects and fungi.

■ Make a loud noise (kchhhhh!)—you get hit by lightning and lose a limb.

■ Smile and sigh (ahhhhhh!)—you become a home for wildlife in your old age.

■ Make a hammering noise (knock, knock, knock) and vibrate—woodpeckers peck into your dead wood.

■ Make a creaking sound and fall down—you blow down in a storm.

■ Stick up one arm—a new seed sprouts from your rotting wood.

Enrichment

Take students on a walk through a neighborhood, local park, or forest site that has plants and trees of various ages. Ask the students to look for tree at various stages in their lives. Have them try to identify at least one tree in each of the following categories:

■ Young sapling (stem or trunk < 1/2 inch {1.3 cm})

■ "Juvenile" (stem or trunk 1/2 inch to 2 inches {1.3 cm to 5 cm})

■ "Young adult" (stem or trunk > 2 inches {5 cm}, but tree still under canopy)

■ "Adult" (trunk > 2 inches {5 cm}, tree in upper canopy)

■ Injured or unhealty trees (showing signs of injury, disease or stress—Is the tree likely to survive?)

■ Elderly tree (What factors are weakening the tree?)

■ Dead tree (What factors combined to cause death?)

END NOTES . . .

ASSESSMENT OPPORTUNITY

Have students write an imaginative story about the lifecycle of the particular tree they created. The story can be written as a fable in which the trees, plants, and animals can talk.
In the story, students should include at least three stages or events of the tree's life, such as sprouting from a seed, or dying and decomposing into the soil. Ideally, the life events should show a cause-effect connection (e.g., a drought one year might lead to a fire that enables the cones of a particular tree to sprout).

RELATED ACTIVITIES

Nothing Succeeds Like Succession, Tree Cookies, The Fallen Log, Every Tree for Itself, Trees in Trouble, Bursting Buds, Signs of Fall, Have Seeds Will Travel, Living with Fire

REFERENCES

Billy B. Billy B. Sings About Trees (audio cassette).

Buscaglia, Leo. The Fall of Freddie the Leaf. Slack Inc., 1982.

Gile, Joan. The First Forest. J. Gile Communications, 1989.

Tressalt, Alvin. The Gift of the Tree. Lothrop, 1992.

Project Learning Tree's ***"Environmental Education Activity Guide Pre K-8."*** *The complete Activity Guide can be obtained by attending a Project Learning Tree workshop. For more information, call the National office at 202/463-2462 or visit our web site at www.plt.org.*

STUDENT PAGE©

TREE LIFECYCLE WORK SHEET

Fill in the information for various stages or events in your tree's life-cycle. Describe at least three stages or events.

TYPE OF TREE (COMMON NAME)

SCIENTIFIC NAME

CHARACTERISTICS OF TREE

LIFECYCLE STAGE OR EVENT

TREE AGE

ROLE IN FOREST ECOSYSTEM

LIST OF THINGS TREE DEPENDS ON TO SURVIVE

LIST OF THINGS THAT DEPEND ON THE TREE TO SURVIVE

PROCESSES THAT MIGHT MOVE TREE INTO THE NEXT STAGE

LIFECYCLE STAGE OR EVENT

TREE AGE

ROLE IN FOREST ECOSYSTEM

LIST OF THINGS TREE DEPENDS ON TO SURVIVE

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LIFECYCLE STAGE OR EVENT

TREE AGE

ROLE IN FOREST ECOSYSTEM

LIST OF THINGS TREE DEPENDS ON TO SURVIVE

LIST OF THINGS THAT DEPEND ON THE TREE TO SURVIVE

PROCESSES THAT MIGHT MOVE TREE INTO THE NEXT STAGE

ABC's of Forests

Using a teacher tip by Margaret Nathanson provided in a previous issue of Nature Study (Volume 47, Numbers 3 & 4) we asked some of the campers at Cayuga Nature Center's Naturalist Day Camp in Ithaca, NY to construct a forest alphabet.

Here's what we came up with:

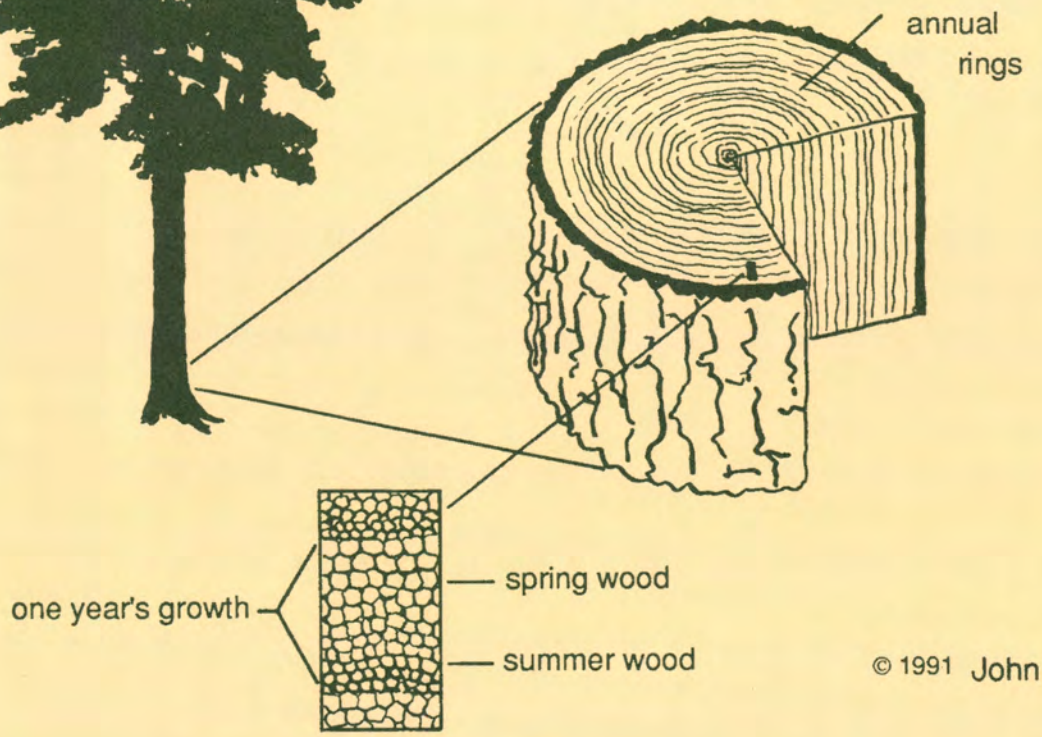
A - aspens, annual rings, acres
B - boles, birch, bark, buds
C - community, capsule, catkin, canopy
D - deciduous,drupe, downy
E - ecosystem, elm, evergreen
F - fissure, fern, fruit
G - grotto, gymnosperms, Gila
H - hemlock, heartwood, hickory
I - island
J - juniper
K - kolorful
L - lobes, larch, leaves, lichen
M - management, maple, medullary ray
N - needles, nature
O - oak, oxygen,
P - pith, pine, people
Q - quiet
R - root, redcedar
S - stand, soil, stalked, swallows
T - tamarack, trees
U - underbrush
V - vegetation,
W - wood, whorl
X - x-citing!
Y - Yellowstone
Z - zylem

NATURALIST'S NOTEBOOK

Showing Your Age

Although it's not always easy to find out a human's age, trees leave a visual record for each year of their lives.

Each spring, trees begin to grow vigorously and lay down large cells that form spring wood. Later, their growth rate tapers off, resulting in the smaller and smaller cells of summer wood. The next year's new spring wood is so dramatically different that the boundary between "old summer" and "new spring" shows up as a ring. The number of these annual growth rings tells the age; their thicknesses tell how well the tree grew each year.



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