

**Tom Bonnicksen**, Ph.D., founding member, International Society of Ecological Restoration, Professor of Forestry, Texas A&M, unpublished *Evergreen* interview:

“The proposed harvest ban—however well intended—chases an unachievable ideal. It says that if we leave forests alone, the result will be a more natural landscape. But reality presents a much different picture. Our forests are byproducts of 12,000 years of dominance by Native Americans, mainly through their use of fire. Removing human influences—by imposing a harvest ban in National Forests—would have horrendous impacts on native forests and species. Many early and mid-succession plant and animal communities would be lost, creating very *unnatural* landscapes, a significant decline in biological diversity and a significant increase in the size of wildfires, resulting in further losses to native forests.”

# Restoring the West's National Forests: Part 1

Since its inception in the aftermath of the Great 1910 Fire, the nation's forest fire-fighting policy has been closely tied to a conservation ethic of near biblical proportion: waste not, want not. Among the articles of faith: prevent forest fires, salvage dead timber and promptly replant lost or harvested forests. The economic and environmental payoffs have been huge,

but nowhere are the benefits more in evidence than in northwest Oregon. The Tillamook forest, scene of four horrific fires between 1933 and 1951, is today valued at more than \$2 billion—166 times the state's \$12 million investment in salvage and reforestation. Thirteen billion board feet of timber were salvaged and 73 million

seedlings were planted.

The benefits of prompt salvage and reforestation can be seen all over the Pacific Northwest. In northern Idaho, a new forest has risen from the ashes of the 1967 Sundance Fire, which destroyed more than 200,000 acres of old-growth cedar and hemlock. It is the same in southwest Washington, where 68,000 Weyerhaeuser acres



Jim Petersen

**Barely visible thinning**—A half-mile across this canyon, dead center in this photograph, lies the Sugarloaf Timber Sale. It took a Supreme Court ruling to bring an end to years of protests, death threats, timber sale appeals and litigation. The sale—on southern Oregon's Siskiyou National Forest—was finally harvested in September 1995. The purpose of the barely visible thinning was to maintain old growth forest conditions for northern spotted owls that nest in the area. A diseased white fir understory was removed, creating additional growing space for old growth Douglas-fir.

were flattened by the 1980 eruption of Mount St. Helens. And west of the Cascades in both Oregon and Washington it is hard to find evidence of the 1962 Columbus Day Storm, despite the fact that hurricane-force winds leveled 30 million acres of timberland *in just five hours*. More than 70 percent of the 17 billion board foot blow-down was salvaged over five years.

Caring for forests is not as simple as it once was. Gone are the days when big fires were followed by big salvage logging and replanting operations—often begun before the smoke cleared. Gone too is the Forest Service's belief that if it simply took care of the trees—growing, harvesting, replanting and increasing per acre growth yields—the rest of the forest would follow along. Now the agency is turning its attention to a far more perplexing problem: how to conserve the natural processes that power life, death and rebirth in forests. The sum total of these processes is thought to add up to something called “biological diversity,” a two-word term for which there are at least 85 different definitions, all of them conceptual, none of them quantifiable. Despite an agreed-upon definition or a means of measurement, a new kind of forestry is emerging. Some call it ecosystem management, while others call it *sustainable forestry*. Either way, the objective is the same: *conserve the natural processes that make forests diverse*.

But long before the term “ecosystem management” was in vogue, the Forest Service was conducting field experiments in overstocked ponderosa pine forests, trying to figure out what combinations of thinning and prescribed fire worked best. Examples of this work can be found all over the West, but two



Jim Petersen

**Promoting diversity**—This photograph, taken in southern Oregon's Siskiyou National Forest, illustrates the use of shelterwood harvesting—a thinning technique that mimics small-scale natural disturbances—to promote plant species diversity. Plant species present in this photograph include Douglas-fir, incense cedar, sugar pine, knob cone pine, grand fir, madrone, chinkapin, canyon live oak and maple. Residual trees—the natural seed source for the next forest—will grow larger and older in the spaces created by this recent thinning. Biological diversity is often associated with the aging process, but there is no direct connection between the age of a forest and the amount of diversity present. In fact, some scientists think there may be as much diversity in very young forests as there is in old ones.

of the more notable ongoing experiments are the Boise Basin Experimental Forest in southwest Idaho and Lick Creek in western Montana's Bitterroot Valley. After years of periodic thinning and careful use of fire, both forests are beginning to look like the great ponderosa pine stands described by early day explorers, naturalists and westbound pioneers.

Such field experiments are of enormous value, not just because they show what is possible, but also because fire behaves differently in different types of forests, so forest restoration tech-

niques must vary accordingly. For example, in warm, dry ecosystems, which make up about half the forest area in the Interior West, fires were frequent, but of low intensity. While favoring ponderosa pine—a thick-barked species that thrives in full sunlight—such fires also limited the spread of thin-barked white fir, a prolific species that grows easily in its own shadow. But after fire was excluded, stand density began to increase and pine began to die out, leaving the fir to compete with itself. After decades, the result is plainly visible. The carcasses of dead trees litter insect and disease-ridden forests. They are destined to burn repeatedly, until there is nothing left to burn.

In cooler, higher elevation ecosystems, which are generally wetter, past wildfires were less frequent but more intense. (It was not uncommon for entire forests to be destroyed). But in the absence of fire, these forests are living longer. Montana's Flathead National Forest is a case in point: eighteen percent of the Flathead was mature in 1899 and another six percent was old, but today 33 percent of the forest is mature and 20 percent is classified as old growth.

As these forests have aged, insect and disease infestations have become more widespread. The result: larger, more intense stand replacing fires, not just in Montana or Idaho but also along the West Coast.

Few—if any—restoration projects have drawn more strident protests than a 1995 thinning in southern Oregon's Siskiyou National Forest. Amid death threats and an Earth First demonstration, the Supreme Court allowed loggers to remove diseased timber surrounding an old growth fir stand the Forest Service wanted to protect. The thinning,

which is not visible from a facing viewpoint less than a mile away, is expected to extend the life of the residual stand by many years, providing critical habitat for northern spotted owls that nest in the area.

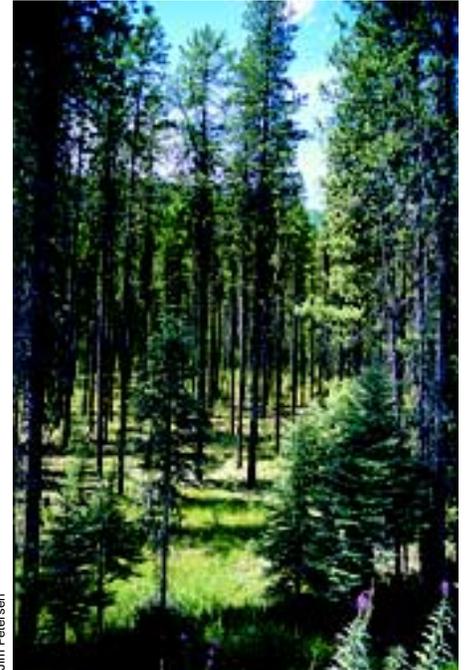
Despite 30 years of successful field testing, and some visibly pleasing results, “Zero Cut” proponents still insist the best way to save National Forests is leave them alone and let nature do the healing. But because forests would presumably be allowed to burn down before naturally reseeding occurred, the healing process could take 200 years—perhaps longer—with no clear picture as to what the next forest might look like. Meanwhile, westerners would be forced to endure long years of smoke-filled skies, impacting both human health and tourist industries that depend on clear, sunny skies.

Among the West’s new environmentalists a more hopeful and more certain strategy is emerging. Rather than allow catastrophic fire to clear the way for the next forest, a variety of thinning techniques would be used to reduce the density of diseased and dying forests to naturally sustainable levels. Once density is reduced, controlled fire could be reintroduced to mimic the ecological effects of low-intensity burns that frequented these forests before white settlement began. Among the benefits such a strategy would have over catastrophic fire: far less loss of wildlife habitat, no loss of aesthetic or recreational values, minimal smoke, increasing diversity in plant and animal species, and no 200-year wait for the next forest.

As the thinnings are envisioned, most trees 100 or more years old would be left to grow larger while serving as a natural seed source for the next forest. There is some disagreement over just how many trees can be removed at a time without adversely impacting wildlife, and there is also some discussion about what to do with large trees that are infected with contagious diseases. Some argue they should be left to become snags, which provide habitat for birds and small mammals, while others say they should be removed before they infect healthy trees. Either choice seems infinitely better than simply allowing entire forests to burn up in increasingly ferocious fires.



Jim Petersen



Jim Petersen

**Two views of the same forest**—The stand on the left has not been thinned but the stand on the right has. These stands lie directly across the road from one another in northwest Montana’s Flathead National Forest. There are no shrubs or small trees growing inside the dense stand on the left because no sunlight reaches the forest floor. Now look at all the grasses and shrubs growing in sunlight on the right. Reducing stand density increases plant diversity while reducing the risk of fire and disease.



Jim Petersen



Jim Petersen

**The power of restoration**—These two Idaho photographs taken a mile apart illustrate the power of forest restoration. On the left, a long ago abandoned mining claim, and, on the right, the adjacent Boise Basin Experimental Forest. The old mining claim is diseased and dying. “Ladder fuel”—broken limbs that reach the ground—provide fire with a fast route to treetops. Now look at the restored stand on the right: no ladder fuel, ample grasses, shrubs and saplings, and abundant growing space for a fine residual ponderosa pine stand.

# Lessons in Nature

The difference between “Zero Cut” and “Forest Restoration” is perhaps best illustrated in terms of nature’s three most intractable lessons: It is not possible to save or preserve a forest. The only constant in nature is change.

Nature is indifferent to human need. Some trees live a long time, but eventually they all die. Sometimes they die enmasse—as they do in big blowups—and sometimes they die one at a time leaving only the space in which they stood. No matter the manner of death, new trees eventually take their places.

By one estimate, the West’s forests have come and gone 16 times since the last Ice Age ended some 10,000 years ago.

Photographs of trees that are older than America would seem to deny this truth, but the fact is forests live in turmoil. No two days are the same. No two minutes are the same: a leaf falls, a bud sprouts, a seed germinates and an old tree falls to earth. The rhythms of life and death play on.

The fact that big fires are once again big features on the western landscape demonstrates nature’s indifference. Old-time fire bosses used to brag about “running smoke out of the woods.” But today’s fire bosses say the old timers went overboard in their efforts to “exclude fire.” They look forward to a time when fire can “more nearly play its

natural role.” What they are acknowledging in the language of fire fighters is the very positive role fire once played in western ecosystems.

In recent years, nature’s three lessons have converged on a fourth lesson: To get the things we want and need from forests we must first learn how to mimic natural disturbance patterns that have been powering forests since the last Ice Age ended. In western forests, the most common disturbances are fire, wind, insects and disease. Of these the most significant has been fire, though the three forces often work in concert.

**Nature is indifferent to human need**—Few events in this century have more dramatically demonstrated nature’s indifference than the May 1980 eruption of Mount St. Helens. The blast leveled 150,000 acres of forestland, including about 80,000 acres in the Gifford Pinchot National Forest. Among the dead: 57 people, 5,000 black-tail deer, 1,500 Roosevelt elk, 200 black bear and countless millions of small mammals, birds, salmon and steelhead. Here, a Weyerhaeuser forester surveys the damage on company lands about 10 miles north of the mountain.

Jim Petersen





Boyd Wickman

**Big trouble**—This ponderosa pine forest in eastern Oregon’s Wallowa-Whitman National Forest may look healthy, but it is big trouble. The white fir understory is diseased and is slowly killing a fine stand of mature ponderosa pine. Unless the fir is removed, the pine will eventually die. White fir should not be growing here in such abundance, but it is because of the long absence of wildfire. Reintroducing fire to such forests is very risky without first removing some of the dead and dying timber.



Jim Petersen

**Meadow restoration**—This dying pine stand was once a New Mexico meadow, and the Forest Service is trying to turn it into a meadow again. Loggers felled the dead trees lying on the ground. Several more thinnings are needed in years to come before the meadow is restored. Finding commercial markets for wood removed from such thinnings has proven to be a daunting task. The Forest Service even tried giving this wood to firewood gatherers but there were no takers.



Jim Petersen

**Ample growing space**—a coalition of environmental groups was involved with the Forest Service in this pilot thinning on northern Arizona’s Coconino National Forest. Stand density was reduced from 400 to 70 trees per acre, providing ample growing space for residual pine and a seedling crop that will begin to grow in a few years. Environmentalists who distrust harvesting have challenged such projects on the grounds that thinning so many trees disrupts squirrels—a staple in the diet of threatened goshawks. Some opponents say they would accept thinning if fewer trees were removed, but fire ecologists warn that the risk of catastrophic fire would remain high in forests where too few trees are removed.

# Restoring the West's National Forests: Part 2

In northern Arizona, along the north and south rims of the Grand Canyon, the National Park Service is considering the unthinkable: logging in a National Park. Federal law prohibits logging in National Parks, but the risk of catastrophic fire has become so desperate the Park Service wants to do it anyway—and in its decision it has the support of Interior Secretary Bruce Babbitt, perhaps the nation's most influential environmentalist.

"This experiment (in cutting trees) is an attempt to learn how to return the

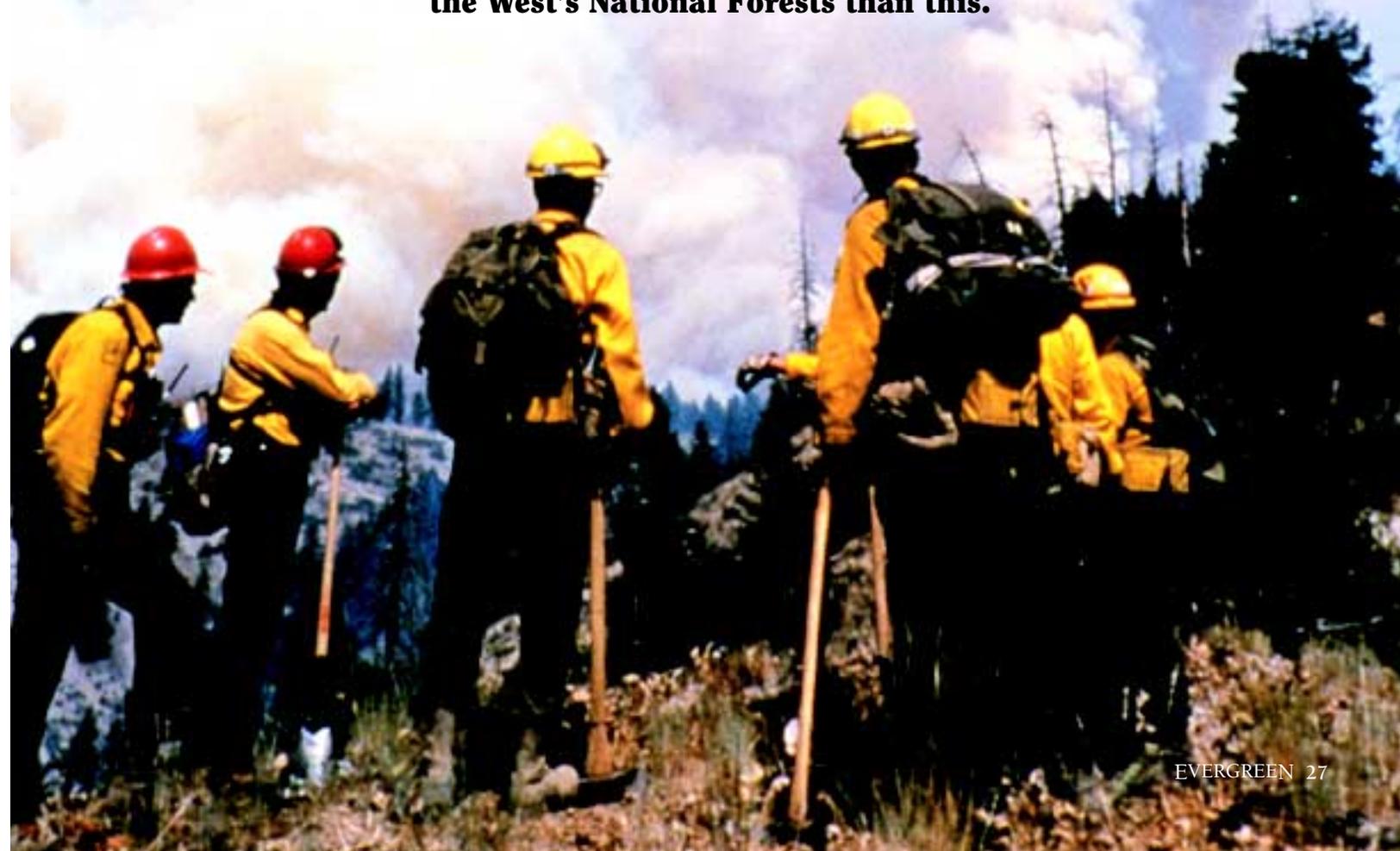
forests to their natural, healthy state and eliminate the danger of catastrophic fire," Secretary Babbitt said in a recent interview with *Arizona Republic* writer, Steve Yozwiak.

"This is a science experiment," explains Grand Canyon Park Superintendent, Rob Arnberger. "It is not an effort by the National Park Service to start logging practices in national parks."

Maybe not, but the fact the Park Service would even consider logging underscores the seriousness of the forest

health problem along the Grand Canyon rim. The plan has shocked "Zero Cut" proponents, who fear the Grand Canyon decision will set a precedent for logging in other parks, and might well undermine their campaign to ban harvesting in National Forests. If conducted, the \$900,000 Grand Canyon test will involve mechanical thinning on an 80-acre tract. So dense is the stand to be thinned that the Park Service estimates 16,000 trees will have to be removed. "We want to do everything we can to save the oldest trees," explains Park Service

**There must be a better way to manage the West's National Forests than this.**



scientist Bob Winfree. Mortality in the oldest trees is on the rise, both inside the Park and in the neighboring Kaibab and Coconino National Forests. Weakened by disease and related stress, they are losing out to fir in the battle for soil nutrients and moisture.

Apart from ecological calamity, milling capacity—or the lack of it—is the most vexing problem facing Southwest environmentalists who favor forest restoration. Many of the region's largest companies went out of business when the National Forest timber sale program collapsed. In the entire four-state region—Arizona, New Mexico, Utah and Colorado—only three of 34 surviving sawmills possess the technology needed to process small logs in volume. The rest are very small and many still use circle saws, a technology unsuitable for small log milling. In the course of this investigation, not a single mill in the four-state region expressed interest in investing in small log technology.

“A new small log mill would cost us at least \$10 million,” one mill manager estimated. “We would not make such an investment without a legally binding 20-year timber contract. Besides, we already buy enough timber from state and private landowners to run profitably.”

Unless small log markets can be found, forest restoration cannot pay for itself without taxpayer subsidy. Environmentalists and fiscal conservatives have both been ardent critics of so-called “below cost” timber sales. One environmental group, the Grand Canyon Trust, is actively searching for markets for small logs removed from a pilot thinning project in the Coconino National Forest near Flagstaff. “If we are going to get (the trees) out of the woods, we’ve got to find a way to use (the lumber). Otherwise, you just can’t come up with enough money to pay people to pull it out,” Trust Program Director Brad Ack told the *Arizona Republic*. The Trust is one of 18 groups involved in the Grand Canyon Forest Partnership, a public-private pilot project that hopes to fire proof at risk forests on the perimeter of Flagstaff. Apart from reducing the looming risk of a firestorm that could easily sweep through downtown Flagstaff, the group hopes to protect the San Francisco Peaks, a spectacular range that rises above the community.

“The peaks are the signature of Flagstaff,” Mr. Ack told the *Republic*. And if that was all just one big blackened place, this town’s economy would really suffer.”



Jim Petersen

**Small logs like these**—harvested from a pilot thinning project on northern Arizona’s Coconino National Forest—could fuel a new highly automated forest products industry in the Southwest, so why aren’t any of the West’s major companies interested in investing? Answer: political instability. The West’s new environmentalists see removing trees like these as key to reducing the risk of catastrophic fire in overly

The Trust’s search for markets is not going well. Log prices plummeted when Asia’s economy collapsed, so even distant mills capable of milling small logs aren’t buying right now. Worse yet, Stone Container recently converted its Arizona’s pulp mill to recycled fiber operation, so no market remains for the smallest and poorest quality wood. Rumors persist that another firm may construct a

pulp mill in the area, but none of the West’s largest companies will confirm such a plan.

“Until there is strong, broad-based community support, we would not be interested,” reported a spokesman for an Idaho concern that has pioneered several leading edge technologies that utilize small logs. The political process has some distance to go before it catches up



dense and often diseased forests. But the region's few remaining sawmills say they won't risk the millions required to install new small log milling technology until Congress corrals radical environmental litigants. (There are only three small-log mills in the four-state region.) Minus major investments in small log technology, restoration forestry will remain a distant dream in the Southwest.

with technology.”

Indeed, few outside scientific circles seem aware that the forest monitoring technologies needed to proceed with forest restoration are already being used by most of the West's major private forest landowners. Among the latest advancements: computer simulation models that allow scientists and foresters to test hundreds of different thinning,

reforestation and restoration techniques—or combinations of techniques—to see which ones best resemble historic patterns of natural disturbance. “What if we do this?” Questions that 20 years ago could only have been answered with a chainsaw can now be answered using desktop computers.

The milling technology needed in the Southwest is also in use else-

where in the West. Several companies operating in Idaho, Montana, Oregon, Washington and California could handle most of the small logs organizations like the Grand Canyon Trust are trying to market. But transportation costs are prohibitive, and, until the political climate improves, it is unlikely any of these technologically advanced companies would consider investments in the Southwest. Moreover, of the West's remaining sawmills most have—of necessity—significantly reduced their dependence on federal timber. Few now obtain more than 25 percent of their logs from federal sources. Since 1990, many that for generations bought only federal timber have purchased timberland and hired forestry staffs. All look to the day when they will not need to buy any federal timber.

“It takes millions of dollars in investment capital to be competitive in this business today,” one mill owner told us. “Lending institutions want to know that your wood sources are reliable. We still hope to buy a little federal timber now and then to keep our sources of supply in balance, but I don't know anyone in this business who still counts on the federal government to sell timber.”

Meanwhile, old timers in the Forest Service, those who know first-hand what big fires can do, privately await “a teaching event”—code for the million-acre fire they believe to be inevitable. When it comes, CNN will provide viewers with a ringside seat for “The Big Show.” Smoke will fill western skies, borate bombers will swoop down mountain ridges, yellow-jacketed firefighters will take their places on fire lines, homes will be evacuated and millions of taxpayer dollars will again pour into rural staging areas that will be glad for the business. Hundreds of thousands of acres of wildlife habitat will be incinerated in firestorms, 400-year-old ponderosas will explode like roman candles, creeks will run black with ash and mud, fish will suffocate, birds will be fried alive and terrified deer will race by—on fire. And someone on the fire line will likely go home in a body bag. “Zero Cut” in real time. There must be a better way to manage the West's National Forests than this.

# Toward A Global Environmental Ethic

If we stop managing National Forests, they will decline and die, just as they've done at least 16 times since the last Ice Age. As they move toward death, they consume less carbon dioxide, which means atmospheric carbon dioxide levels rise, which means more air pollution and maybe global warming.

I'm fairly certain society has no interest in sitting around while this happens, so we must ask ourselves, "What's the alternative?" The one-word answer is "Management." Management—periodic harvesting followed by long periods of re-growth and renewal—provides humankind with the

only known tool for arresting inevitable decline in forests. What's more, by using the wood we harvest, rather than fossil-fuel intensive substitutes like steel and concrete, we store carbon indefinitely thereby preventing its return to the atmosphere. These are global environmental considerations meriting serious discussion before lawmakers vote to ban harvesting in National Forests.

**Benjamin Stout**, Ph.D., retired dean, School of Forestry, University of Montana, Missoula, unpublished *Evergreen* interview, October 1998

In the course of researching this report, we worked closely with several scientists whose contributions to conservation we admire—Jack Ward Thomas, Steve Arno, Chad Oliver, Tom Bonnicksen, Ben Stout, Lauren Fins and Jim Bowyer.

Although their disciplines vary widely, each stressed the need for the nation to embrace a more global environmental ethic.

Dr. Bowyer, a University of Minnesota Professor of Forestry, first broached the subject in a 1993 *Evergreen* interview. "Most of the raw materials consumed in the U.S. come from impoverished Third World countries that lack the money, technology and political will needed to regulate their own extractive industries," he said. "A nation that consumes more than it produces is in effect exporting its environmental impacts to other nations that provide what is consumed. It is like shipping your garbage to a town that needs the money and is willing to put up with the stench."

For an everyday perspective on what Dr. Bowyer is talking about, visit a supermarket, shopping mall or home building center. In the entire history of civilization, no nation has ever been better fed, better

clothed or more comfortably housed. Living in such abundance, we seem to have lost the ability to think critically about *the sources* of our myriad comforts and conveniences. We oppose logging, but insist on living in bigger houses. We oppose oil drilling, but prefer the safety of big, gas-guzzling vehicles. We oppose mining, but can't imagine a world without computers which run on circuits of gold, copper and platinum. We oppose the use of fertilizers and pesticides, but demand a safe and abundant food supply.

Even worse, we seem unaware of the global environmental consequences of our own political actions. The government's 1996 decision

to reduce National Forest harvest levels in Oregon and Washington by 43 million cubic meters was seen as good news in most quarters.

What went unreported was that the demand-driven shift to nonrenewable wood substitutes (mainly steel and concrete) boosted oil consumption by 12.9 billion liters *in that year alone*—enough oil to power six million cars for an entire year. *Nothing* adds carbon dioxide to the Earth's atmosphere faster than burning coal or oil.

"In the emerging global economy,"



The future meets the past in this Boise Cascade forest in southwest Idaho.

Jim Petersen



USFS

Dr. Bowyer advised, "nations should be increasing, not decreasing, their dependence on wood fiber because wood is renewable, recyclable, biodegradable and far more energy efficient in its manufacture and use than are products made from steel, aluminum, plastic or concrete. Furthermore, growing forests and the lumber they provide store large amounts of carbon dioxide that would otherwise escape into the atmosphere, adding to the potential for global warming."

It would be nice if such a global perspective became part of a more scholarly discussion about what to do about the West's ailing National Forests. We aren't suggesting that these forests become wood



**A firestorm** in Idaho's Boise National Forest. Compare this to the small photograph nearby taken on Boise Cascade timberland in the same area. The difference: a 25 year-long thinning program.

factories, but there ought to be some consideration of the global impacts associated with allowing the West's National Forests to burn to the ground as a first step in their centuries long natural recovery. How much will air quality suffer in the meantime? Who will answer for the sharp rise in pulmonary disease? Where will western communities get their municipal water after forest watersheds burn? And what about lost fish and wildlife habitat? Can western states clamoring to diversify their resource-based economies expect that technology and tourist-based businesses will want relocate to communities engulfed in smoke all summer? Will courts hold taxpayers liable for fires that spread from

untended federal lands to neighboring privately owned forests? And as more and more timberland is set aside in no-harvest reserves will builders switch from renewable wood to nonrenewable steel, fashioning the nation's homes from junk cars as the steel industry urges?

We hope journalists will demand that "Zero Cut" proponents answer these questions. And if they answer, the follow-up question should be "Where is the peer-reviewed science that supports your position?" Peer reviews are important for two reasons. First, science is not perfect. The credibility of a particular study often rests on the scrutiny of qualified third-party scientists whose work is consistently accurate and

reliable. There is no better defense against junk science. Second, we know a few scientists out there now who make their living traveling between press conferences and courtrooms saying whatever their clients want them to say. Journalists thus need to make the distinction between peer-reviewed science and public relations stunts staged by special interest groups.

We also hope the press will contact Ted Turner for his views on forest restoration. Though he frequently contributes money to environmental groups, Mr. Turner has approved an impressive multi-year thinning project at Vermejo, his New Mexico ranch. A local sawmill is buying the logs, and neighboring landowners are said to be so pleased by what they see that they want to join in next year. Why can't similar programs be implemented in western National Forests? Even if diseased trees aren't sold (many environmentalists think no one should be permitted to profit from the sale of publicly owned natural resources) the timber must still be removed from forests, presumably at taxpayer expense. Otherwise it remains a fire hazard, undermining any hope for forest recovery.

Finally, we hope the national press will seek out the West's new environmentalists. Their desire to link science and technology with so many public interests embodies a far more certain and more hopeful outcome than anything we discern from the worn out rhetoric established environmental groups are still dispensing daily. Saving forests by first allowing them to burn to the ground—all the while enduring long years under smoke-filled skies—makes absolutely no sense. The nation does not need to wait 200 years for the next forest to appear in the West. It is already in the ground and growing, but it needs some help. Restoration forestry is the answer.

The past as prologue: Sixty years ago, the government paid loggers to remove rocks and logjams from Oregon stream channels. Back then, biologists believed such obstructions impeded fish passage. Now biologists and loggers are again working side by side—only this time they are putting rocks and logs back into stream channels, where they provide hiding cover and spawning habitat for fish. A similar irony will soon unfold in western National Forests. Faced with unstoppable wildfires, the government will hire loggers to do the thinning and pruning work necessary to create and protect publicly desired old growth forests. The public will side with the West's new environmentalists and the old environmental movement will simply fade away.

**Worth protecting**—Ponderosa pine monarchs like these in northern Arizona's Coconino National Forest are the focal point of a forest protection program being advanced by the West's new environmentalists. By thinning overly dense stands that crowd these trees, environmentalists hope to protect them from wildfire, insects and disease. Ponderosa pine thrives in full sunlight but cannot adequately regenerate itself in overly dense forests that dominate much of the Intermountain West and Southwest. Sadly, countless thousands of these Southwest giants have already succumbed to insects and disease. More will die if a large-scale thinning program is not implemented soon, but numerous political and legal barriers remain.



Jim Petersen

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To ensure accuracy, all *Evergreen* articles undergo a two-stage pre-publication review. In Stage 1, interviewees are

required to review draft manuscripts for errors in fact or interpretation. In Stage 2, scientists who are familiar with the subject matter review manuscripts for accuracy and completeness. While not a peer review, this process makes for strong, fact-based presentations on which the Foundation stakes its reputation.

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