

**Testimony of Dr. W. Wallace Covington, Regents' Professor  
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<http://www.for.nau/ecoorest/>

Before the Committee on Resources  
Subcommittee on Forests and Forest Health  
U.S. House of Representatives

**Oversight Hearing on Preventing Wildfires through Proper Management of the  
National Forests**

August 14, 2000

Madam Chairman Chenoweth-Hage, and members of the Committee, thank you for this opportunity to testify on a subject of personal importance to me and of critical importance to the health of our nation's forests and the people and communities that live within them.

My name is Wally Covington. I am Regents' Professor of Forest Ecology at Northern Arizona University and Director of the Ecological Restoration Institute. I have been a professor at NAU since 1975.

I have a Ph.D. in forest ecosystem analysis from Yale University where I worked with Professors F. Herbert Bormann and Daniel B. Botkin on the Hubbard Brook Watershed Ecosystem Study. There I conducted an ecosystem analysis of changes in species composition, organic matter and nutrient budgets, and net primary production on a time series of northern hardwood stands ranging from 1-yr old after clearcutting to an old-growth stand that had never been cut. I also have an M.S. in ecology from the University of New Mexico where I worked with Professor James Gosz. There I directed field crews in establishing the Tesuque Watershed Ecosystem Study using the Santa Fe Watershed as a control area.

Over the past 25 years I have taught graduate and undergraduate courses in research methods, ecological restoration, ecosystem management, fire ecology and management, forest management, range management, wildlife management, watershed management, recreation management, park and wildland management, and forest operations research. I have been working in long-term research on fire ecology and management in ponderosa pine and related ecosystems since I moved to Northern Arizona University in 1975. In addition to my publications on forest restoration, I have co-authored scientific papers on a broad variety of topics in forest ecology and resource management including research on fire effects, prescribed burning, thinning, operations research, silviculture, range management, wildlife effects, multiresource management, forest health, and natural resource conservation. I am senior author of the Ecosystem Restoration and Management: Scientific Principles and Concepts chapter of the interagency publication entitled The

Ecological Stewardship Reference. I am a member of numerous professional societies including the Ecological Society of America, the International Society for Ecosystem Health, the Society for Conservation Biology, the Natural Areas Association, the Soil and Water Conservation Society, the Society for Range Management, and the Society of American Foresters. I am also a member of the Society for Ecological Restoration and am outgoing chair of its Science and Policy Working Group. In addition to publishing in the scientific literature I have been actively involved in outreach efforts to natural resource professionals, community leaders, and the general public on issues related to forest ecosystem management.

Although the general principles that I will discuss apply to the vast majority of the West's dryer forest types, I will focus my testimony on ponderosa pine forests. As the GAO has pointed out over 90 percent of the severe crown fire damage nationally is in this forest type.

It is an unfortunate set of circumstances that have led to this hearing. Scientists have predicted the current forest crisis for the last 75 years (Leopold 1924, Weaver 1943). In 1994 I was senior author on a review paper (Attachment One) in which I stated that we could anticipate exponential increases in the severity and extent of catastrophic fire. It is not a prediction I ever wanted to come true. In that same paper, I also suggested that we have a narrow window of opportunity to take preventative actions to restore forest health and minimize the losses of civilian and firefighter lives as well as the mounting damage to our nation's natural resources.

We have been extremely lucky that no lives have been lost so far this season. In some respects we were lucky that the Cerro Grande Fire occurred in the fireshed for Los Alamos, a town that had perhaps the best evacuation plan in the nation. The forest is full of communities that have poor escape routes and little capability for evacuation in the event of a fast moving fire. It is not likely that our luck will continue. The Viveash Fire traveled 9 miles and burned 20,000 acres in a 24-hour period. Given such a rate of spread in heavy forest fuels there is no way that we will be able to evacuate vulnerable mountain communities in time to prevent the loss of lives. Clearly, if we do not do something quickly we can expect civilian and firefighter fatalities that are today unimaginable. I commend the Committee and Congress for taking a problem-solving approach to the current and future fire situation.

I am an optimist who believes with thoughtful action, adequate resources and public and private leadership we can begin to solve this crisis. There are three points I intend to make in my testimony that will contribute to the solution.

1. We have a solid body of scientific information to begin applying ecologically based forest restoration treatments to protect people, communities, and the forests surrounding them. As we proceed we should continue to build on that knowledge through continued research, monitoring and adaptive management.

2. The solution to catastrophic wildfire must include more than the wildland/urban interface. It is unclear how large a barrier would have been needed to protect Los Alamos under the extreme conditions and power of the Cerro Grande Fire. In addition, there are economic, social and aesthetic reasons that these communities exist in the forest. Communities are inextricably linked in many ways to the forests that surround them. People live in forested areas because they love forested habitats. They don't want to live in a fire-scarred landscape.

3. There are emerging models of communities working to reduce the threat of fire while restoring the forest for its full suite of values. Their success depends on meaningful community collaboration, human and financial resources and adequate scientific support to make well informed management decisions. Congress, federal agencies, universities, and non-governmental organizations must support these communities to help them achieve success.

**We have a solid body of scientific information to begin the process of forest restoration that will protect people, communities and the forest.**

There is much wailing and gnashing of teeth by activists, members of the lay public, and even some within the academic community about the scientific basis of forest restoration. Some of the arguments are founded on differences of opinion about desirable ecological conditions for western forestlands. Others stem from differences of opinion about whether public lands should be used for consumptive resource use, especially by wood products or grazing interests, or for individual uses and/or non-consumptive uses. At times individuals use what might best be described as pseudoscientific arguments to try to advance a particular cause.

By pseudoscience, I mean a set of theories, assumptions, and methods erroneously advanced as science. Pseudoscience stands in contrast to science, which is based on attempts to objectively discover the truth about a natural system. The scientific method has been developed as a systematic way to discover truth, or more specifically to avoid being fooled by biases about how we imagine that things might be. A.D. Bradshaw (1993) of the University of Liverpool in England has presented a particularly cogent discussion of the need for objectivity in ecological restoration work. Otherwise, he fears that arguments over restoration objectives and approaches will tend to degenerate into decisions and actions based on intuition and impressions instead of the best knowledge available. He goes on to state that, "With this goes the belief that good restoration is intuitive, stemming from feelings rather than logical understanding, and that because of this it is only learned by experience... Certainly nobody should ever decry the importance of intuition... Yet applied to the exclusion of other principles, these beliefs will destroy the efficiency and effectiveness of restoration ecology..."

Restoration ecology, he posits, must be based on six cardinal points:

1. Awareness of other work.

2. Preparedness to carry out proper experiments to test ideas.
3. Preparedness to monitor fundamental parameters in a restoration scheme.
4. Further tests and experiments suggested by these monitoring observations.
5. The restoration of functioning ecosystems in which a whole variety of species is involved.
6. Published results.

There is abundant scientific research that began in the 1890's and continues today that provides a sound scientific framework for implementing the science and practice of restoration. We have solid information about presettlement forest conditions, changes in fire regimes over the last century, deterioration of overall ecosystem health, and ecological responses to thinning and prescribed burning--the key elements of any attempt to restore ecosystem health in ponderosa pine and related ecosystems. We know that current overcrowded stands of trees do not sustain the diversity of wildlife and plants that existed a century ago. We know this by examining the data of early naturalists and scientists. We also know this to be true from primary research. Scientists that have compared biological diversity of overstocked stands--stands that have had decades of fire exclusion--with open, park-like stands that have not had severe fire regime disruption, have found greater plant diversity, greater insect diversity, and greater bird diversity. Similar studies have also found greater old-growth tree vigor and resistance to insect attack in open, park-like stands--stands similar to those present before settlement. We also know that stopping ecologically based forest restoration that includes thinning, is not saving the forest as some would like you to believe, but only contributing to its demise and causing severe losses to the wealth of species that depend on it.

Research across the Intermountain West has shown that restoration treatments substantially reduce fire hazard by thinning trees to decrease tree canopy density, break up interconnected canopy fuels, raise the crown base height, and then reduce accumulated forest floor fuels and debris with prescribed fire. Fire alone is usually inadequate. Without thinning, fire can lead to increased mortality, especially among old growth trees.

Restoration thinning enhances the productivity (growth) of trees, allowing young trees to develop old-growth characteristics such as large size and full crowns. Perhaps most importantly, restoration has been shown to increase rapidly the productivity of native understory grasses and herbs, the species that make up 90-99% of the plant biological diversity in western fire-adapted forests. The resources provided by abundant understory vegetation--seeds, flowers, fruits, and cover--translate into key wildlife habitat components. For example, the number of butterfly species and individuals increased within two years in Arizona sites that had received ecological restoration treatments.

A variety of restoration options are being investigated at research sites across the West, applying treatments developed locally by scientists, managers, environmental activists,

resource users, and members of the public. It is important to continue and expand the research effort, but at the same time it is imperative that we accept the responsibility to apply the extensive knowledge we already have, before more forests are lost. Restoration faces many challenges, because ecosystems have been highly fragmented and degraded by decades of overuse. It is not necessarily simple nor is success always guaranteed. But the preponderance of research clearly indicates that restoration management approaches stand in striking contrast to the destructive effects of unnaturally intense fires. Clearly the risks of inaction far outweigh the risks of scientifically based restoration treatments.

The actions that others and I believe should be taken to restore the ecological integrity of ponderosa pine forests and therefore reduce the threat of crown fire are well known. I do not advocate a "one-size fits all approach" but rather crafting management approaches based on the location under analysis, its presettlement condition, and its relationship to the broader ecosystem and the communities that live within it. In this sense, ecological restoration should not be viewed as a strict recipe or a rigid set of prescriptions. Rather, ecological restoration should be viewed a broad intellectual framework for restoring and enhancing not only ecosystem health, but also sustainable human uses of the land.

At the Ecological Restoration Institute we have developed some general principles for restoration of ponderosa pine ecosystems <http://www.for.nau/ecocest/>. In general, treatment design should:

- \* Strive to emulate, insofar as is practical, natural ecosystem patterns and processes. In ecological restoration we refer to these natural conditions as "reference conditions". In most cases for ponderosa pine forests this includes fewer trees per acre; retaining older trees and removing the excess trees thus opening up the forest canopy to promote increased numbers and species of plants and grasses.
- \* Seek to incorporate human needs with ecosystem conservation goals. For example, in many circumstances it may be desirable to deviate from strict-sense restoration prescriptions to accommodate specific uses by humans, endangered species, or other ecosystem management objectives.
- \* Recognize that ecologically based restoration treatments not only provide fuel breaks to stop crown fires from spreading across the landscape, but also enhance resource values and minimize the risk of environmental degradation.
- \* Be based on comprehensive economic analysis. Initially the cost of pre-suppression treatments and restoration appears large, however, when compared to the cost of fire suppression, property loss, environmental services lost (such as water), potential loss of lives and other factors it is relatively small. As others have said, we can either pay now, or pay much more later.
- \* Recognize that initial costs will be higher than maintenance costs. For example, in a degraded forest the cost of restoration can be as high as \$700/acre. Following

treatment, prescribed, low-intensity fire can be used as the primary tool at a much lower cost, as little as \$40/acre for large areas.

\* Recognize that agency staff capacity and operational funds are limited and must be increased to meet the challenge. In the near term, fire suppression costs will continue to mount and implementing pre-suppression treatments will require resources as well.

\* Consider the potential for the creation of new restoration based jobs and industries. Many new jobs will be created throughout the nation as a consequence of implementing ecological restoration. Furthermore, in many situations the woody material could be removed and used to produce wood products to provide jobs and offset some of the costs of the restoration.

This is not to suggest that we do not need more research or that we should not continue to learn from current treatments so that we can improve future treatments. One of the most important contributions the scientific community could make to improve land management is to develop monitoring protocols that are simply applied, affordable, understandable to land managers and that can be quickly synthesized to inform adaptive management.

This need for continued research and monitoring is particularly acute for processes that operate at the landscape scale. For example, with regard to endangered and threatened species as well as many other species occupying the forest, we need more information on wide-ranging animals that we cannot gather until there are more and larger restoration treatments in place. Ironically some critics of forest restoration argue that before we can implement landscape scale restoration treatments we must know the effects of treatments on this scale—a Catch-22 argument.

### **The solution to catastrophic wildfire must include more than the wildland/urban interface.**

The Cerro Grande fire has focused policy attention on the need to create defensible perimeters around communities in the wildland/urban interface. Without a doubt we need to take action to secure communities. However, my fear is that by defining the "urban/wildland interface" as some sort of narrow ring around a town to protect property, we will miss the whole reason for the existence of forest communities. A town is not just the place where people have homes. Communities are in the forest because they are emotionally, economically, and socially linked and dependent on the forest. When we consider the areas that need immediate treatment we should consider the human community "impact area"—the entire area that if impacted by a catastrophic fire, will undermine the health and livelihood of a community.

The Forest Service Cohesive Strategy includes one aspect of this greater impact area I've mentioned by identifying watersheds as important areas of focus. An excellent example is the Santa Fe Watershed, a 17,000-acre area that provides 40% of the water supply for the

city. In June, my colleague Tom Swetnam and I attended a meeting in Santa Fe to provide science-based recommendations for treating the watershed. The conditions in the Santa Fe watershed are remarkably similar to the conditions that existed around Los Alamos prior to the fire. The fact that the City of Santa Fe, the Forest Service, the Santa Fe Watershed Association (including the Sierra Club, the Audubon Society, and the Nature Conservancy), and citizens are actively designing pre-suppression treatments is commendable. I am hopeful that meaningful restoration actions can be taken in the Santa Fe Watershed and surrounding areas before a tragedy similar to Los Alamos hits Santa Fe.

A second example of an important impact area beyond the town site itself is the San Francisco Peaks north of Flagstaff, Arizona. Recreation and tourism contributes significantly to the Flagstaff economy. A wildfire at the Snowbowl ski area or along one of the many popular trails on the peaks could have a significant impact on many small businesses dependent on recreation dollars. Although it is critical that we design treatments to protect the property of Flagstaff residents, it will be fruitless in the long run if their economic livelihood and quality of life disappears.

Another reason that attention cannot be narrowly focused on a ring around the city is because it will fail to address one of the most contentious issues of our time, the protection of endangered species. Wildfire in the Southwest contributes to the loss of essential habitat for many of these vulnerable species because they are not adapted to stand replacing fires. According to a recent draft plan by the Coconino National Forest, over the last ten years the nesting habitats of seven northern goshawks and six Mexican spotted owls have been eliminated or severely altered by stand replacement fires in the vicinity of the San Francisco Peaks.

There are numerous factors that contribute to the decline of species in this country but the biggest threats, according to experts like E.O. Wilson, a Harvard conservation ecologist, are habitat destruction and degradation. Degradation of habitat occurs for many reasons but one of the most severe factors is the elimination of important ecological processes, such as the periodic, low-intensity burns that characterize the fire dependent ponderosa pine forest. By not restoring the forest we contribute to the decline of habitat and the collision between society and nature.

From a conservation biology perspective (conservation biology deals with the biology of rare and declining species), one of the most critical needs for species conservation is the ecological restoration of the core areas of greater ecosystems. Core areas are large areas that are managed as source areas for native plants and animals to disperse across the larger landscape. Core areas are typically, but not always, wilderness areas, National Park backcountry, and similar undeveloped areas. In the ponderosa pine type, these core areas are often even more overcrowded by unnaturally dense stands of trees than is the rest of the landscape. As such, our parks, wilderness areas, and other reserve areas are at a much greater risk of catastrophic crown fire than is the rest of the landscape. Furthermore, because of the importance of these areas as strongholds of biological diversity, their loss to crown fire is a much more critical blow to biological diversity than are fires in other

areas. If we are serious about restoring ecosystem health we must confront the difficult problem of how to restore these critical core areas and do so immediately. At the very least we should seek to protect them with a defensible perimeter using restoration based fuel breaks much as we are trying to do with urban areas.

**There are emerging models of communities working to reduce the threat of fire while restoring the forest for its full suite of values**

Designing restoration and fuel reduction strategies that protect towns is not easy because of the social, economic and philosophical ties people have to forests. In addition, even with broad support for treatments there are some people and organizations who will choose not to participate, yet will litigate if the approaches don't match their ideology. The towns working to implement fire risk reduction and the ecological restoration of forests are developing important models for accomplishing protection. In addition, their experiences are an important source of information that should be used by decision-makers, agency officials and others for adapting their own ways of operating to support community-based decisions.

For the past three years the Grand Canyon Forests Partnership has worked to develop and implement strategies to prevent catastrophic fire and restore the ecological integrity of ponderosa pine forests around Flagstaff. Over fifteen public and private organizations participate in the Partnership. Members include Northern Arizona University, the Coconino National Forest, the City of Flagstaff fire department, the Chamber of Commerce, the Grand Canyon Trust and many others. The group was formed in response to the volatile fire season of 1996. During that season fires were a constant threat within the city limits and two wildfires in the Coconino National Forest demonstrated the vulnerability of the San Francisco Peaks to fire. In fact, it was the decision to re-deploy fire fighters from the Hochderffer fire in the Coconino National Forest to a fire within the Flagstaff City limits that resulted in the Hochderffer fire growing to approximately 16,000 acres.

The goal of the Partnership is to analyze 100,000 acres of forest surrounding Flagstaff and within that area to treat approximately 30,000 strategically located acres to achieve fire protection for the town and the San Francisco Peaks. Although there are aggressive fuel reduction treatments underway on city property and on private property in the city, the Partnership recognizes the social and economic importance of applying ecologically based restoration to the forest surrounding Flagstaff. The Ecological Restoration Institute at Northern Arizona University in collaboration with the Rocky Mountain Research Station and others is developing the science-based treatments, research and monitoring that are essential for developing effective approaches. Developing the science behind each treatment is a critical part of achieving community consensus and responding to criticism. Other important activities include developing economically viable approaches to restoration by promoting and developing the use of small diameter trees (where feasible), community outreach and education, and exploration of restoration based employment options.



## What Congress Can Do

There are several constructive steps Congress and the federal agencies can take to improve our current situation.

1. Treatments to reduce fire threat and restore the ecological integrity of forests should become the single biggest priority of forest management policy and the land management agencies working in the Intermountain West. As you will recall the 1999 GAO report pointed out that the Forest Service has estimated that 39 million acres of Forest Service lands are at high risk to catastrophic wildfire in that region alone.
2. Congress should provide adequate resources to the agencies to maximize treatments. Senator Domenici's amendment to the Fiscal Year 2001 Interior Appropriations Bill in the Senate provides \$240 million in pre-suppression money to treat forests to prevent fire. This legislation represents pro-active thinking but the resources to accomplish the job are still insufficient. Compare this appropriation to the estimated one billion dollars needed to compensate victims and repair the landscape after the Cerro Grande Fire. A simple extrapolation of recent rates of increase in crown fire damage suggests that within the next decade acres burned could easily double whereas costs for fire suppression and compensation could approach four billion dollars annually.
3. Wherever possible, Congress and the land management agencies should support the positive collaboration of forest communities to design ecologically based restoration treatments. This includes: producing high quality, timely environmental review documents; elevating the production of the review documents to a top priority; assisting communities to develop economically viable opportunities for restoration products; and assisting to develop new employment opportunities in restoration.
4. Support the development of science-based restoration treatments.

To move forests from their current degraded conditions to healthy, diverse, and productive ecosystems requires knowledge. Our lack of understanding of how naturally functioning ponderosa pine forests function and the ecological and social implications of changed forest conditions has led to the current situation we now face with regard to catastrophic fire, endangered species and the social and economic upset of forest communities.

The Ecological Restoration Institute at Northern Arizona University is generating significant knowledge about pine forest restoration and working to get that information into the hands of communities and land managers that can apply it on the ground. With each treatment we learn more and can incorporate that knowledge into the next set of treatments.

Senator Jon Kyl, with the support of Secretary of Interior Bruce Babbitt, has recognized the need for good science and has actively supported the work of the Ecological Restoration Institute at NAU. His support for science-based solutions has allowed us to design effective restoration treatments that are the underpinning of the development of socially acceptable approaches to forest restoration underway in Flagstaff and other forest communities. This year we are again hoping for federal funding to assist in our efforts. This money is a crucial contribution to solving forest problems now and into the future.

Thank you very much for asking me to appear before the Subcommittee.

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