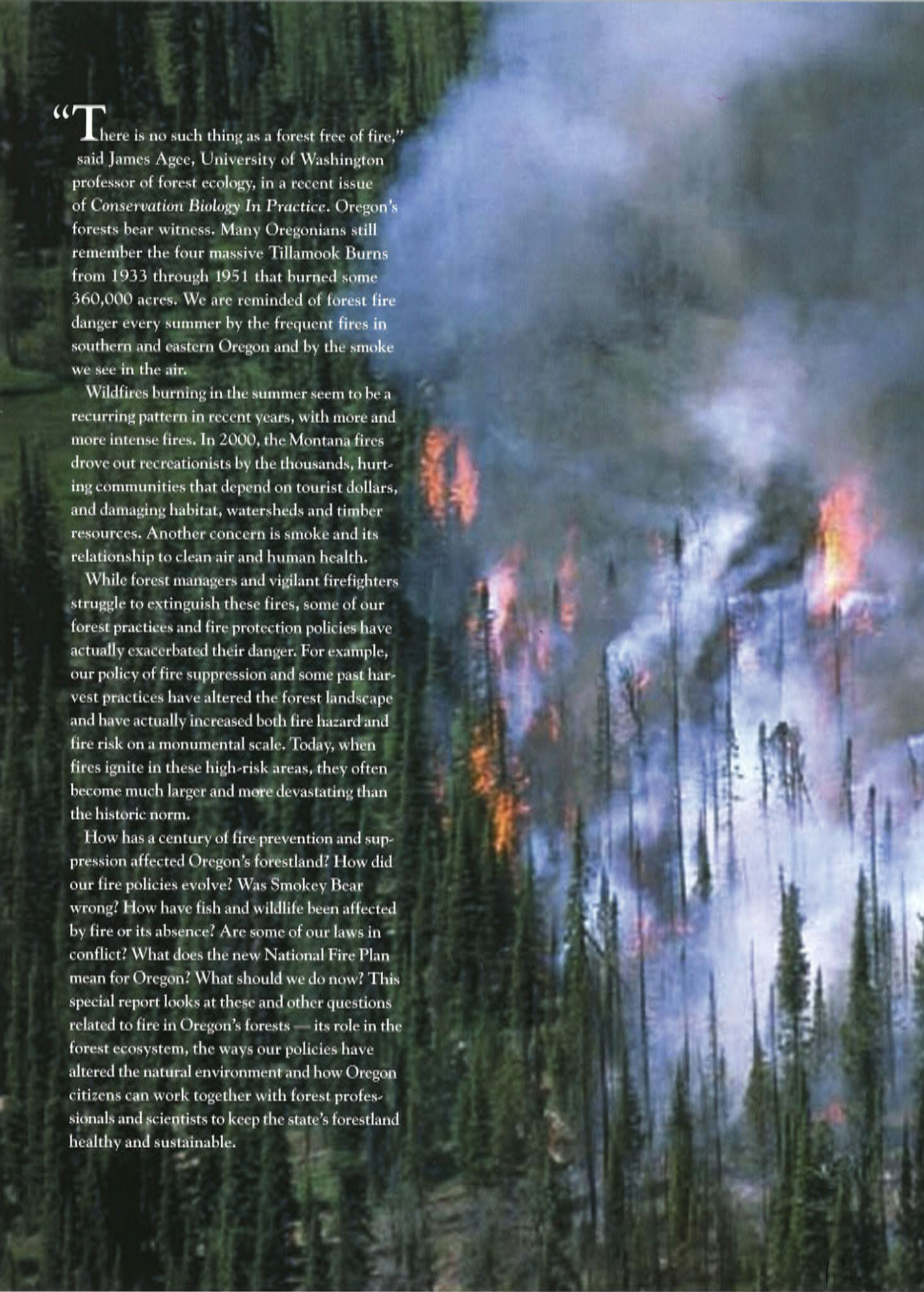
Fire in Oregon's Forests

Assessing the Risks, Effects and Treatment Options

A Special Report From The Oregon Forest Resources Institute



"There is no such thing as a forest free of fire," said James Agee, University of Washington professor of forest ecology, in a recent issue of *Conservation Biology In Practice*. Oregon's forests bear witness. Many Oregonians still remember the four massive Tillamook Burns from 1933 through 1951 that burned some 360,000 acres. We are reminded of forest fire danger every summer by the frequent fires in southern and eastern Oregon and by the smoke we see in the air.

Wildfires burning in the summer seem to be a recurring pattern in recent years, with more and more intense fires. In 2000, the Montana fires drove out recreationists by the thousands, hurting communities that depend on tourist dollars, and damaging habitat, watersheds and timber resources. Another concern is smoke and its relationship to clean air and human health.

While forest managers and vigilant firefighters struggle to extinguish these fires, some of our forest practices and fire protection policies have actually exacerbated their danger. For example, our policy of fire suppression and some past harvest practices have altered the forest landscape and have actually increased both fire hazard and fire risk on a monumental scale. Today, when fires ignite in these high-risk areas, they often become much larger and more devastating than the historic norm.

How has a century of fire prevention and suppression affected Oregon's forestland? How did our fire policies evolve? Was Smokey Bear wrong? How have fish and wildlife been affected by fire or its absence? Are some of our laws in conflict? What does the new National Fire Plan mean for Oregon? What should we do now? This special report looks at these and other questions related to fire in Oregon's forests — its role in the forest ecosystem, the ways our policies have altered the natural environment and how Oregon citizens can work together with forest professionals and scientists to keep the state's forestland healthy and sustainable.

Lightning strikes the earth an estimated eight million times a day. When it strikes in a forest and conditions are right, it ignites a fire. Historically, fire has been the major natural source of forest disturbance all over the earth. When intense, fire kills trees and clears the way for a new forest. When less severe, it clears out underbrush and leaves most larger trees undamaged. Over time, humans joined lightning as a major cause of forest fires.

The forests of Oregon and the Pacific Northwest, even the wet forests of the coast, have been shaped largely by fire. In their journals and diaries, nineteenth century pioneers on the Oregon Trail described the landscape of northeastern Oregon as open, park-like forests of predominantly large ponderosa pine, widely spaced and receding into the distance. The forest floor was largely lush grasses, open and free of undergrowth, and often burned over from frequent small fires. The coastal forests typically burned only every several hundred years, but the fires were of high intensity.

As westward migration continued throughout the nineteenth century to the interior West and Oregon, settlers began to occupy land where natural fires were frequent. Learning to control them became a necessity of life. Like the American Indians, who had been using fire as a tool to shape forests and grasslands for thousands of years, farmers and ranchers also set fires to clear land for crops and grazing.

The Year of the Great Fire

According to forest ecologist James Agee of the University of Washington, America had no real fire policy until it had an institution in place to take responsibility, and even then it took a massive fire to spur policy development. That event — which came to be known as the Big Blowup — occurred in Idaho and Montana in the summer of 1910, scorching three million acres and taking scores of lives. Although our firefighting techniques then were primitive, settlers went on the offensive for the first time, choosing to combat the blaze rather than retreat.

When the Big Blowup occurred, a new agency was in place to formulate fire policy. The U.S. Forest Service had been created in 1905, and the fire of 1910 had a tremendous effect on the young agency, its federal foresters and the policy they developed. It marked the beginning of an era of fire prevention and suppression that has lasted for nearly a century.

Fire Suppression and Unintended Consequences

Historically, fires in westside Douglas fir forests were infrequent, with fire intervals averaging 100 to 400 years. These fires were intense and large, replacing entire forest stands. In contrast, fire was a frequent source of disturbance in the ponderosa pine and

Stephen Arno
Research Forester-Fire Ecologist, Retired
Missoula Fire Sciences Laboratory
Missoula, Montana

"Historically, the vast majority of forests in the western United States were fire-dependent ecosystems. Fire molded the forests — people have a hard time understanding that. The problem is that the Forest Service hitched its whole star to fire suppression and changed forests in unprecedented ways. What we need to do now is simulate fire in order to mimic the natural processes that created and sustained western forests. I believe that we are capable of restoring more historical and sustainable stand structure through a combination of management techniques, first treating forests near people's homes. Beyond that we have a lot of treatment options to limit the spread of fires, and patches of forest on the landscape can be rotated over time to maintain a varied pattern and to protect against severe conflagrations."

mixed-conifer forests of eastern Oregon and the rest of the interior West. In any given stand, they occurred regularly in intervals ranging from 3 to 25 or more years. They were primarily low-severity grass fires, and they served to keep the forest floor open, releasing nutrients and clearing the way for new life.

As fires were prevented and suppressed, shade-tolerant tree species regenerated under the pine, and dead wood and needles began to accumulate. The forests became dense, a more continuous ladder of fuels was formed, and the large mature pines became more stressed and susceptible to insects and disease due to competition with other vegetation for water. In the native ponderosa pine forests, trees had been widely spaced with perhaps 12 to 50 trees per acre, but after several decades of suppression, as many as 500 to 1,000 trees of various species and sizes would occupy each acre.

When fires did occur, they were often larger and more intense than the historic norm because the grass ignited low shrubs, which in turn spread flames to the understory trees. Fire experts refer to this phenomenon as a "fuel ladder." Because of their thin bark, the understory trees were less fire-resistant, and when they burned, their flames were much more likely to reach the crowns of the large pines, destroying them as well. In addition, past harvest practices removed many of the large trees and opened the canopy enough for small trees to grow in the understory, adding to the fire risk.

Our fire exclusion policies have been in place now for nearly a century. As a result, fire ecologists today view much of Oregon's forestland — particularly on the dry east side of the Cascades, in the high Cascades and in the southwest Coast Range — as having moved dangerously away from its natural condition.

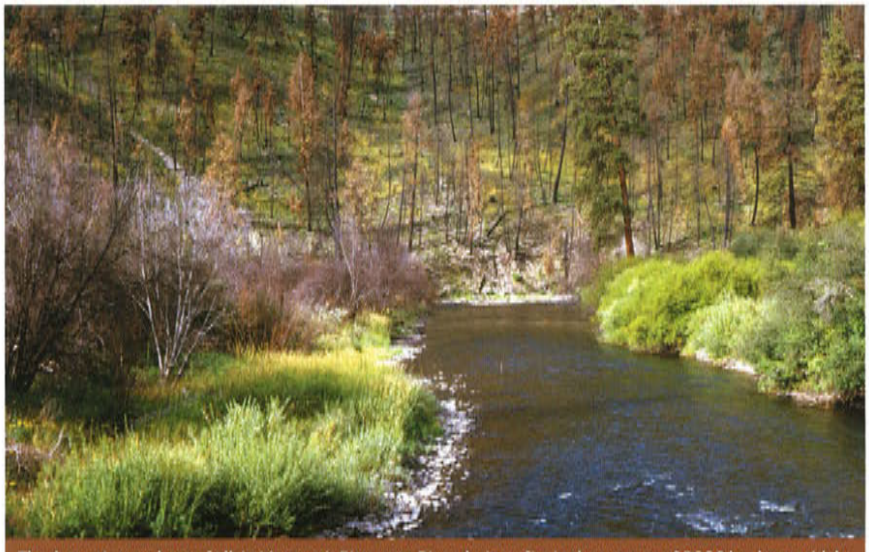
This problem is not unique to Oregon. There is concern at the national policy level, and there is general agreement among policy makers, scientists and foresters that many Western forests are seriously out of balance and at high risk for large, intense fires. The path to a cure, however, is not simple. Continuing with fire suppression only will clearly make the problem worse unless additional and corrective measures are taken. Ignoring the situation — i.e. leaving the high fuel conditions in our forests — will result in fires that have devastating effects on watersheds, fish and wildlife, and many of our communities.

Wildlife and the Impact of Fire

How fish and wildlife respond to fire is a concern, but interestingly, while some direct mortality occurs, it is not the major issue under most conditions. "Certainly there is some wildlife mortality as a result of fire," says wildlife biologist James Rochelle, "but less than one might expect." Mobile animals are generally able to escape and fire does not always burn the litter layer on the forest floor, so animals that can burrow usually survive. Fish move to cooler deep pools and then recolonize streams once the water quality improves.

THE FIRE TRIANGLE

Three things are necessary for fire: oxygen, heat and fuel. These are the sides of the fire triangle. Oxygen is part of the atmosphere, so fire is possible anywhere on earth. Heat traditionally has come from lightning, but ignition by humans now has often taken over as the primary source. Take one of these three elements away and the fire goes out. For example, putting water on a campfire or on a home in flames essentially removes the heat and prevents further combustion.



The dramatic top photo of elk in Montana's Bitterroot River during a fire in the summer of 2000 has been widely reproduced. While such fires create change in habitat and result in some wildlife mortality, the landscape is not permanently damaged. The lower photo shows how the same forest was recovering a year later. Fire has traditionally been a shaper of the forest landscape and wildlife has adapted, with remaining habitat determining which animals return and which move to other areas.

The real issue is habitat change as fire creates a new set of conditions to which some species can adapt well and others find unsuitable. Over time the forest regenerates following fairly predictable patterns, and these changes in forest habitat are reflected in the changing composition of the wildlife community. An important question is whether local populations of diverse species remain viable when fires of uncharacteristic scope and intensity drastically alter their habitat.

Wildlife biologist and spotted owl expert Larry Irwin of the National Council on Air and Stream Improvement says that in one researched incidence of fire that damaged spotted owl habitat, owls were back in the burned zone within days. In another case, three-fourths

THE FIRE BEHAVIOR TRIANGLE

The fire behavior triangle defines the way a fire burns — whether slowly with low flames or rapidly and wild. The sides of this triangle are weather, topography and fuel. A change in one of these factors causes a change in the fire's behavior that may determine how hot it burns and how fast it spreads. For example, if a fire burns on a slope and moves uphill, it tends to move quickly because the flames are tilted toward the surface, preheating the fuels in front of it. The common denominator between the fire triangle and the behavior triangle described on page 2 is fuel — and fuel is the one thing we have some influence over. This concept is the basis for fuel treatments in the forest.

of them showed up elsewhere a few years later. Remaining habitat is the important consideration. Even in high-intensity fires, sources for new habitat typically were left behind. Wildlife in the Northwest has had centuries to adapt to natural disturbance, including fire, so remaining habitat has become a starting place for recovery. But because we are just beginning to see these uncharacteristically intense fires in the pine forests of the interior West, there is some concern about the ability of fish and wildlife to adapt.

Another significant question is the impact to soil and water resources from post-fire erosion and sedimentation. Intense wildfires can produce erosion and sedimentation rates that dwarf virtually any forest management activity or other natural event (other than volcanic eruptions). The threats of severe wildfire to watershed resources (forest soil and site productivity, water quality and fish habitat) are potentially great, and managers of several major community water systems in Oregon are extremely concerned about the prospects of fire in their watersheds.

James Agee
Professor of Forest Ecology,
University of Washington
Seattle, Washington

"Over the past decade, we have come to realize the paradox inherent in our fire suppression efforts. The more intensely we have protected the forest from fire, insects and disease, the worse many of our problems have become. Western U.S. fire statistics show an alarming trend in wildfire severity and area burned that is primarily attributable to fuel buildups in western forests. We have been sitting on a time bomb with little idea of how long the fuse is. Are we at the worst-case scenario now, or will it get worse?"

The Role of Fire in Oregon's Forests

A brief look at the different types of forests in Oregon's roughly 28 million acres of forestland and the historic role of fire in them will help us understand the scope of the problem and the prescriptions being put forward to address it. The Cascade crest is a chief geographic boundary among forest types. The Cascades tend to trap the warm winds and moisture that come in off the Pacific, creating a westside climate that is temperate, wet and dominated much of the year by gray days. Where on the west side there are a lot of cloudy days and plenty of moisture, east of the Cascades there are a lot more sunny days but a lot less moisture. Furthermore, temperature variation between summer and winter is much more pronounced on the east side.

These two climates support distinctly different forest types, and between them — straddling the Cascade crest and in southwest Oregon — is a zone of mixed conifers. Because of the climate, frequency of lightning strikes and high brush component, the Siskiyou region of southern Oregon is particularly prone to fire. West of the Cascades lie the great, green conifer forests dominated by Douglas fir, with an understory of hemlock and cedar. There are variations as one moves from the Sitka spruce zone in the coastal fog belt to the subalpine forests along the Cascade crest. Central and eastern Oregon tend to be dominated by mixed conifer and ponderosa pine forests, with even dryer rangeland areas populated by sagebrush, bunchgrasses and juniper woodlands.

The Types of Fire Regimes

Fire ecologists have been able to establish how often fire returns to different types of forests under natural conditions by aging fire scars left on trees by past fires. This has led to the

The Science of Fire

In a large building set off on a perimeter road near the airport in Missoula, Montana, a group of scientists gathers daily to conduct the experiments that guide all the firefighting operations in the United States and inform the country's national policies and standards. Known officially as the Missoula Fire Sciences Laboratory, it is part of the Forest Service's Rocky Mountain Research Station.

Research at the station is divided into three categories: fire behavior, chemistry and fire effects. In the fire behavior category, scientists actually develop the evaluation tools and methods used by firefighters in battling a fire. Scientific studies of heat release, flame length, rate of spread, structure vulnerability and other fire characteristics determine the fire danger rating system and protocols for both pre-fire preparation and fire suppression. In the chemistry category, chemists study fire emissions and their effect on the atmosphere and global change. They share research with the National Aeronautics and Space Administration and have a new direct receiving station for a NASA satellite that monitors worldwide atmospheric conditions. In the fire effects category, researchers focus on the effects of fire or its exclusion on land, vegetation, fish and wildlife. They study tree-level physiology and, through modeling, extend results to whole landscapes. The data from fuel studies they conducted were used in developing the National Fire Plan of 2000 discussed later in this report.

A Forest Service chemist at the Missoula Fire Sciences Laboratory analyzes the composition of smoke samples from a forest fire in Siberia.

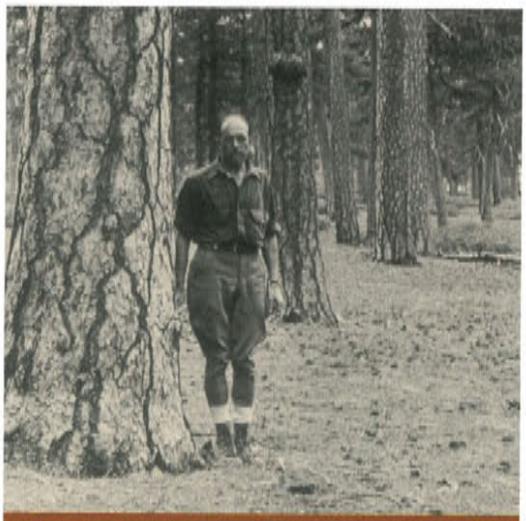
Here a researcher monitors and controls experiments in the world's largest combustion chamber (through the window behind him). Fire scientists worldwide come here to use the facility.

A Forest Service scientist sets up fuel and an ignition source to run an experiment in the Fire Lab's wind tunnel.

The lab boasts the world's largest combustion chamber, and researchers from around the world come to conduct experiments. It also has a wind tunnel, where wind effects on combustion and fire spread are monitored and studied.

John Boro
Fire Operations Director
Oregon Department
of Forestry
Salem, Oregon

John Boro, who is intimately familiar with Oregon's fire-fighting capabilities, says ODF has established close ties with local communities and the federal government so that fire-fighting resources are there if they're needed. Incident Management Teams trained in techniques, logistics and operations determine appropriate responses. "We continue to recognize that fire prevention and suppression are important tools in meeting our broader forest policy objectives," said Boro. "We also recognize that they aren't the only tools and that we need to promote other policies and practices that together will integrate with fire prevention and suppression to better maintain healthy forests."



In the study of fire in forests, Harold Weaver was an important figure. The Forest Service began pursuing a policy of fire exclusion after the legendary Big Burn of 1910 in Idaho and Montana. In 1943 Weaver published a landmark paper that was the first to recognize that suppressing fires in pine forests, where historically small and frequent burns kept the forest floor clear, was in fact dangerously altering those forests, making them overcrowded and susceptible to uncharacteristically intense fire. Weaver, who happens to be a native Oregonian and a 1928 graduate of Oregon State University, was a controversial figure at that time, but his work has come to represent the first warning sign of a major problem created by fire exclusion.

finding that frequent fires tend to be less severe than those that occur at longer intervals.

In the damper areas of northwest Oregon, fires tend to occur less often than in most other parts of the state. Intervals can be 400 years or more, and when fires do occur, they are generally quite intense and transform entire landscapes. The lower elevations around the Willamette Valley, the Cascades and the central Coast Range have progressively greater fire frequencies as one moves south. Historically, many of Oregon's eastside forestlands tended to burn with great frequency, ranging from 3 to 25 years, and fires generally were less severe. Mixed stands at higher elevations or in transitional areas between the east and west sides had fire return intervals from 40 to 80 or more years. Fire ecologists classify these three types, respectively, as high-severity, low-severity and mixed-severity fire regimes.

The Problem Confronting Us

The Forest Service's fire exclusion policy, which the agency elevated to a major mission after 1910, became increasingly effective over the next 50 years. In 1935, the Forest Service initiated the "10 a.m. fire policy," meaning that any fire had to be contained by 10:00 the next morning, and most state agencies followed suit. But in 1943, Harold Weaver, a government forester employed by the Indian Service (forerunner to the Bureau of Indian Affairs), published a paper that raised doubt about the long-term success of aggressive fire suppression. Weaver, an Oregonian and graduate of Oregon State University, began to notice changes in the composition of eastside forests and an increase in their fuel loads.

Fighting Fire with Fire

It was several decades later that fire policies changed to include prescribed burning. In addition, beginning in the 1970s, protocols began to allow some lightning fires to burn in national parks and wilderness areas rather than requiring immediate suppression. But

Methods of Forest Treatment

Here are a few of the methods forest managers use to treat forests that have changed from historic norms in density and species mix due to human efforts to suppress fire:

Prescribed Burning Here a strip of fire has been laid down in a stand that contains old-growth ponderosa pine as well as a lot of younger pine trees. The purpose of the prescribed burn is to reduce accumulated fuels (needles and branches), to kill some of the younger trees to reduce competition with the large trees and to reduce the "fuel ladders" within the stand. The flames seen here will kill the smaller trees but the larger trees will survive because they have thick, insulative bark. To prevent a prescribed fire from escaping, forest managers conduct the burn under very specific conditions (fuel moisture, weather) with a fireline all the way around.

Mowing Brush This tractor is actually mowing brush in the understory of a central Oregon ponderosa pine forest. The brush species is called Bitterbrush – a highly flammable shrub. Mowing the brush helps reduce the risk of wildfire and helps prevent fire from jumping up into the crowns.

Thinning Thinning is being promoted as a way to reduce the risk of crown fires in ponderosa pine and dry mixed-conifer forests. The goal is to open up the stand so there is more space between tree crowns. This helps prevent fires from spreading from tree to tree through the crowns. Effective thinning leaves the larger trees because they have thick bark to better resist fire. They also have higher crowns, so low ground fires are less likely to reach and ignite them. This stand has been thinned wide, and some trees pruned in an earlier operation have been left. However, when trees are thinned wide, understory vegetation responds (creating more fuel). This thinning is 8 to 10 years old and the shrubs are now well developed. This stand is ready for a prescribed burn, which will reduce the number of shrubs. Thinning, followed by prescribed burning on 10- to 15-year intervals (for ponderosa pine forests), can help maintain fire- and insect-resistant forests.

such actions were fraught with difficulties, said fire ecologist Stephen Arno. "Funding for prescribed burning and silviculture to reduce fuel accumulations has traditionally been subservient to funding for suppressing wildfires," he wrote in the proceedings of a Society for Ecological Restoration conference. Furthermore, he said, "Land managers are held responsible for the smoke emissions produced by prescribed burning, and they can also suffer career setbacks when even carefully planned and executed burns escape containment due to circumstances beyond their control."

For these and other reasons, prescribed burning and letting natural fires burn have been relegated to a relatively minor role, and heavy emphasis has been placed on fire prevention and suppression. There was no differentiation of forest types in that policy. In his classic book, *Fire in America: A Cultural History of Wildland and Rural Fire*, Stephen Pyne said, "...the tragedy of American fire was not that wildfires were suppressed but that controlled fires were no longer set."

The Fallacy of a Single Solution

The Forest Service's fire management policy generally applied to all federal forestland, regardless of its composition. Most state forest man-

Gregory Filip
Professor and Extension Specialist
Department of Forest Science
Oregon State University
Corvallis, Oregon

"Stressed landscapes and weakened trees open the door to insects and disease. Many of Oregon's eastside forests are in that condition because fire has not played its normal role in the last century. We can look at tree growth core samples and tell that diseases are more severe today than in the past. We're out of the range of historic variability, and bugs love the white and grand fir that have invaded traditional pine forests. When you have no fire, then insects and disease act as a surrogate, because something needs to relieve the stress of constant tree growth – something needs to bring the forest back."

agement agencies adopted and implemented similar policies. With our current understanding of climate and forest types, it is easy to see that practicing fire suppression in a region of high-severity fire, where return intervals are quite long, would not have much immediate impact. For example, during the past century of our fire prevention and suppression policy, the absence of fire in a typical westside Douglas fir forest might well be quite normal, since average return intervals can be up to several hundred years.

The problem, however, has occurred at the other end of the spectrum in the more frequent moderate-to-low-severity fire regimes, which happen to dominate most of eastern and southwestern Oregon and the entire interior West. During the course of the past century of fire exclusion, a ponderosa pine forest might have had 10 or 15 fires that would have cleared the undergrowth and given it the open appearance that the Oregon Trail settlers saw. Today those same forests are crowded and stressed, and conditions are ripe for disease and fires much more severe and devastating than the normal, low-severity grass fires.

The Regulatory Conundrum

There are now 120 million acres of low- and mixed-severity U.S. forestland classified as Condition Class 3, meaning at high risk of fire. In Oregon and Washington alone, Agee estimates that there are some 10 to12 million acres in Class 3. Of Oregon's 27.5 million acres of forestland, more than one third (39 percent) is in Condition Class 3. Another 45 percent is in Class 2, or moderate risk.

It is becoming clear that protection objectives for these Class 3 forests are coming into conflict. For example, in a forest whose natural density and composition have been altered by a century of fire suppression and harvest practices that are no longer acceptable, following a course of no action may be an invitation to an unnaturally intense fire. Yet this same forest may contain streams with excellent habitat for salmon and other species protected under the Endangered Species Act (ESA). The logical solution to tree densities and composition mixes that are out of their historic range is a combination of thinning and judicious fire prescription, but either of these treatments might disturb areas protected under the ESA. The problem is one of frequently incompatible management objectives, along with the no-risk policy preference described previously.

Steve Mealey, who is retired from the Forest Service and is now manager of wildlife, watersheds and aquatic ecology for Boise Building Solutions, found a graphic way to visualize the complexity of the problem we have created. Using Boise's sophisticated mapping capabilities, he produced a series of state maps, each showing the locations of different landscape conditions.

Stephen Fitzgerald
Extension Forester and Associate Professor
OSU Extension Forestry Program
Central Oregon Region

"Think of forest succession as a clock that ticks predictably for 3 to 20 years, and then suddenly fire or some other disturbance sets it back. It starts ticking again – the forest continues to grow; the clock may tick longer or shorter depending on when the next fire comes, setting forest succession back. The problem is that we've changed the disturbance regime and in doing so have inadvertently changed the nature and composition of the forest. The task facing us is enormous. Oregon's eastside forests are putting out more biomass than we're removing. We need to use prescribed burning and thinning on tens of thousands of acres, and we must act before catastrophic fire takes them all. The type of thinning I'm recommending is different from that of the past. Forests should be thinned wider and the larger trees (with the thickest bark) should be left."

When the maps are laid side by side, it becomes clear that much of Oregon's forestland is at risk of unnaturally intense fire, mostly on federal lands containing old growth stands, old growth reserves and watersheds that are protected areas for resources like fish, wildlife and drinking water. In other words, many of the resources we are working the hardest to protect — old forests, salmon and other endangered species, for example — are in forests at highest risk of fire because we have practiced suppression for so long. To complicate matters further, Larry Irwin says we have discovered that these altered, overdense, high-risk Class 3 forests most in need of corrective treatment have become prime spotted owl habitat.

Conflicting Rules

The administrative side of the problem adds new levels of complexity. In the cases of salmon and the spotted owl, corrective prescriptions for a forest landscape may create conflicts with the Endangered Species Act or be effectively delayed or stopped by lawsuits or appeals filed under the Act. Jack Ward Thomas, former chief of the Forest Service and now Boone and Crockett Professor of Wildlife Conservation at the University of Montana in Missoula, says there are countless cases of conflicting rules.

"We essentially took fire out of the system after 1910," Thomas said. "We tended to think of trees as something in a warehouse." Then in the '60s and '70s, we passed a series of laws to help protect the environment: the Clean Air Act, the Clean Water Act, the Endangered Species Act, and in Oregon, the Oregon Forest Practices Act. Yet the "no risk" management approach of the federal regulations often conflicted with earlier federal legislation that allows or mandates resource development activities such as recreation sites and commercial timber harvest. The Organic Act of 1897, for example, directs managers of federal forestland "to improve and protect the forest ... and to furnish a continuous supply of timber for the use and necessities of the citizens of the U.S." Thomas says, "Every intelligent person cares about the environment, and no one can argue with the intent of these laws. The problem is that no one thought about how the regulations would work together."

Another issue is the conflict between prescribed burning and the federal Clean Air Act. With the amount of forestland in need of prescribed burning, the amount of smoke would run up against clean air standards. This does not mean we can't conduct prescribed burning; it does mean, however, that we will be restricted in how much we can burn in any given year at any given location. An alternative is to conduct thinning and other fuel-removal treatments that don't utilize burning. However, some groups object to further timber harvest in national forests.

Colin Hardy
Research Forester
Team Leader
Missoula Fire Sciences Laboratory
Missoula, Montana

"It's important for people to distinguish between fire exclusion and suppression. Exclusion is the policy that calls for putting out fires and suppression is the tactic for doing so. What we study here is suppression, and our mission is to give firefighters the information they need to be most effective in their work. We need good suppression techniques, and we're better at it than any place in the world. We conduct research around the globe, and many parts of the world turn to us for help in conducting effective operations. What we need is the kind of informed policy that will lead to the best decisions about where and when we apply suppression techniques."

Larry Irwin
Western Forest-Wildlife Program Manager
National Council for Air and Stream Improvement
Stevensville, Montana

"Scientists can put a cube of sodium in a bowl of water and tell you precisely what will happen. Studying wildlife is a lot less predictable, since animals won't stay still. What we try to do is link wildlife populations with habitat, and fire is all about habitat. Since we've removed it as a player to a large extent, things have been more confusing. For example, we need to reduce fuels by thinning in overstocked ponderosa pine forests, but it turns out that spotted owls are there. The places where owls are doing the best are in places that are most susceptible to fire."

The Problem of Fire Exclusion

These photos, all taken from the same point, show changes resulting from fire exclusion and removal of large pines. Fire scars show that, between 1600 and 1895, low-intensity fires burned through this forest every 3 to 20 years. Fires have been excluded from this area since 1895. About half of the large pines were harvested from this site before the 1909 photo was taken.

1909
The stand is open and park-like, and the few stumps and slash piles indicate a recent light cutting. This would be the general appearance of the typical pine forest – less any human intervention – that nineteenth-century settlers saw in eastern Oregon.

1948
Considerable understory has developed with small openings in the forest.

1979
Note how the understory has now developed with dense thickets of Douglas fir and ponderosa pine.

1997
Note how different the stand is from 1909. Patchy underburning in 1993 killed some conifers, and selective logging removed some of the larger trees. Snags indicate that a recent beetle infestation killed some trees.

The Concept of Risk

Thomas sees the conundrum as one that in large part revolves around the concepts of short-term and long-term risk. The ESA tries to minimize short-term risk because its mandate is to protect the ecosystem on which endangered species depend. The natural tendency in such circumstances is to employ a management-avoidance approach, stopping any further activity in the affected area. Also, the ESA doesn't take into account natural disturbance patterns and how they change forests over time.

However, when it comes to solving problems created by a century of fire prevention and suppression in our Western forests, immediate action is required in the areas of highest risk. In this case it might be to remove some of the fuel mechanically and introduce fire when it is safe to do so-taking some short-term risk to alleviate long-term risk and return ecosystems to healthy conditions.

Avoiding all activity in the affected areas maintains the long-term risk of abnormally modifying habitat through very severe fire. The issue may become one of taking a short-term risk on the fire prevention side and possibly disturbing some spotted owl habitat in order to restore the ecosystem, improving its ability to survive the next fire.

The Problems of Passive Management

Since the inclination of laws like the ESA and clean air and water acts is toward management avoidance, some federal regulatory agencies feel they should let nature take its course in the restoration effort. Ecologist James Agee, however, is quick to point out a major fallacy in such reasoning: "The hard lesson that we should take away from the last decade of fire management in drier forests, particularly in the North American West, is that a choice to do nothing is a choice of action, not always one with a desirable outcome." The passive management approach, he says, is "not a sustainable forest strategy in ecosystems that have substantial histories of natural and Native American disturbance, including forests on almost every continent."

In the specific case of restoring forests affected by a century of fire suppression and bringing back the natural condition of the pine forests, Agee said, "Passive management cannot restore these conditions; active management is necessary." The treatment, he says, can be done by fire, by mechanical means (harvesting) or by a combination of the two.

A National Fire Plan

Following the severe fires of 2000, President Clinton requested a report that would recommend a strategy to deal with the wildfire problem. The goal was to reduce fire's impact on rural communities and ensure that the country has sufficient firefighting

These figures apply to the 15.8 million acres of primarily state and private forestland protected by the Oregon Department of Forestry:

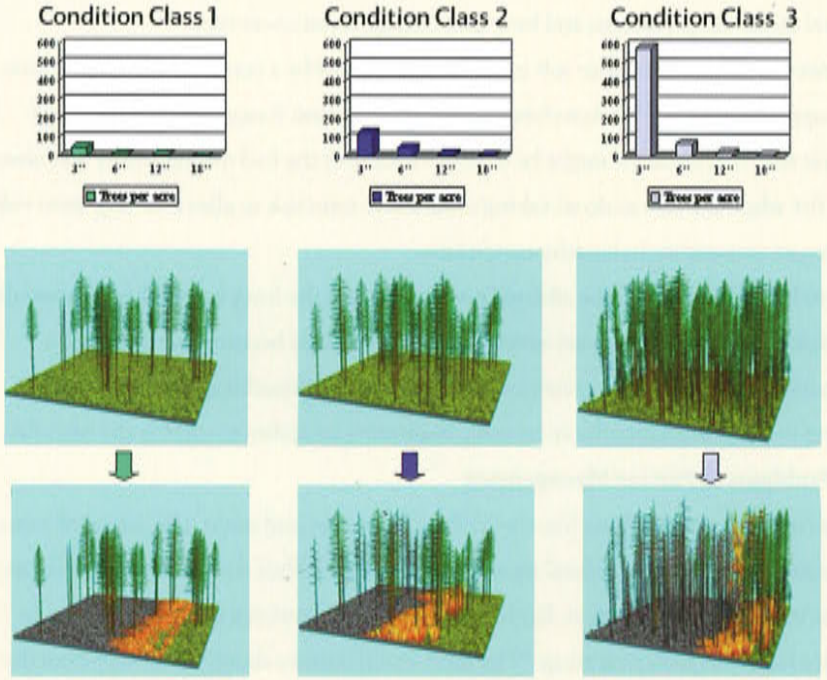
- **Number of fires in Oregon in 2001, all causes: 1,261**
- **Ten-year average, since 1991: 1,104**
- **Number of fires in Oregon in 2001 caused by lightning: 466**
- **Ten-year average, since 1991: 346**
- **Number of fires in Oregon in 2001 caused by humans: 795**
- **Ten-year average, since 1991: 758**
- **Number of acres burned in Oregon in 2001, all causes: 51,438**
- **Ten-year average, since 1991: 11,896**
- **Cost of fire suppression in Oregon in 2000: $5,750,862**

Steve Mealey
Manager-Wildlife, Watersheds and Aquatic Ecology
Boise Building Solutions
Springfield, Oregon

"Settlers who came through the Blue Mountains during the 19th century found big ponderosa pines spaced 30 to 50 feet apart with mostly grass on the open forest floor. A portion was blackened from recent light burns, which occurred every 5 to 25 or so years. Due mostly to 100 years of fire exclusion, the forests have gone from 30 to 60 pine trees per acre to 300 to 600 or more of mostly fir trees. As a result, fires now burn with uncharacteristic intensity and put entire ecosystems at risk. To fix things, we need to strike a balance between the short-term, risk-averse philosophy and static management approach of regulatory agencies and the long-term risk reduction vision that active restoration requires. We have only a very limited time to come to terms with our current policy dilemmas and restore at-risk forested landscapes."

Classifying a Forest's Risk of Fire

Condition Class 1, at left, means the forest's structure is near its historic condition and fire patterns within it are near their historic range. The risk of losing key ecosystem components is low. This stand has had frequent, low-severity surface fires that rarely killed the larger trees. Suppressing fires for more than one normal return interval creates a forest resembling Condition Class 2. Here normal fire behavior has been moderately altered from its historic range and the risk of losing key ecosystem components has increased to moderate. The forest in Condition Class 3 is at high risk of fire, and when it occurs, it will be more intense with a much higher probability that it will reach the crowns of the larger trees and kill them. Some 84 percent of Oregon forestland is currently in Condition Classes 2 and 3. Fire ecologists say that intervention in the form of mechanical treatments (like thinning) and prescribed burning are needed to restore these forests to their historic condition.



W.J. Hann and D.L. Bunnell, "International Journal of Wildland Fire"

resources. The report addressed firefighting management and preparedness, reduction of hazardous fuel accumulations and outreach to local communities.

The report, which led to the adoption of a National Fire Plan, focused on unnaturally high fuel accumulations and acknowledged the problems created by fire management policies of the past. It recommended active management in the form of mechanical thinning and prescribed fires to return forests on federal lands to historic levels of density and species composition. The report acknowledged the extent of the problem and a necessary commitment to the time forest restoration will take: "Implicit in the Administration's efforts to reduce wildfire risk through the elimination of brush, small-diameter trees and other fuels, and the reintroduction of fire to forest and rangeland ecosystems, is the understanding that reversing the effects of a century of aggressive fire suppression will be an evolutionary process, not one that can be completed in a few short years."

Protecting Oregon's Forests

The National Fire Plan focuses primarily, though not exclusively, on the high-hazard and high-risk areas of the interior West. In Oregon this means forestland primarily east of the Cascades and in southern Oregon, a great percentage of which is in national forests. Oregon has been aware of the danger for some time. In the mid 1990s Governor Kitzhaber put together a team of scientists and forestry professionals who studied the problem and issued a report. The report identified that the problem lies mostly on federal lands where timber harvest has been restricted. Kitzhaber and other western governors have stressed the need for extensive active management to reduce growing forest health and wildfire problems.

Tom Schmidt, supervisor of the Ochoco National Forest and currently on special assignment as Interagency National Fire Plan Coordinator for the Pacific Northwest, knows the problem from direct experience. Even prior to the last decade of federal harvest restrictions, he was faced with fir trees that were susceptible to drought and insect attack. In the absence of fire, the fir trees had created unhealthy conditions when they crowded in beneath the historically open ponderosa pine stands. Not only were the fir trees now competing with the fire-, drought- and insect-resistant pine trees, they were providing ladder fuels and dense vegetation that carries fire into the crowns, where it reaches high intensity rather than remaining low intensity near the ground. For a while he was able to address the problem by modifying timber sale contracts to direct harvests toward removing smaller, understory grand fir. Because of the low commercial value of the timber (from both lower-value species and small-diameter trees), the needed treatments often will not sustain a commercial timber sale that would generate income to the federal Treasury and provide the needed treatment. Instead, Treasury funds are necessary to provide the treatments.

Schmidt says the National Fire Plan is doing positive things in Oregon, but the problem is massive. So far, most of the effort has been planning or administrative due to the potential conflicts related to other federal policies, such as the Endangered Species Act, the National Environmental Protection Act and historic preservation. Hal Salwasser, dean of the College of Forestry at Oregon State University, concurs. He believes there is a good strategy in place with the National Fire Plan and that it has begun to address the risk where people are living in or adjacent to forests. "But when you move a few miles into the forest," he said, "little or nothing is being done. By the time you get to roadless or wilderness areas, there is no agreement at all on a course of action."

"Wildfires occurring in the shorter-interval fire-adapted ecosystems, where fuels have accumulated over several missed fire cycles, often burn beyond the natural range of variability. Consequently, habitats, soils and watersheds are burned beyond their adaptive limits. The severity of these fires poses threats to species persistence and watershed integrity. The damage from these fires is often long-lasting and, within some ecosystems, may be irretrievable. ...The extent and severity of fire could eventually push declining populations beyond recovery, especially in the West."

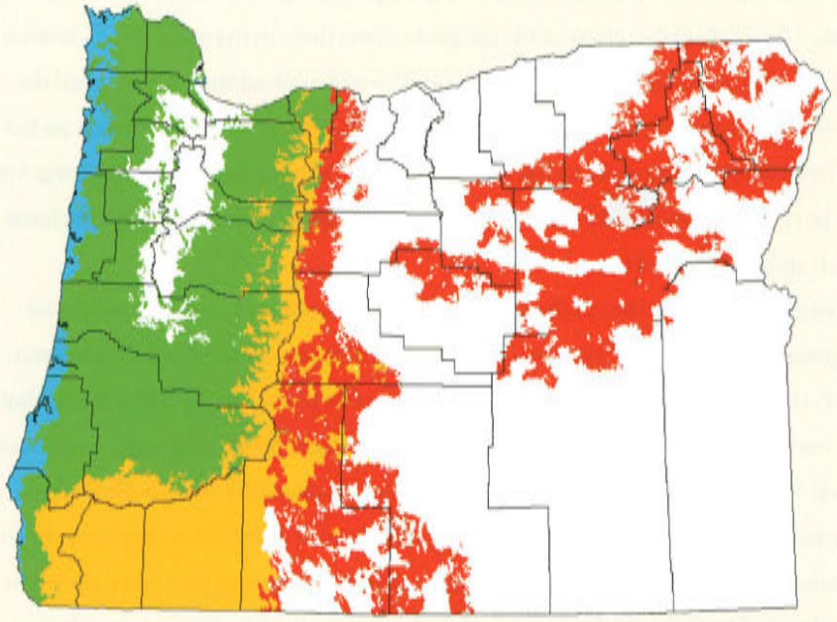
– National Fire Plan authors L. Laverty, Jerry Williams and Mike Dombeck, "Protecting People and Sustaining Resources In Fire-adapted Ecosystems: A Cohesive Strategy," 2000.

Jack Ward Thomas
Boone and Crockett
Professor of Wildlife
Conservation
University of Montana
Missoula, Montana

"A century of fire exclusion has created problems that need to be addressed, but a long-term vision is required. Every intelligent person cares about the environment, and no one can argue with saving species or protecting the quality of our air and water. The problem is that many of our environmental protection laws promote static management. The ecologist who wants to correct the problems created by fire suppression needs to be proactive — to manipulate the landscape today in order to restore its long-term health. Yet he or she is often bound by a law whose mandate is to prevent even short-term risk. In a way, it's a classic case of a 100-year vision, an annual budget that's subject to a shifting legislative agenda, and a two-year election cycle."

Oregon Forest Types and Fire Characteristics

This map is a greatly simplified representation of the types of forests in Oregon, from the hemlock-spruce coastal area and Douglas fir forests of the moist west side to the ponderosa pine of the drier east side. Between them, along the Cascade crest and in southwest Oregon, is an area of mixed conifers. Note how, moving from west to east, the historic frequency of fire ranges from 400+ years to five or fewer. Note too how in areas of frequent burning, fires tend to be less severe.



Hemlock-Spruce
- Historic Fire Return Interval: 400+ years
- Historic Fire Severity: high severity

Douglas fir
- Historic Fire Return Interval: 100-230 years
- Historic Fire Severity: high severity

Mixed Conifers
- Historic Fire Return Interval: 40-80 years
- Historic Fire Severity: moderate severity

Ponderosa Pine
- Historic Fire Return Interval: 5-25 years
- Historic Fire Severity: low severity

Adapted from Oregon Department of Forestry data

Bureaucracy also creates its own problems. The General Accounting Office issued a report in January 2002 critical of NFP efforts to date, stating that "the federal effort still lacks clearly defined and effective leadership" among the five federal agencies charged with management of the nation's forests. Schmidt says that original NFP timelines anticipated an expanded program that would require 10 to 15 years to have a major corrective impact, but recent funding problems have already made that goal unrealistic.

Addressing the Issues in Oregon

One of the key problems in fire protection is a phenomenon known as the wildland-urban interface — the place where homes and forest environments meet. In Oregon, the problem is a result of the state's increased population and the desire of more citizens to build homes in forest settings. The trend puts an extra burden on the state's fire protection program, in terms of both personnel and cost.

"This problem has been looming over us ominously for a while," said Rick Gibson, ODF's fire prevention director. He said the state has been innovative in its approach to

the urban interface issue, referring specifically to Senate Bill 360, the Oregon Forestland-Urban Interface Fire Protection Act. Gibson calls the voluntary, community-based nature of the program a way for homeowners to share the burden of protection and learn ways to make their homes less vulnerable to fire.

The National Fire Plan at Work in Oregon

Since the urban interface problem is part of the National Fire Plan, Gibson says that a number of Oregon programs for homeowner education are funded by grants from the federal program. Darrel Spiesschaert, ODF National Fire Plan grant coordinator, says that in addition to education, the program provides funds for building up fire suppression capability, restoring burned areas and exploring alternative fuels utilization and marketing. Most of the brush and small trees removed from dense areas have little commercial lumber value, but some communities and groups are exploring innovative uses for the by-products of hazardous fuels reduction such as sawdust and chips as a source of energy and commercial products.

Looking to the Future

Smokey Bear's message is and always has been targeted at preventing forest fires caused by human carelessness. It's an important message, but one that has become so ingrained in the American psyche that many people have come to think of all forest fires as bad. Smokey has not been wrong all these years, and his campaign has prevented the burning of countless acres and the untold loss of life. The important thing is to use our understanding of the historic role of fire to manage our forests sustainably for the future.

As for forest science, ecologists Stephen Arno and James Agee know how the problem could be addressed using a combination of natural fires, prescribed burning, silvicultural thinning, other fuel-reduction techniques, and making homes and developments more fire resistant. They know too that forest science is at a stage where management techniques can restore the forest. One thing they are sure of is that we are past a point where passive management can work.

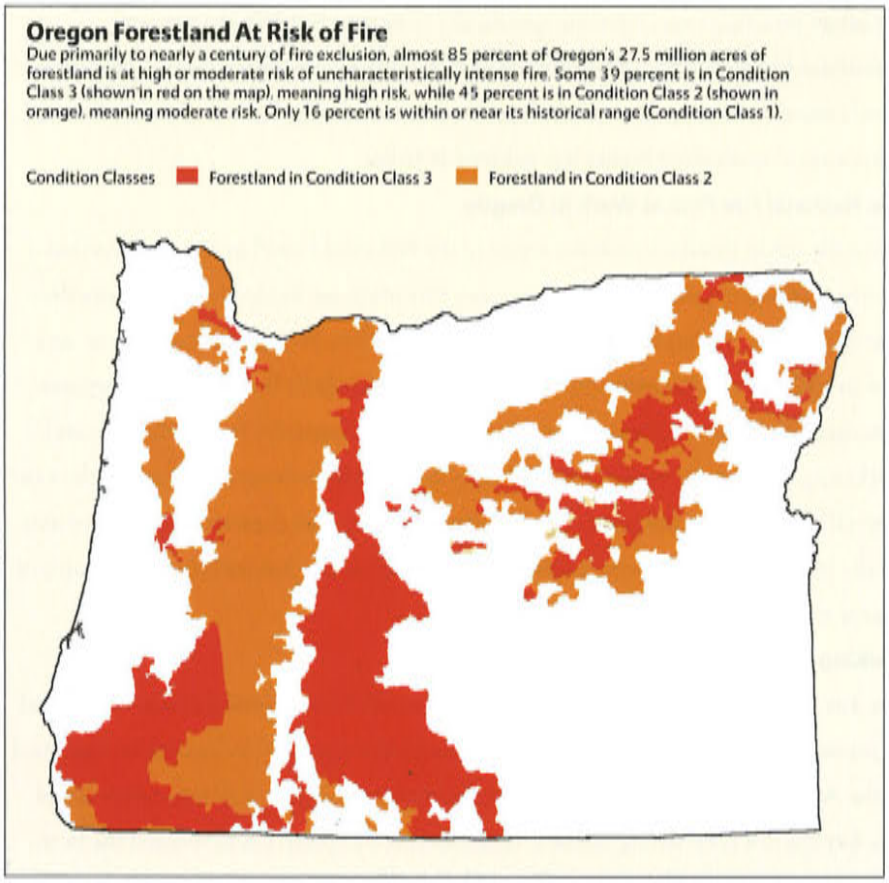
Jack Ward Thomas defines the problem more pragmatically. Forest managers, he said, are in the difficult position of reconciling a 100-year vision with an annual budget and a two-year election cycle. It is unclear whether Congress will have the faith and foresight to maintain funding for the long term, and it is equally unclear whether the forest products industry, the public and private workforce and local communities will be allowed to contribute effectively to recovery efforts. If sustainability is a stool supported by three legs — environmental, economic and social — the social and economic components have

NATIVE AMERICANS AND FIRE

European-American settlers were not the first to alter the North American landscape by using fire as a tool. American Indians were quite sophisticated in their use of fire and had been setting fire to the forest for thousands of years before European settlement. The practice created open areas that attracted game like deer and elk, and it cleared the way for crops like camas, hazelnuts, tarweed and wild wheat. According to Cliff Snider, chief of the Chinook Tribe, "All the [Columbia] river Indians set fire to the forest periodically. It's good for things. It makes the trees grow better; it makes the grass grow better." Author and historian Stephen Dow Beckham of Lewis and Clark College said, "From David Douglas's journals to those of overland immigrants like Jesse Applegate, there are accounts of American Indians methodically burning areas of the forest."

James Rochelle
Wildlife Biologist
Rochelle Environmental
Forestry Consulting
Olympia, Washington

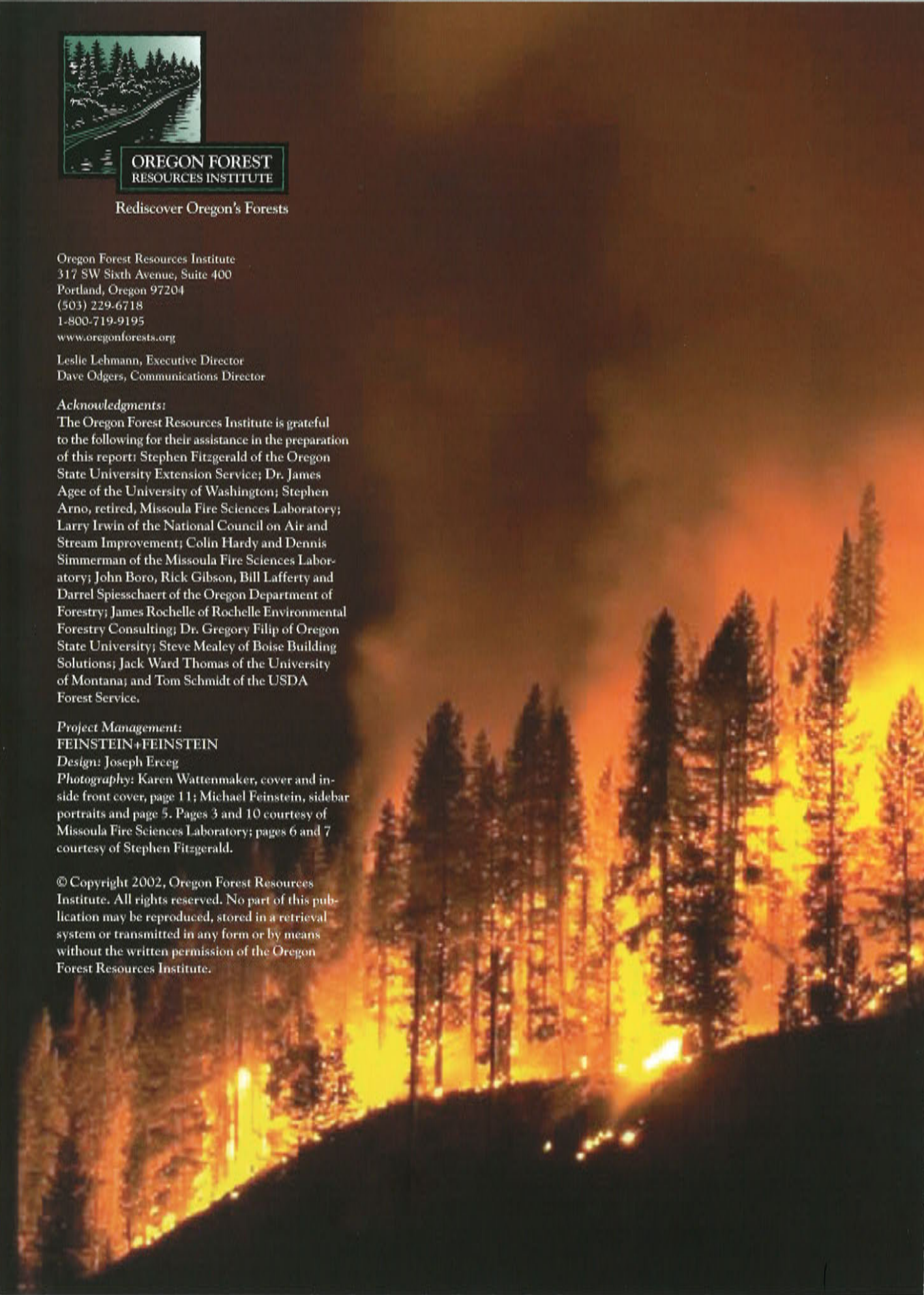
"The real issue of fire's impact on wildlife is not so much about mortality as about habitat change. Fire does kill some animals, but fewer than one might suspect. More important is what remains after fire, because that becomes the starting point for recovery. Even in high-intensity fire there is a lot of forest structure left in snags and dead trees, and fire does not always burn the litter layer on the forest floor. Animals in the Northwest have adapted over time to natural disturbances, and fire sets in motion a process of forest redevelopment that is accompanied by a fairly predictable wildlife response. Some species are 'winners' that thrive in the open conditions; others are 'losers' that require the habitat conditions found in later stages of forest development."



been overlooked on federal lands and the environmental component fails to adequately address the risk of wildfire. By any measure, such a policy fails the sustainability test.

Experts still wrestle with costs as our suppression efforts become increasingly expensive. Some perspective comes from some recently monitored costs of several treatment options on the east side of Mt. Hood, which is one of the areas with major forest health problems. Fighting wildfire costs $5,000 per acre, while planned burning to control stocking levels costs $300 per acre. In contrast, commercial thinning to reduce fuel loads in overstocked areas actually generated income of $50 per acre.

As the issues are debated, growing underbrush continues to increase fuel loads in parts of Oregon already at high risk for catastrophic fire, and mature trees continue to grow weaker. Meanwhile, a hiker may leave a fire with embers still hot, a camper may not quite crush a cigarette, and lightning still strikes the earth eight million times every day.



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Rediscover Oregon's Forests

Oregon Forest Resources Institute
317 SW Sixth Avenue, Suite 400
Portland, Oregon 97204
(503) 229-6718
1-800-719-9195
www.oregonforests.org

Leslie Lehmann, Executive Director
Dave Odgers, Communications Director

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