Testimony of Dr. William Wallace Covington, Regents' Professor And Director of the Ecological Restoration Institute Northern Arizona University

http://www.eri.nau.edu

Before the House Subcommittee on Forests and Forest
Show Low, Arizona

Field Hearing to Discuss Interagency Cooperation in Wildland Fire Fighting

September 28, 2002

John Wesley Powell with Paiute Indian Chief Tau-gu

Gifford Pinchot with President Teddy Roosevelt

Chairman McGinnis, and members of the subcommittee, 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 for just over 27 years. My colleagues, graduate students and I have conducted research into ponderosa pine and related frequent fire types in South Dakota, Eastern Washington, California, Utah, Colorado, New Mexico, Chihuahua, Sonora, and Durango (Mexico), and, of course, Arizona since I arrived in Arizona in 1975.

In addition to my publications on fire ecology and management, ecosystem health and 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 Principles chapter of the interagency publication on Ecological Stewardship published in 1999.

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, and the Society of American Foresters. I am also a member of the Society for Ecological Restoration and was chair of its Science and Policy Working Group from its inception through 2000 when I vacated that position to take a sabbatical year at Duke University. In addition to publishing in the scientific literature I have been actively involved in outreach efforts to natural resource professionals, community leaders, the general public, and local to national policy makers on issues related to forest ecosystem management.

A Textbook Example of How to Do it Right

Before I begin my formal remarks I want to take a minute to recognize the outstanding community support and interagency coordination, dedication, and firefighting expertise demonstrated by those who worked so long and diligently to keep the Rodeo-Chediski fire from being even more devastating than it was. Were it not for the great skill, team work, and creativity of firefighters, federal, state, and local governments and community leaders working together for a common goal, it is likely that hundreds more houses would have burned, and worse yet civilian and firefighter lives would have been lost. We now need to develop and apply that same approach to implementing preventative restoration based hazard reduction and ecosystem health treatments at similar scales so that a disaster of this magnitude never happens again.

My Approach in this Testimony

Although the general principles that I will discuss apply broadly to the vast majority of the West's dry frequent fire forest types, I will focus my testimony on ponderosa pine forests. As the GAO has pointed out in 1999 over 90 percent of the severe crown fire damage nationally is in this forest type.

In my remarks I will give a brief overview of the historical context for federal fire management policies, discuss some ideological barriers to achieving consensus about how to proceed, and recommend a set of actions designed to help overcome these limitations.

Historical Background: Ideology and Land Management Rivalry 1889-Present

Ideological warfare over how to manage western forests is not new. The roots of this crisis in western forest management go deep. Fire historian Stephen Pyne is undoubtedly our best modern day chronicler of the history of our failure to work with fire in forests of the West. In his book, *Paiute Forestry: A History of the Light-burning Controversy*, Pyne describes the historic meeting between then Secretary of Interior John Noble and John Wesley Powell, then director of Interior's Geological Service. The meeting had been set up by Gifford Pinchot, director of the government's new Forestry Department, then in the Department of Interior also.

It was obvious to Aldo Leopold shortly after he graduated from the Yale School of Forestry arrived in the Southwest in 1909. Having just graduated with a Master of Forestry degree from Yale University, Leopold was trained as a keen observer of land conditions. He wrote a series of reports and essays, perhaps the most notable of which was his 1924 paper in the Journal of Forestry entitled, "Grass, brush, timber and fire in southern Arizona." In that paper he noted that south of the US:Mexico border, frequent fires and absence of overgrazing had maintained diverse, productive, sustainable watersheds, but that north of the border, assiduously protected from fire but mercilessly overgrazed, watersheds were degrading rapidly and woody vegetation was encroaching everywhere.

Bureau of Indian Affairs forester, Harold Weaver, recognized the coming forest health crisis in the 1930s raising the alarm that because of the disruption of the natural frequent, low intensity fire regime ponderosa forests were becoming overstocked with dense sapling thickets, unprecedented tree disease and insect attacks were occurring, and fire behavior was intensifying. He warned that unless something was done, these symptoms of degrading forest health would only get worse (H. Weaver. 1943. Fire as an ecological and silvicultural factor in the ponderosa pine region of the Pacific slope. Journal of Forestry 41:7-14. Working with tribal members, Weaver started a prescribed burning research program on the Colville Indian Reservation in 1942, designed to be re-burned on an approximate 10 yr interval. Those plots continue to be burned regularly today.

It is interesting to note that in a 1976 report entitled, "Ponderosa fire management: a task force evaluation of controlled burning in ponderosa pine forests of central Arizona", Harold Weaver along with Harold Biswell, Harry Kallendar, Roy Komarek, Richard Vogl noted that:

> "Between 1947 and 1956 in the National Forests of New Mexico and Arizona, 115,000 acres of timber were burned in six fires with most trees killed or heavily damaged. In 1948, 1950, and 1954, three wildfires on the Fort Apache Reservation in Arizona covered 8,100 acres in which nearly all timber was killed."

We only wish we had that problem today.

Weaver became BIA Area Forester in Phoenix, Arizona, in March, 1948. Weaver began working with Fort Apache tribal members to restore periodic burning to reservation lands. Despite periodic setbacks due to restrictions related to air quality concerns dating from the late 1970s, prescribed burning coupled with active forest management have continued, and as you have heard helped to prevent severe crownfire in several stands within reservation lands.

In the late 1950s, Charles Cooper, also a BIA forester, conducted a sweeping analysis that constituted his doctoral dissertation from Duke University. In that dissertation and in subsequent publications (see Charles F. Cooper. 1960. Changes in vegetation, structure, and growth of southwestern pine forests since white settlement. Ecological Monographs 30:129-164) Cooper described the population irruption of pine trees, the increase in fuel loads, and the degradation of forest health. In his concluding paragraphs on page 162 of his monograph, Cooper states:

"It is doubtful if, after 40 yrs of protection, use of prescribed fire can now reverse the trend toward excessively dense pine thickets. Silvicultural possibilities of planned fire can probably only be realized in young stands originating after timber harvest. Some practical and economic means must be found for thinning young pine stands and for reducing the amount of hazardous fuel."

By the late 1970s it became obvious to me that ponderosa pine dominated landscapes were filling in so quickly with overly dense stand level fuel loadings such that by early on in the 21st century we would see very large, landscape scale fires that were essentially uncontrollable.

My warnings became more strident as I saw both the size and the severity of crownfires increase throughout the 1980s. In fact in a recently discovered video tape of a presentation Silver City, NM, on February 23, 1993, I forecast that if we failed to implement large restoration-based hazardous fuel reduction treatments, by 2010 we would witness greater ecosystem scale fires in excess of 100,000 acre and that we would have to evacuate communities along the Mogollon Rim rapidly and efficiently or risk losing 100s of civilian lives. It is not a prediction that I wanted to come true, but, of course it did.

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.

How We Can Meet the Demands Placed upon Our Generation

Recognizing that unnatural crownfires and other symptoms of ecosystem stress are signals that these ecosystems are falling apart, we must act and we must act quickly. A "learning by doing" approach known as active adaptive management is a well established procedure that we know will work. No one is talking about tinkering here and this isn't just some new fangled academic idea. Adaptive management is rooted deep in theory and practice, having sprung from the evolutionary operations approach long used in optimizing complex chemical engineering problems. Crawford S. Holling (University of Florida) and Carl Walters (University of British Columbia) and their intellectual "offspring" have developed this approach as a tried and true procedure for solving complex resource management problems, monitoring and evaluating a range of policy options, and then feeding resulting knowledge back into the ongoing resource management endeavor.

A soft systems approach to adaptive management might be most appropriate for restoration of ponderosa pine and related frequent fire landscapes. In such a situation collaborative groups consisting of policy makers, stakeholders, technical specialists and land managers develop well informed alternative working hypotheses about reasonable ways to simultaneously work toward restoring ecosystem health while probing for deeper understanding of greater ecosystem structure and function.

We Need Thorough Knowledge and Carefully Reasoned Analysis, Systematically Checked Against Factual Evidence.

In applying this approach, clear thinking, objective acquisition and interpretation of information, and open dialogue among collaborators is essential. Following are some steps to implement this approach

Define the problem

Describe the pathology of degradation

1. Are there unnatural population dynamics-- irruptions of some, crashes of others?
2. Are there deleterious changes in nutrient cycling and hydrology?
3. Are there decreases in diversity and net productivity of herbaceous food webs?
4. Are there losses of tree vigor, especially of old-growth?
5. Are there unnatural insect and disease outbreaks?
6. Are fuels steadily accumulating on the forest floor and in the tree canopies?
7. Has there been a shift away from presettlement fire regimes?

Describe the contexts for the ecological restoration issues.

1. What are reference conditions for different hierarchies?
2. What is the cause of degradation?
3. What are the temporal and spatial patterns of post-disruption changes?
4. To what extent, and at what rate, do current disturbances (e.g. wildfire, bark beetle irruptions) and conventional management practices (e.g., thinning alone, prescribed fire alone) restore ecosystem structure and function?
5. What ecological, social, and political factors affect recovery?
6. How can humans speed recovery to fully functioning ecosystems?
7. How can we do this while providing for continued use by humans?

Determine changes in reference conditions over time.

1. What was the natural fire regime?
2. When was the fire regime disrupted?
3. How have ecosystem structures/processes changed over time?
4. How have ecosystem functions/processes

Assemble practical field data readily available or easy to acquire to inform treatment, monitoring, and evaluation design. Examples of such data are:

1. Fire scars
2. Tree structure, species composition, age, vigor
3. Herbaceous density and composition
4. Forest floor fuels and dead biomass

Use practical analysis techniques to provide useful information for designing and comparing proposed treatments. Examples of such analysis are:

1. Reconstruction of presettlement forest structure
2. Intersecting lines of evidence
3. Dendrochronology / fire history
4. Ecological simulation
5. Fire behavior analysis

Develop restoration-based sideboards for designing alternative prescriptions. Examples of such sideboards are:

1. Retain all trees which predate settlement
2. Retain postsettlement trees needed to re-establish presettlement structure
3. Thin and remove excess trees
4. Rake heavy fuels from base of trees
5. Burn to emulate natural disturbance regime
6. Seed with natives/control exotics

Determine how alternative restoration treatments will be tested. A multi-scaled approach might make sense, with pre/post measurements, replication, and random assignment of treatments where possible. One such approach that we have developed in concert with collaborators in federal, state and local agencies, nongovernmental organizations, and interested volunteers consists of:

1. Spot treatments (.01-.03 acres) around old-growth trees
2. Micro treatments (1 - 40 acres)
3. Initial large-scale treatments (500 - 1000 acres)
4. Monitoring and feedback of results from these treatments
5. Adaptive management approach at the scale of 10-50 thousand acres

Overcoming Barriers to Implementing Restoration at the Greater Ecosystem Scale

There are some challenges to getting operational scale adaptive ecosystem restoration and management on the ground.

1. Fuzzy thinking about the problem.
2. Reverse logic: prejudging the conclusion then selectively finding facts and arguments that support that conclusion
3. Scientific, social, and political perfectionism; let’s not do anything until all uncertainties are removed
4. Cultural differences and distrust among policymakers, practitioners, researchers, interest groups, and the public
5. Funding problems

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. Some differences of opinion are ideological. 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 of the University of Liverpool in England has often 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 in to 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.

We must seek to follow such a science-based approach if we are to resolve the forest ecosystem health and crownfire problems we are confronted with today.

Love of the Land is Good, But not Enough

We all love the land. It's in our genetic makeup. Although love of the land is important, it is not sufficient. Actions based on love alone without adequate knowledge can be devastating. The philosopher Bertrand Russell used a teaching story to illustrate this point. In the Middle Ages when the plague was rampant in Europe, religious leaders urged the population to assemble in churches to pray for deliverance. As a result of so many people being gathered in overcrowded conditions, the plague spread with accelerated rapidity throughout Europe. No one questions the love of the religious leaders for their congregations, but without scientifically based knowledge of how the plague spread, their advice had consequences that were the opposite of their desires for their congregations. This is an example of love without knowledge of the consequences of uninformed action. Today there are many examples of individuals inspired by love of the land, but without sufficient knowledge or time for critical and comprehensive thought who are obstructing meaningful action to restore forest ecosystem health and protect the land and people of the West.

Restoration has Many Benefits

If we overcome these challenges, the benefits of ecological restoration and diligent land stewardship in ponderosa pine and related ecosystems are many and they are sustainable indefinitely

1. It eliminates unnatural forest insect and disease outbreaks
2. It enhances native plant and animal biodiversity
3. It protects critical habitats for threatened or endangered species
4. It improves watershed function and sustainability
5. It enhances natural beauty of the land
6. It improves resource values for humans, not just for current, but also for future generations
7. In cases where a road system is in place and small wood processing facilities are available, the trees removed can often help defray the cost of restoration treatments and provide jobs and income for local communities

We Must Think and Act Big and Start Immediately

We can restore ecosystems but we must act on large scales and act immediately.

1. To restore these degraded ecosystems, it is essential that we restore entire greater landscapes, and do so quickly—time is clearly not our ally.
2. We must do so in a systematic, scientifically rigorous fashion.
3. For protection of structures such as houses, the science seems pretty clear: use fire resistant materials, fire resistant landscaping and don't build too close to heavily fueled landscapes.

4. For protection of watersheds, critical habitat for humans and other animals and plants we have to think much bigger. Here we need to think and act at the scale of greater ecosystems—large chunks of the landscape that include not only wildlands but also embedded human communities. These greater ecosystems typically occur on a scale of 100,000 to 1,000,000 acres.

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.

2. Congress should provide adequate resources to the agencies to maximize comprehensive restoration treatments, not just thinning and burning, but also restoration and rehabilitation of seeps, springs and riparian areas, closure and rehabilitation of unwanted roads, improvement of existing roads to minimize watershed impacts, control of aggressive exotic species and reintroduction of missing native plants and animals.

3. Where ever possible, Congress and the land management agencies should support the 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 jobs and where feasible restoration products; and, assisting to develop new employment opportunities related to restoration.

4. Support the development of science-based restoration treatments.

Conclusion

In conclusion, I suggest that those participating in restoration efforts follow a holistic, systematic approach characterized by clear thinking, local collaboration, and solid knowledge, both of the biophysical system and of the sociopolitical system. Then we need to develop clear objectives for desired resource uses and ecosystem conditions coupled with practical plans for implementing and testing alternative treatments at operational scales. Otherwise, decisions regarding restoration-based fuel treatments will continue to degenerate into ill informed speculation, subjective judgment, bias, ideology, and personal policy preferences.

We are at a fork in the road. Down one fork lies burned out, depauperate landscapes—landscapes that are a liability for future generations. Down the other fork lies healthy, diverse, sustaining landscapes—landscapes that will bring multiple benefits for generations to come. Inaction is taking, and will continue to take, us down the path to unhealthy landscapes, costly to manage. Scientifically-based forest restoration treatments, including thinning and prescribed burning, will set us on the path to healthy landscapes, landscapes like the early settlers and explorers saw in the late 1800s.

Knowing what we now know, it would be grossly negligent for our generation not to move forward with large-scale restoration based fuel treatments in the dry forests of the West. Inaction is clearly the greatest threat to the long-term sustainability of these western ecosystems.

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