SCIENTIFIC RESEARCH AND THE KNOWLEDGE-BASE CONCERNING FOREST MANAGEMENT FOLLOWING WILDFIRES AND OTHER MAJOR DISTURBANCES

OVERSIGHT FIELD HEARING

BEFORE THE

SUBCOMMITTEE ON FORESTS AND FOREST HEALTH

OF THE

COMMITTEE ON RESOURCES
U.S. HOUSE OF REPRESENTATIVES

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C O N T E N T S

OVERSIGHT FIELD HEARING ON SCIENTIFIC RESEARCH AND THE KNOWLEDGE-BASE CONCERNING FOREST MANAGEMENT FOLLOWING WILDFIRES AND OTHER MAJOR DISTURBANCES

Friday, February 24, 2006
U.S. House of Representatives
Subcommittee on Forests and Forest Health
Committee on Resources
Medford, Oregon

The Subcommittee met, pursuant to call, at 1:00 p.m., at the Medford City Council Chambers, 411 West 8th Street, Medford, Oregon, Hon. Greg Walden [Chairman of the Subcommittee] presiding.

Present: Representatives Walden, DeFazio, and Inslee.

Also Present: Representative Baird.

Mr. WALDEN. The Subcommittee on Forests and Forest Health will come to order.

The Subcommittee is meeting today to hear testimony on the scientific research and knowledge base concerning forest management following wildfires and other major disturbances.

Before we open our session, I would like to introduce the fire chief for Medford, who has some words he needs to share with us because of the capacity crowd here. So please join and welcome Fire Chief Dave Bierwiler.

Chief.

Chief BIERWILER. Thank you, Congressman.

Mr. WALDEN. That was right on cue.

Chief BIERWILER. The occupancy limit here, once all the chairs are filled, that's all the people we can have in here. There's an exception that we're going to invoke today. We're going to allow some people to be standing in three of the corners. Because we have such a large crowd, we need to make sure that everyone knows where the exits are. And in that rare event we have an emergency and you have to leave, out this door next to the elevator is a stairwell that goes down to the bottom floor. Do not take the elevator if we should all have to leave. Same thing over here for those of you on this side. There's an elevator out here. There is a stairwell before you get to the elevator. Use the stairwell and go to the bottom of the building in some event we would have to leave.

Thank you.

Mr. WALDEN. Thank you, Chief.

Ladies and gentlemen, please stand for the posting of the colors by the United States Naval Sea Cadet Corps, Higgins Battalion, Central Point, Oregon.

Please be seated.

Thank you very much for your posting of the colors.

STATEMENT OF THE HON. GREG WALDEN, A REPRESENTATIVE IN CONGRESS FROM THE STATE OF OREGON

I want to welcome everyone here today and thank you for attending.

As you know, I've been working for nearly two years with Congressman Brian Baird from Washington State, Stephanie Herseth from South Dakota, Wayne Gilchrest from Maryland, and Bob Goodlatte from Virginia and many other Members of Congress to put together legislation to help land managers more effectively restore forests after catastrophic events such as wildfires, windstorms and hurricanes and ice storms. After holding seven congressional hearings and reviewing thousands of pages of reports, we introduced the Forest Emergency Recovery and Research Act, H.R. 4200.

While some have attacked the bill even before it was drafted, the overall response to the legislation since introduction has been favorable, garnering support from diverse groups such as the International Association of Fish and Wildlife Agencies, the Society of American Foresters, the Theodore Roosevelt Conservation Partnership, the Wildlife Management Institute, former long time Oregon State Forester Jim Brown, Forest Service Chief Dale Bosworth, Department of Interior, Associated Oregon Counties, the Evergreen Foundation, the National Association of Forest Service Retirees, the United Brotherhood of Carpenters and Joiners, and other organizations. There are nearly 150 cosponsors of the bill in the House of Representatives.

And I believe the initial success of the bill has much to do with the high quality of testimony that we have received in previous hearings, which have greatly helped us to draft this legislation. Virtually every provision in the bill came out of testimony from the seven hearings we've had on this topic in this Subcommittee over the last couple of years.

For example, we heard that the public wants to have the ability to participate or comment on potential projects. That's why we require the agencies to allow for public involvement, comment and appeal. This process builds on the successful Healthy Forests Restoration Act.

We heard there's no one-size-fits-all management prescription for treating burned or damaged forests. That's why our bill does not dictate any specific activity such as salvage logging. And let me say that again. The legislation does not mandate any particular activity take place on our forests.

Not only do forest conditions vary greatly from place to place, and our Subcommittee has held hearings all across this country looking at those different places, but catastrophic events such as wildfire act unpredictably, each event requiring a unique response.

Our local land managers and scientists with local knowledge probably have the best ability to prescribe appropriate treatments. The only action we require in this legislation is that the agencies do a rapid evaluation of the area after a major disturbance event. Any actual project or activity after that is up to the discretion of local managers to put forward for public review, comment, and appeal.

We heard that more attention needs to be given to retaining snags and downed woody debris for wildlife habitat and soil stability. That's why we require peer-reviewed research protocols be developed that include the retention of standing dead and downed trees and why we require that the agencies provide guidance to the field for updating their management plans concerning dead tree retention and other restoration activities.

We heard repeatedly that management objectives as stated in forest plans need to be guidance for all restoration activities. That's why we require that all management actions following a catastrophic event comply with that area's forest plan and be compliant with all environmental laws. If logging is prohibited for an area in a forest plan, then nothing in our legislation would change that.

We heard from numerous scientists and managers that if the Forest Service or the Bureau of Land Management decided they wanted to harvest and reforest after a catastrophic event, then it was essential that they move quickly while there was still value in the trees and while reforestation was most likely to be successful. This is why we provided expedited procedures and timelines so the agencies could be more responsive and move quicker, better mimicking more successful state and tribal forest practices. And we've heard from both states and tribes on different land management strategies and results.

The Government Accountability Office told us that there was nearly a million acres backlogged of reforestation needs on America's forests, almost all of which resulted from catastrophic events. That's why our bill provides better guidance and more funding for restoration and other reforestation work.

We heard and we have observed that more scientific research is needed on post-disturbance forest management. While there is a tremendous amount of practical knowledge that's been built from decades, if not centuries, of trial-and-error forest management following fire and other events, there's not a large amount of actual peer-reviewed science on the issue of how best to manage our forests after catastrophic events. That's why a major part of this legislation is dedicated to developing and funding scientific research with university partners and other qualified organizations. To insure the quality of such research, we require that it be subject to independent, third-party peer review. And to make sure that it's funded, we are modifying the bill that was first introduced a month or two ago to include a guaranteed stream of revenue.

All of us in this room today are aware that post-fire scientific research has become a hot item, if you'll excuse the pun, especially in recent months. Too often it's sometimes hard to see the real science through the political smoke.

In particular, a short-term study that was recently published in the journal Science has been touted by a few as the definitive and final say on the effects of post-fire harvest. And while I believe that

most reasonable people recognize that no single study provides all or even most of the answers, each one, however, does offer some insight and does help broaden our understanding and base of knowledge about what happens in these forests after an event. I agree with my colleague Mr. Udall, the Ranking Democrat on this Subcommittee, that we as members of this committee and others who are interested could benefit by actually hearing from the researchers about their research, their findings, their protocols. And that's what brings us here today.

Likewise, it's important that we all remember that academic freedom is a crucial element of open scientific discourse. Researchers have an obligation to follow agreed upon protocols and sound scientific and ethical principles while policymakers have an obligation to give researchers the support and freedom to engage in their work, regardless of whether or not their findings agree with anybody's political agenda. More information, more scientific research can only help us achieve the common goal of better forest and habitat stewardship.

At the same time we need to recognize that science is not the final arbiter of forest management. Many societal values that are cultural or economic, for example, must also be considered in management decisions. As Dr. Jerry Franklin, whom we'll hear from later this afternoon, has told this Subcommittee before, science can help managers to make more informed decisions, but the decisions are societal choices.

So today we're here to look at the level of knowledge concerning post-disturbance forestry. What does the most recent science tell us? How do we prioritize and fund more and better research? How well is science applied by land managers and how can this be improved? Or, in other words, what do we know? How do we know it? And how do we apply it?

[The prepared statement of Mr. Walden follows:]

Statement of The Honorable Greg Walden, a Representative in Congress from the State of Oregon

Welcome everyone and thank you for attending:

As you know, I've been working for nearly two years with Congressmen Brian Baird from Washington, Stephanie Herseth from South Dakota, Wayne Gilchrest from Maryland, Bob Goodlatte from Virginia, and many other Members of Congress to put together legislation to help land managers more effectively restore forests after catastrophic events such as wildfires, windstorms, hurricanes and ice storms. After holding seven congressional hearings and reviewing thousands of pages of reports, we introduced the Forest Emergency Recovery and Research Act, H.R. 4200.

While some attacked the bill before it was even drafted, the overall response to the legislation since introduction has been very favorable, garnering support from diverse groups such as the International Association of Fish and Wildlife Agencies, the Society of American Foresters, the Theodore Roosevelt Conservation Partnership, the Wildlife Management Institute, former Oregon State Forester Jim Brown, Forest Service Chief Dale Bosworth, the Department of the Interior, Associated Oregon Counties, the Evergreen Foundation, the National Association of Forest Service Retirees, the United Brotherhood of Carpenters and Joiners, and many additional conservation and local government organizations. The bill has strong bipartisan support with nearly 150 cosponsors in the House.

I believe that the initial success of the bill has much to do with the high quality of testimony we received in previous hearings, greatly helping to guide us as we drafted the legislation. Every provision in the bill came out of testimony or research findings.

For example, we heard that the public wants to have the ability to participate or comment on potential projects; that's why we require that the agencies allow for

public involvement, comment and appeal. This process builds on the successful Healthy Forests Restoration Act.

We heard that there's no one-size-fits-all management prescription for treating burned or damaged forests; that's why our bill does not dictate any specific activity, such as salvage logging. Let me say that again. Our bill does not mandate salvage logging.

Not only do forest conditions vary greatly from place to place, catastrophic events such as wildfire act unpredictably, each event requiring a unique response. Only local managers and scientists, with local knowledge, have the ability to prescribe appropriate treatments. The only action we require in our bill is that the agencies do a rapid evaluation of the area after a major disturbance event; any actual project or activity after that is up to the discretion of local managers.

We heard that more attention needs to be given to retaining snags and downed woody debris for wildlife habitat and soil stability; that's why we require peer-reviewed research protocols be developed that include the retention of standing dead and downed trees, and why we require that the agencies provide guidance to the field for updating their management plans concerning dead tree retention and other restoration issues.

We heard repeatedly that management objectives as stated in forest plans need to guide all restoration activities. That's why we require that all management actions following a catastrophic event comply with the area's forest plan, and be compliant with all environmental laws. If logging is prohibited for that area in the forest plan, then nothing in our legislation changes that.

We heard from numerous scientists and managers that if the Forest Service or BLM decide they want to harvest and reforest after a catastrophic event then it is essential that they move quickly while there is still value in the trees and while reforestation is most likely to be successful. This is why we provide expedited procedures and timelines so the agencies can be more responsive and move quicker, better mimicking more successful state and tribal forest practices.

The Government Accountability Office told us that there was nearly a million-acre backlog of reforestation needs on our national forests—almost all of which results from catastrophic events; that's why our bill provides better guidance and more funding for reforestation and other restoration work.

We heard and observed that more scientific research is needed on post-disturbance forest management. While there is a tremendous amount of practical knowledge that has been built from decades, if not centuries, of trial and error forest management following fire and other events, there is not a large amount of actual peer-reviewed science on this issue. That's why a major part of our bill is dedicated to developing and funding scientific research with university partners and other qualified organizations. To insure the quality of such research, we require that it be subject to independent, third-party, peer-review.

All of us in this room today are aware that post-fire scientific research has become a very hot item (pardon the pun), especially in recent months. Too often it's hard to see the real science through the political smoke.

In particular, a short-term study that was recently published in the journal Science has been touted by a few as the definitive and final say on the effects of post-fire harvest. While I believe that most reasonable people recognize that no one study provides all or even most of the answers, each one however does offer some insight and helps to broaden our base of knowledge. I agreed with my colleague Mr. Udall that the Subcommittee members could benefit by actually hearing from the researchers about their research, their findings and the protocols they followed.

Likewise, it is important that we all remember that academic freedom is a crucial element of open scientific discourse. Researchers have an obligation to follow agreed upon protocols and sound scientific and ethical principles, while policy makers have an obligation to give researchers the support and freedom to engage in their work, regardless of whether or not the findings of that research agree with anyone's political agenda. More information, more scientific research can only help us achieve the common goal of better forest and habitat stewardship.

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So today we are here to look at the level of knowledge concerning post-disturbance forestry—what does the most recent science tell us? How do we prioritize and fund more and better research? How well is science applied by land managers and how can this be improved? Or in other words: What do we know? How do we know it? And how do we apply it?

Mr. WALDEN. Now, before I ask other Members for their opening remarks, I ask unanimous consent that Representative Brian Baird of Washington have permission to sit on this dais and participate in the hearing. Hearing no objection, it is so ordered.

Now, I would like to welcome my neighbor, my colleague, and my friend from the Fourth District of Oregon, Peter DeFazio, for an opening statement.

STATEMENT OF THE HON. PETER DeFAZIO, A REPRESENTATIVE IN CONGRESS FROM THE STATE OF OREGON

Mr. DEFAZIO. Thank you, Mr. Chairman. I really appreciate your providing us this opportunity. I am always pleased to be able to try and make policy and understand things here at home as opposed to inside the Washington, D.C. Beltway, which seems to be a different reality.

You know, I think there's substantial grounds for agreement here. I mean 40 years ago we were telling people operating logging shows to get all those logs out of the stream, and we paid them to do it in fact. Then we figured out that no, actually structure in the stream is really important, and now we pay people to put logs in streams, or we require it. In the case of the site we visited this morning involving private lands, a condition of their post-fire efforts on their property with—where substantial salvage logging was conducted was to also put structure in the stream and protect the stream as best they could against sedimentation with other—with other methods.

So I think when we say we don't know everything we should know or need to know, it's really true. I mean it's a lot like the Woody Allen movie where they find out 50 years from now that chocolate really is really good for you and we should all be eating a lot more of it. You know, we don't know everything we need to know. So that's—that's absolutely key.

As a policymaker, you know, we ultimately—and I think people need to understand this—we need to be informed by the science, but the science is never going to be definitive because there are social choices to be made once we have the science. Once we understand the range of options that are available for post-catastrophic event recovery, as policymakers we have to decide where on the spectrum you're going to fall. You know, do you—and it depends to a great deal upon the classification of that land that—going into the fire. The private land we saw this morning, they want to maximum timber production. That's their right under state forest practices, and that's how they conduct their activities.

On the Federal land it becomes a more complex issue, and that's where the U.S. Congress and particularly this committee comes in. You know, what was the classification of that land? What was the intention for the future? What objectives do we want to accomplish with that? Which could require more or less intervention after an event.

And not all land will be treated the same, as the Chairman said. You know, lands that were intended to, you know, continue basically totally unmanaged, such as wilderness areas, will be left as wilderness areas. But there are a lot of other Federal lands in the gray area, and then the overlay of the Clinton forest plan, editorial

comment, of which I was not a big fan, end of editorial comment, you know, really complicates things here in the Pacific Northwest, particularly when it comes to the issue of late successional reserves. Many late successional reserves are not what people would envision. They're not a bunch of big old trees that we've draw a line around. Some of them are actually quite young tree plantations, many of them overstocked, that they drew lines around in the idea or hope that some day they might be old growth. But in some cases where man has interfered, then man is going to need to carefully manage to move back toward what we think was a natural state.

And that's why we're here today, to hear from a range of opinions on science, you know, and try and become better informed, because we're going to make policy. We're going to try and make it in the most informed manner possible. And, you know, our job is to understand the implications of what we're doing. We won't always agree totally on the objectives, but we need to know where we're leading with any legislation we might impose.

So thank you, Mr. Chairman.

Mr. WALDEN. Thank you, Mr. DeFazio.

Mr. Inslee from Washington State, thanks for coming down and joining us in your participation in our Subcommittee every time. So welcome and your opening remarks.

STATEMENT OF THE HON. JAY INSLEE, A REPRESENTATIVE IN CONGRESS FROM THE STATE OF WASHINGTON

Mr. INSLEE. Thank you. Thanks for letting me join you. I spent three years up in Salem and I just love this country, and I appreciate you letting me join you.

We share something. We share in Washington your national forest, and you share ours up in here. And I think we equally love and care for each.

I really appreciate Mr. Walden holding this hearing. And I was thinking about sort of why we're here today, and I came across a quote I wanted to share that—it says it's from some old social commentator. He says: "It's not what we don't know that gets us into trouble; it's what we think we know that just ain't so that's the problem."

And now the only problem is I can't remember whether that was Will Rogers or Yogi Berra or Mark Twain. But it still applies no matter who it was.

And I think it's kind of a comment, as Peter suggested, that getting to the bottom of the science and the new science is very important. That's why I appreciate Mr. Walden's holding this hearing.

I also appreciate his efforts to have reinstated this study that has been in the news lately out of OSU, to get that research going again. And I think that's important to clear the decks, because I think we all agree on a hopefully bipartisan basis that censorship is not going to be an effective way for us to get to the bottom of the science associated with this.

If there are critiques of science, it's important that we all look at the critiques, but let's get the information out so we can all have a healthy debate. So I appreciate Mr. Walden's efforts in that regard.

I wanted to make just a comment what I think about the big issues here. I think it's important to say. One is during our discussion today I hope we will—we will focus on the difference between replanting and salvage logging of standing dead timber. And the reason I say that is in discussions with my constituents I found a lot of confusion about that, that people sort of just wash them all together. And I hope during our discussion we will segregate revegetation replanting from the issue of whether or not we remove standing dead timber. I think if we focus on that difference that will help in our discussion.

Second thing is that I hope that we'll also focus on the fact that we have different values about what we want to see the forest do. And all of them that are sincere, we got to work out as a community which ones we want to follow. Some are economic. Some ecosystem. Some are simply aesthetic. And I hope we focus on the difference between those.

Having said that, I wanted folks to know Tom Udall, Ranking Member in our committee, and I have also submitted a bill. It is designed to do some of the things that Mr. Walden and Mr. Baird would do, which is to enhance and improve our scientific understanding of things in the forest. And we take a little different approach how to do that.

I wanted to comment on three things just so the witnesses might address themselves to this. I do have some concerns about Mr. Walden and Mr. Baird's bill that I wanted to address.

One, I am concerned that the bill as drafted today would reduce the degree of scientific inquiry on the specific proposals, management proposals we have for these forests. What we have learned is we have made collectively on a bipartisan basis enormous mistakes in the forest, starting with Yogi Bear who taught us to put out all forest fires and now we have thick forests as a result.

Peter suggested some of the other——

Mr. DEFAZIO. Smokey the Bear, not Yogi the Bear.

Mr. INSLEE. Smokey the Bear, not Yogi the Bear.

Mr. DEFAZIO. Yogi the Bear, Smokey the Bear.

Mr. INSLEE. Well, you know, actually——

Mr. WALDEN. That was clearly a partisan thing there.

Mr. INSLEE. There's a certain irony because actually Yogi the Bear had better scientific advice, actually.

Mr. DEFAZIO. He had better food.

Mr. INSLEE. He had better food, yeah.

Thank you for that editorial comment. I appreciate that, Peter. I know that didn't sound right.

But we made mistakes. And one of the mistakes we've made is not doing enough science when we make these decisions. And I am concerned about the underlying bill would in its noble effort to reduce the time period to make decisions reduce the available science that is available to decisionmakers to make these decisions. And I hope that as this thing moves forward that we can find a way to have adequate scientific inquiry, including following the standards and the rigorous science involved in the EIS process and somehow to meet that standard before we make management decisions here.

Second, I'm concerned that the bill would essentially severely damage the roadless area policy that we have adopted, or at least

many of us believe have adopted in this country, that 96 percent of the public wants to see these roadless areas respected. There—we have found it's very rare to find something called a really temporary road because we have a ten billion dollar backlog of decommissioning roads already. So I'm very concerned in that respect.

Third, I think all of us need to be concerned of lack of funding to do any of these mandates of the Forest Service. It doesn't matter how brilliant any of us are on this panel to adopt a statute involving this unless we provide these agencies the funding to get these jobs done. They're simply not going to be able to get the job done. In fact, they are being starved. They can't meet their legitimate obligations they have today. And until that focuses, until we have a higher priority in funding the Forest Service rather than tax cuts in this country, we're not going to get this job done.

Thank you, Mr. Walden.

Mr. WALDEN. Thank you, Mr. Inslee. Thanks for joining us.

And now I'm pleased to welcome another Congressman from the great State of Washington. It's a great state. Not quite as great as Oregon, but, you know, kind of carved it out of our side. Brian Baird from the Fourth District, right?

Mr. BAIRD. Third.

Mr. WALDEN. Third District of Washington State. Welcome.

STATEMENT OF THE HON. BRIAN BAIRD, A REPRESENTATIVE IN CONGRESS FROM THE STATE OF WASHINGTON

Mr. BAIRD. Thank you, Mr. Walden.

I want to thank the Chairman and all of you for being here. This is obviously an important issue. I am pleased to have worked with your congressman, Greg Walden, on this legislation. And I'll tell you why I do.

I represent a district that is one of the ten most forested districts in the entire country. Thousands of people depend on forest products for their livelihood, and at the same time there are many people there who care very passionately, as do I, about protecting and preserving the environment.

The hearing today was called by our friend and colleague, Mr. Udall, in order to address the recent study by Mr. Donato. And regarding that study, I must tell you that I am actually quite disappointed. And I'll tell you why I'm disappointed.

A little bit about my background. Before I worked in this job, I chaired the Department of Psychology at Pacific Lutheran University. I hold a doctorate and taught statistics and research methods.

I want to be absolutely blunt. I have placed a high premium on scientific integrity. I have risked my political career on votes defending scientific integrity. I have spoken out and written repeatedly on the importance of scientific integrity. And I would tell you that I believe scientific integrity is a two-way street.

My judgment is that in this case Mr. Donato, the journal Science, and the reviewers of this article did not do their job. I'll articulate why in a moment, but I will tell you that quite frankly I don't think that this——

Mr. WALDEN. Can you hold on one second.

I just want so the audience knows, the protocols in our hearings are not to have audience reaction.

Mr. BAIRD. But if you're going to react, applause beats the heck out of laughter.

Mr. WALDEN. A little laughter is fine. But just so we set the parameters.

Mr. BAIRD. I appreciate that, Mr. Chairman.

I am also disappointed because I sought sincerely in preparation for this hearing to examine the study pretty carefully. That's why we're having the hearing. If we're going to put forward scientific studies and suggest that they should inform public policy, it's incumbent on the authors of those studies and on those of us who would consume it to carefully look at the design and the conclusions that they're drawing.

I repeatedly asked Mr. Donato for his raw data and was repeatedly denied that request. Now, you should know that your taxpayer dollars funded this study. Frankly, studies should let the chips fall where they may as far as what the outcome is. But to suggest that a fellow scientist, which I consider myself, and a representative of the people, the taxpayers who fund your studies, should not have access to the data to evaluate the merits or demerits of your study I think is absurd and beyond what I think.

The policies of Science magazine itself are as follows:

When a paper is accepted for publication in Science, it is understood that any reasonable request for materials, methods, or data necessary to verify the conclusions of the experiment must be honored. As a condition of publication, authors must agree to honor any reasonable request for materials and methods necessary to verify the conclusion of experience—experiments reported and must agree to make the data upon which the study rests available to the community in some form for purposes of verification and replication.

Now, on our side of the aisle, the Democratic side, we have repeatedly and I think rightfully challenged the administration to provide information on everything from how they developed their energy policy to pre-Katrina information to pre-9/11 information. And yet when I asked a very simple request of an individual who has offered a study up to inform public policy to give me his data, that's been rejected. Data that were funded, the collection of which was funded by the taxpayers. So I am to say the least disappointed by that.

Mr. Chairman, as I mentioned before, scientific integrity goes both ways. We have not only a right but a responsibility to carefully evaluate not only this particular study but the entire breadth of studies.

Today we had the opportunity, this group and a host of others, to go visit real world sites, not in the abstract, not in some photo, but a real world site where you had seen post-fire logging and reforestation and post-fire situation where there was no harvest.

We have data to inform this debate. There is no such thing as the science says logging always harms restoration. Scientists will tell you that it depends on the nature of the fire. It depends on the nature of the vegetation. It depends on the goals of the purpose of the land. It depends on what you would replant and why and how you would do it and importantly, vis-a-vis this study, when you would do it.

So the notion that one position exists on this I think is specious. And I'm proud that as part of our legislation we've included extensive discussion of including science and preapproved management plans and in funding science, further scientific research as part of actual harvest efforts.

So I thank the Chairman for convening this and look forward to actually getting some serious discussion of a study and of the broader issue.

Mr. WALDEN. Thank you, Mr. Baird. I appreciate working with you and appreciate you having the opportunity to come and sit with our Subcommittee today. It is helpful to have somebody who actually taught statistics as well as understands them be on our panel.

Mr. BAIRD. Well, that's not necessarily synonymous.

Mr. WALDEN. I know. We appreciate it.

We'd like to—OK. Now we go into the—just so the audience knows, we'll invite our witnesses up to present their findings to us, and then we'll each have an opportunity on the Subcommittee to ask questions.

If our witnesses would make their way up over here, I'll read a little about your background as you make your way up.

Dr. Stephen D. Hobbs is the Executive Associate Dean, College of Forestry at Oregon State University. Dr. Hobbs has been on the faculty for 28 years. He has a Bachelor of Science in Forest Management from the University of New Hampshire, a Ph.D. in Forestry Science from the University of Idaho. He's a Fellow in the Society of American Foresters and is currently Chair of the Oregon Board of Forestry.

Dr. Cynthia West, Acting Director, Pacific Northwest Research Station, has oversight responsibilities for research programs across ten laboratories and eleven experimental forests in Alaska, Washington and Oregon. She acts as a liaison between the Pacific Northwest Research Station and land management agencies in the region. Prior to joining the PNW Station in 2002, Dr. West led a comprehensive program in forest products research, education, and technical assistance as Department Head of Forest Products at Mississippi State University. Prior to her appointment with MSU, Dr. West served for nine years with the USDA Forest Service in the Northeastern Research Station as a Researcher and Project Leader. She was co-located at the Forestry Sciences Lab in Princeton, West Virginia and Virginia Tech in Blacksburg, Virginia, where she served as an Adjunct Faculty in the Wood Science Department.

Dr. Dave Peterson, Fire Ecologist, USDA, has been engaged in forest and ecology research for more than 25 years after receiving his Ph.D. in Forest Ecology from the University of Illinois. He has worked with the USDA Forest Service's Fire Management Planning Research Work Unit and Atmospheric Deposition Effects Research Work Unit, the U.S. Geological Survey's Cascadia Field Station and, currently, at the USDA Forest Service's Pacific Northwest Research Station with the Fire and Environmental Research Applications Team. That's a mouthful. He's been a Professor at the College of Forest Resources at the University of Washington since 1989.

Daniel Donato, Graduate Student, Oregon State University. Mr. Donato is a graduate student in the Forest Sciences Department at Oregon State University. He earned a Bachelor of Science degree from the University of Washington in forestry and has about a decade of experience in forest and fire ecology. He's been collecting field data on the ecosystem response to the Biscuit Fire in southwestern Oregon for approximately three years.

Dr. Peter F. Kolb, Montana State University Extension Forestry Specialist; Adjunct Professor of Forest Ecology, College of Forestry and Conservation, University of Montana. Dr. Kolb earned his Ph.D. from the University of Idaho in forest and range ecophysiology, his M.S. from Idaho in silviculture, and his B.S. in Forestry from Michigan State University. His past research emphasis includes the effects of heat and water stress on conifer seedling establishment, the role of soil characteristic, forest pests, pathogens and wildfire on forest succession dynamics, the impacts of forest thinning on root diseases, woody debris treatments and their effects on forest and range restoration, cultural practices to enhance woody debris decomposition, and plant community recovery following wildfires and salvage logging. During the past six years he has worked extensively with wildfire-affected private forest landowners in both assessing fire impacts as well as developing restoration treatment guidelines.

And Ted Lorensen, Assistant State Forester, Oregon Department of Forestry. Mr. Lorensen is currently Assistant State Forester for the Department of Forestry's Resource Policy Division. In this role he oversees the Forest Resources Planning and Private and Community Forests Program. He received a Bachelor of Science in Forest Management from the University of Washington in 1977 and has been employed by the Oregon Department of Forestry since then. Past positions within the Department have included a range of field and staff posts, including forest practices forester, protection from fire program staff, policy analyst/land use planning coordinator, and forest practices program director.

I have one thing I need to take care of here.

Now then, if you would all please stand and raise your right hand and repeat after me. We'll swear you in for the testimony you're going to give today.

[Witnesses sworn.]

Mr. WALDEN. Let the record show they all indicated affirmatively. Please be seated.

Now, let me remind our witnesses that, under the Rules of the Committee, you must limit your oral statements to five minutes, but as you know your entire statements will appear in our hearing record.

So we welcome all of you, and we have your testimony. And we appreciate the work you've put into providing us with your insights into these issues.

I'd like to now start by recognizing Dr. Hobbs for his statement. Dr. Hobbs, welcome. Thank you for joining us today.

And just one mike check issue. If the light is on, your mike is off. If the light is off, your mike is on. So you want them lit if you don't want to be heard.

STATEMENT OF STEPHEN D. HOBBS, EXECUTIVE ASSOCIATE DEAN, COLLEGE OF FORESTRY, OREGON STATE UNIVERSITY

Mr. HOBBS. Well, good afternoon, Chair Walden and Members of the Committee. My name is Steve Hobbs, and I'm the Executive Associate Dean of the College of Forestry at Oregon State University.

Mr. WALDEN. You might pull that just a little closer I think.

Mr. HOBBS. Can you hear me OK now.

Mr. WALDEN. That's better.

Mr. HOBBS. During my career as an OSU faculty member, I have had the very good fortune to have been stationed right here in Medford as a leader of an interdisciplinary team of scientists working on reforestation problems in southwest Oregon.

What I'd like to do this afternoon is briefly describe the program that I worked on while I was here in Medford, because I think it has applicability to the subject of this hearing. I'll also summarize some of the broader findings of the program and make recommendations about how to develop the knowledge base necessary to address post-wildfire restoration issues.

Now, in 1978 the Forestry Intensified Research Program, commonly referred to as the FIR Program, if you will, was formed to find solutions to the region's widespread reforestation problems associated with timber harvest and brush field reclamation. Now, this was a cooperative interdisciplinary and interagency program that integrated fundamental and applied research with an intensified outreach education program.

Now, one of the very unique aspects of this program was assigning an interdisciplinary team of OSU scientists to actually live and work in southwest Oregon. And this I think is a very important point and one of the reasons why this program was so successful.

Now, the FIR Program was conducted over a 13-year period of time and involved probably more than a hundred studies. The FIR Program was highly successful in addressing the reforestation problems of the region.

Now, what I'd like to do now is summarize some of the key results from this very extensive research and outreach education effort. Some of the more important findings were:

First, that most of the forest lands can be successfully reforested with planted seedlings following timber harvest and site preparation, and included in that is prescribed fire, or brush field reclamation.

Second, successful reforestation requires achieving certain standards in a carefully choreographed sequence of events appropriate to site conditions and the management objectives to be achieved for those lands.

Third, the landscape and environmental conditions are highly variable in space and time. Thus treatments must be tailored to fit site conditions to achieve management objectives.

Fourth, competition from woody and herbaceous plant species well adapted to site conditions can delay stand development.

Fifth, if intervention is necessary to achieve management objectives, the timing and sequence of operations is crucial. Delays in particular can often have unintended consequences, for example,

competition from associated vegetation or logging damage to regeneration.

And, finally, establishing an interdisciplinary team of scientists and educators in the problem area on a year round basis greatly enhanced the applicability of the research to management problems and the acceptance and implementation of new knowledge by practitioners.

Now, given the current threat of wildfire and the need for better information about post-wildfire restoration, salvage logging, and other effects these practices have on resource values, it is of—this is of critical importance.

To develop the knowledge base that will provide resource managers and policymakers with credible information upon which to base decisions both they and the public can have confidence in, I'd like to make the following four recommendations to the Subcommittee.

First, establish a long-term research and outreach education program that is specifically focused on post-wildfire restoration, including salvage logging.

Second, insure that universities and Federal agencies are full partners in this program. Universities are uniquely equipped to provide a broad range of interdisciplinary expertise and research and outreach education, and university involvement would also provide the training for the next generation of forest resource scientists and managers to better deal with these problems that we face.

Third, use the FIR model as a basis for this program. Integrating fundamental and applied research with outreach education, using interdisciplinary teams stationed in the geographic problem areas creates huge advantages over the traditional research and outreach education model and greatly speeds the transfer of new information to decisionmakers.

And my final point. Sufficient flexibility should be built into the planning and management of Federal forests to permit the kind of rigorous scientific experimentation needed to generate credible, scientifically sound information for policymakers and resource managers.

Thank you very much for providing me with an opportunity to testify before this Subcommittee today.

[The prepared statement of Mr. Hobbs follows:]

Statement of Stephen D. Hobbs, Executive Associate Dean, College of Forestry, Oregon State University

The occurrence of wildfire is a major forest health issue facing resource managers and policy-makers throughout the western US. In Oregon the hazard is particularly severe on overstocked federal forestlands. Management actions surrounding post-fire restoration activities, including salvage logging, are controversial and often the subject of heated debate and litigation. Frequently these situations are characterized by lengthy delays of management actions which sometimes result in unintended consequences. A major contributing factor is the lack of credible information about the effects on resource values of post-wildfire restoration practices, including salvage logging that might be used to achieve management objectives. Although a great deal is known about subjects such as reforestation, it is clear adequate information is still not available. To build the knowledge base necessary for managers and policymakers to have a wider range of options and greater confidence in the decisions they make and to gain public trust, a significant research and outreach education effort is required. We need search no further than southwestern Oregon to find an

example of what can be accomplished when leaders have a vision and take action to solve a serious forest resource management problem.

For many years forest managers in southwestern Oregon were plagued by serious reforestation problems following timber harvest. In the 1970s this resulted in the USDI Bureau of Land Management withdrawing significant acreage from the allowable cut land base. As a result, federal agencies, the forest industry, and county governments approached Oregon State University (OSU) about forming a new research and outreach education program focused on finding solutions to the reforestation problems. In 1978 the Forestry Intensified Research (FIR) Program was launched. This program integrated fundamental and applied research with outreach education. The FIR Program was conducted cooperatively by scientists from the OSU College of Forestry and the USDA Forest Service Pacific Northwest Research Station. Researchers based in Corvallis and Medford worked closely with local managers and resource specialists to address critical questions related to the reforestation problems. An important and innovative aspect of the program was the location of an interdisciplinary team of OSU scientists in Medford for the duration of the program (1978-1991) to conduct research and outreach education programs. When the FIR Program was completed in 1991, new information had been developed from more than 100 studies spanning 13 years. These studies conclusively demonstrated the vast majority of forestland could be reforested. This information was summarized in the book Reforestation Practices in Southwestern Oregon and Northern California published in 1992. [1]

Although post-wildfire restoration and salvage logging were not the focus of the FIR Program, much of what was learned does have applicability. For example, in southwestern Oregon it is clear that:

1. Lands can be successfully reforested with planted seedlings following timber harvest, site preparation (including prescribed burning) or brush field reclamation.
2. Successful reforestation requires achieving certain standards in a carefully choreographed sequence of events appropriate to site conditions and the management objective(s) to be achieved.
3. The landscape and environmental conditions are highly variable in space and time. Thus treatments must be tailored to fit site conditions to achieve management objectives.
4. Competition from woody and herbaceous species well-adapted to site conditions can delay stand development.
5. If intervention is necessary to achieve management objectives, the timing and sequence of operations is crucial. Delays in particular can often have unintended negative consequences (e.g., competition from associated vegetation, logging damage to regeneration).
6. Establishing an interdisciplinary team of scientists and educators in the problem area on a year round basis greatly enhanced the applicability of the research to management problems and the acceptance and implementation of new knowledge by practitioners.

Despite the many achievements of the FIR Program, it did not directly address questions related to post-wildfire restoration per se or salvage logging and although some work was done on natural regeneration, this was a relatively small part of the program. Given the current threat of wildfire, the need for better information about post-wildfire restoration, salvage logging, and the effects these practices have on resource values, is of critical importance. To develop the knowledge base that will provide resource managers and policy makers with credible information upon which to base decisions both they and the public can have confidence in, the following steps are recommended.

1. Establish a long-term research and outreach education program specifically focused on post-wildfire restoration, including salvage logging.
2. Insure that universities and federal agencies are full partners in the program. Universities are uniquely equipped to provide a broad range of interdisciplinary expertise in research and outreach education. University involvement would also provide for training the next generation of forest resource scientists and managers to better deal with these problems.
3. Use the FIR model as the basis for the program. Integrating fundamental and applied research with outreach education using interdisciplinary teams stationed in the geographic problem areas creates huge advantages over the

[1] Hobbs, S.D., S.D. Tesch, P.W. Owston, R.E. Stewart, J.C. Tappeiner II, and G.E. Wells. Eds. 1992. Reforestation Practices in Southwestern Oregon and Northern California. Forest Research Laboratory, Oregon State University, Corvallis, Oregon. 465 p.

traditional research and outreach education model and greatly speeds the transfer of new information to decision-makers.

4. Sufficient flexibility should be built into the planning and management of federal forests to permit the kind of rigorous scientific experimentation needed to generate credible, scientifically sound information for policy makers and resource managers.

Mr. WALDEN. Thank you, Mr. Hobbs, for being here, Doctor. We appreciate your comments and the work that you do.

I now recognize Dr. West for her statement.

Good afternoon. Welcome. We look forward to hearing your comments.

STATEMENT OF CYNTHIA WEST, ACTING DIRECTOR, PACIFIC NORTHWEST RESEARCH STATION; ACCOMPANIED BY DAVID PETERSON, TEAM LEADER, FIRE AND ENVIRONMENTAL RESEARCH APPLICATIONS TEAM

Ms. WEST. Thank you, Mr. Chairman and members of the Subcommittee, for the opportunity to talk to you today about scientific research concerning forest management following wildfires and other major disturbances.

I am Dr. Cynthia West. I'm Acting Director of the Pacific Northwest Research Station. And I would like to summarize my remarks, and you have my written testimony submitted for the record.

I'm accompanied here today by Dr. David Peterson, who is the Team Leader of our Fire and Environmental Research Applications Team at the Pacific Wildland Research Fire Sciences Laboratory in Seattle, Washington. Dr. Peterson will be able to answer more specifically your questions about current and ongoing post-fire management research.

First, I would like to talk a little bit about the role of science, the process of scientific debate and discourse within our science community, and the role of science in land management decisionmaking.

Scientists help managers interpret what they're seeing on the ground and help evaluate the environmental effects, social and economic costs and benefits, and the effectiveness of potential management programs and activities toward reaching some set of management objectives.

For example, many managers in recent fire seasons have reported dramatic reductions in fire spread and intensity as fires entered stands that have been thinned or previously burned. In recent years research results from carefully designed scientific studies on a number of sites has supported and actually added specificity to these observations.

We know that the scientific basis for land management decisionmaking is more complete for some areas than for others. We acknowledge that we have much to learn. There are important knowledge gaps that exist that we should and must address.

Scientific research is a process of building knowledge study by study. As we are able to integrate results from multiple studies, we increase our understanding of where responses differ and where they can be generalized. Scientists' ability to provide information will aid decisionmakers in the future.

Information and technology produced through basic and applied science programs, like the Forest Service Research and Development programs and our partners, can be found on our Forest Service Web site and publications and through other sources.

Scientists through the peer review process and often vigorous discussion seek to continually evaluate and improve the scientific body of evidence and the strength and range of applicability of their conclusions and results. Results are affected by the specific geographic area or forest type, variability in weather and climate conditions, and variability in the way management treatments are applied. Active discussion and debate within the science community can help sort out the reasons for differences in results and help build scientific consensus on important issues. To external observers, this debate can be seen as an argument for or against a certain management practice or policy. But the best scientific debates lead to refinements in our understanding, new research to answer remaining questions, and better information for managers. Scientific debates are focused on competing results or differences in possible explanations or theories for those results. This contrasts with public policy debates, which often derive from different philosophies of the role of government or of the desired social outcomes.

Management of fire and the effects of fire on the landscape raises many questions of policy in addition to the questions of science. Although policy questions may often be framed as science questions, many nonscientific considerations, such as societal goals, current law, economics, must be part of the answer to these policy questions. And while science can provide a solid foundation for management and policy decisions, science alone is not sufficient to determine policy.

Adaptive management by land managers is a useful tool that combines emerging research with evaluation of management practices. This approach enables managers to modify practices as our understanding of management impacts and opportunities improve.

While many managers and scientists consider post-fire logging as part of a suite of appropriate restoration techniques after wildfire, others argue that it causes damage to burned sites sufficient to outweigh potential benefits. These discussions have often been carried on with a notable absence of balanced evaluation of the available science. Some of these arguments have at their root different core philosophies on what constitutes appropriate management. Managers and policymakers need the best possible information presented in an unbiased manner to support them in developing sound and supportable recommendations for post-fire management activities. The appropriate role of science is to provide such information while avoiding participating in policy or political debates.

Thank you for the opportunity to discuss with you the role of science in management decisionmaking and policy development. Dr. Peterson and I will be happy to answer any questions you may have.

Thank you.

[The prepared statement of Ms. West follows:]

Statement of Dr. Cynthia West, Acting Station Director,
Pacific Northwest Research Station, USDA Forest Service

INTRODUCTION

Mr. Chairman and Members of the Subcommittee:

Thank you for the opportunity to talk to you today about scientific research concerning forest management following wildfires and other major disturbances.

I am Dr. Cynthia West, Acting Director of the Pacific Northwest Research Station. The Station is one of eight research facilities in the Research and Development branch of the USDA Forest Service. These facilities collectively conduct the most extensive and productive program of integrated forestry research in the world. Our mission is to synthesize and communicate scientific knowledge that helps people understand and make informed choices about society, natural resources, and the environment. Our researchers work with a range of partners including scientists in other agencies, universities, nonprofit groups, and industry as well as community groups and state, local, and federal land managers. The information and technology produced through basic and applied science programs are available to managers, policy makers, and the public through many outlets.

The headquarters for the Pacific Northwest Research Station is in Portland, Oregon. The Station has 10 laboratories located in Alaska, Oregon, and Washington and employs about 95 scientists, and 400 technicians and support staff. Our research program includes studies on impacts and management of disturbances such as fire; interactions between upland management and aquatic systems; forest inventory and analysis, and social and economic impacts of resource management.

I am accompanied today by Dr. David L. Peterson, team leader of the fire and environmental research applications team at our Pacific Wildland Fire Sciences laboratory in Seattle, Washington. Dr. Peterson will be able to answer your questions about current and ongoing post fire management research.

First I would like to talk a little about the role of science, the process of scientific debate and discourse within the science community, and the role of science in land management decision-making.

THE ROLE OF SCIENCE

Science can describe the connections between human and ecological systems, develop methods to forecast the occurrence of damaging fire events and other disturbances, and characterize the possible outcomes of alternative management options. Scientists can help managers interpret what they are seeing on the ground and can help evaluate the environmental effects, social and economic costs and benefits, and effectiveness of potential management programs towards reaching management objectives. This scientific information can help managers and policy makers to decide the most appropriate management strategies for specific situations.

For example, many managers in recent fire seasons have reported dramatic reductions in fire spread and intensity as fires entered stands that have been thinned or previously burned. In recent years, research results from carefully designed scientific studies on a number of sites have supported and added specificity to these observations. Scientists continue to work closely with managers to better interpret these events, improve models for predicting and visualizing fire behavior in modified fuels, and set up landscape scale experiments.

We know that the science basis for land management decision-making is more complete for some areas than for others. The PNW Station, along with its sister facilities, and other scientists are working to improve information so that managers and the public are able to evaluate alternatives using the best technical knowledge and expertise. We acknowledge that we have much to learn—important knowledge gaps that we must address. Scientific research is a process of building knowledge study by study. As we are able to integrate results from multiple studies, we increase our understanding of where responses differ, and where they can be generalized. Scientists' ability to provide information will aid decision-makers.

DEBATE WITHIN THE SCIENCE COMMUNITY

Scientists, through the peer review process and often vigorous discussion, seek to continually evaluate and improve the scientific body of evidence and the strength and range of applicability of their conclusions and results. Studies, especially in resource management, often vary greatly in scope and objectives, apply different methods, and control for different variables. Results are affected by the specific geographic area or forest type, variability in weather and climate conditions, and variability in the way management treatments are applied. Active discussion and debate within the science community can help sort out reasons for differences in results, and build scientific consensus on important issues. To external observers, this

debate can be seen as an argument for or against a certain management practice or policy. But the best scientific debates lead to refinements in our understanding, new research to answer remaining questions, and better information for managers on the effects of management options under a range of scenarios. Scientific debates are focused on competing results or different possible explanations (theories) for those results. This contrasts with policy debates, which often derive from different philosophies of the role of government or of the desired social outcomes.

THE ROLE OF SCIENCE IN LAND MANAGEMENT DECISION-MAKING

Management of fire and the effects of fire on the landscape raises many questions of policy in addition to questions of science. Although policy questions may often be framed as science questions, many non-scientific considerations—such as societal goals, law, and economics—must be part of the answer to these policy questions. While science can provide a solid foundation for management and policy decisions, science alone is not sufficient to determine policy. Adaptive management by land managers is a useful tool that combines emerging research with evaluation of management practices. This approach enables managers to modify practices as our understanding of management impacts improves.

Debate over the effects and appropriate use of post fire management, including logging, has intensified in recent years as the sheer size of wildfires has grown. While many managers and scientists consider post fire logging as part of a suite of appropriate restoration techniques after wildfire, others argue that it causes damage to burned sites sufficient to outweigh potential benefits. These discussions have often been carried on with a notable absence of balanced evaluation of the available science. Some of these arguments have at their root different core philosophies on what constitutes appropriate management. Managers and policy makers need the best possible information, presented in an unbiased manner, to support them in developing sound and supportable recommendations for post fire management activities. The appropriate role of science is to provide such information while avoiding participating in policy or political debates.

SUMMARY

Thank you for the opportunity to discuss with you the role of science in management decision-making and policy development. Dr. Peterson and I would be happy to answer any questions you may have.

Mr. WALDEN. Thank you very much, Dr. West. We appreciate you and Dr. Peterson for being here today.

I now recognize Mr. Donato for your statement today.

Good afternoon. Thanks for joining us. We appreciate your taking time away to be with us and actually talk about your findings with this Subcommittee. So welcome.

STATEMENT OF DANIEL DONATO, GRADUATE STUDENT, OREGON STATE UNIVERSITY

Mr. DONATO. Good afternoon, Chairman Walden and members of the Committee. Thank you for the opportunity to speak today.

My name is Dan Donato. I'm a graduate student in Forest Science at Oregon State University. I am representing a team of senior ecologists and research associates conducting an extensive field study of post-fire vegetation and fuel dynamics in southwestern Oregon. For the past three years we've been collecting data on forest structure and composition in especially cogent, rigorously selected set of recent and older fires that have experienced post-fire management.

The recent publication of a paper from our study has generated some intense discussion. And the very fact that a one-page paper has generated this level of discussion underscores the paucity of direct scientific information that exists on the effects of management intervention following disturbances.

Before moving on to the specifics of our paper, I do want to note that—and this is a repeating theme I'm sure you're familiar with—decisions regarding intervention after disturbance are driven by management objectives. The relevance of science is to provide information within this context.

What does this study contribute?

Previous to our research, very few published studies existed on the effects of salvage logging with respect to forest regeneration and fire hazard. Of the very limited number of studies, most have been retrospective and confounded. They could not disentangle the effects of logging from those of slash treatments or tree planting. Moreover, none of these prior studies implemented an experimental design that included pretreatment data, replication and controls. Pretreatment measurements and short-term data provide critical reference points for understanding long-term processes. This study contributes these aspects.

What are the limitations of this study?

In our paper we presented data on the immediate effects only of salvage logging two to three years after the Biscuit Fire in southwestern Oregon. Strictly speaking, the scope of inference of this study is limited to that timeframe and set of conditions, although it is likely relevant in some capacity to other fires.

And I think you worded it well yourself, Chairman Walden, that no study's ever meant to be the final word, and certainly we make no inferences to longer term processes in this paper.

Our study employs a replicated and statistically rigorous design known as a before/after control intervention framework to assess the effects of management treatments across a broad portion of the burn targeted for salvage.

In our study we have sampled five of the seven east side salvage units on the Biscuit Fire, large enough to accommodate study plots. And this included all five that were available for sampling as of the summer of 2005. This includes a representative cross-section of Biscuit salvage operations.

We sampled the burn on portions that were expected to be the most problematic for conifer establishment and the critical first years following the burn. We found substantial conifer establishments two and three years after the fire and that seedlings were surviving multiple years. Mature trees distributed throughout the burn that had not been killed by the fire probably acted as seed sources, and this underscores the importance of surviving trees to forest regeneration. The seedling densities we observed thus far exceed what would be planted under current management plans, although appreciate that other factors other than density are also important.

These findings highlight a need for caution in extrapolating knowledge gained from post-timber harvest studies to post-disturbance ecology. Much of what we have learned indicates that ecosystem response to harvest and disturbance differs in fundamental ways. This cannot be stressed enough.

Now, with respect to the salvage effects, we conducted our measurements after logging and prior to subsequent fuel treatments. The regeneration we observed was reduced by 71 percent as a result of the salvage operations. This was due to soil disturbance and

burial by woody materials. We also saw an increase in the amount of surface fuels of a magnitude that may well be significant with respect to reburn potentials. This simply underscores the importance of subsequent fuel treatments if mitigation of short-term fire risk is an objective.

While the results are not necessarily surprising, they raise some important questions. For example, does the increase in fire hazard associated with salvage slash exceed acceptable levels? And how will these fuel loads compare between logged and unlogged stands over time? What might the specific effects be of subsequent slash treatments in post-fire ecosystems? And what role might natural processes play in attaining management objectives?

Where management objectives include rapid reforestation as a goal, it is useful to note that salvage has consistently been shown to reduce natural regeneration that is underway by two years after the fire. This was shown in the 1930s on the Tillamook burn and again in the '50s in California and with this study as well.

We do not know of any evidence of an ecological need to log a burned site in order to plant it. To the contrary, studies to date indicate a need to replant because of the logging. However, this does not preclude salvage as a management option. Rather, with information from this study and additional ones that isolate the effect of different harvest techniques and timing, any undesirable impacts of salvage could be minimized.

In closing, while there is a large body of knowledge, observational knowledge on the part of land managers, which is an extremely important piece, our scientific understanding of the effects of post-fire interventions is weak at best. Moreover, because the knowledge base from timber harvest has limited inference to post-fire ecology, our understanding of the effects of post-fire intervention will only advance with well-designed experiments that include controls and pretreatment data. Also, quantifying short-term responses and isolating individual management actions provide critical reference points for understanding long-term processes. In light of this, our team intends to expand its research across a broad range of time scales, ecosystems and fires in order to address many of the questions currently being raised as a result of our paper.

Thank you to the Committee for the opportunity to present my findings today.

[The prepared statement of Mr. Donato follows:]

Statement of Daniel C. Donato, Department of Forest Science, Oregon State University; Joseph B. Fontaine, Department of Fisheries and Wildlife, Oregon State University; John L. Campbell, Department of Forest Science, Oregon State University; W. Douglas Robinson, Department of Fisheries and Wildlife, Oregon State University; J. Boone Kauffman, Institute of Pacific Islands Forestry, USDA Forest Service, PSW Research Station; and Beverly E. Law, Department of Forest Science, Oregon State University

Introduction

Thank you for the opportunity to speak today. I am a graduate student in the Forest Science Department at Oregon State University, and have a Bachelor of Science degree in forestry and about a decade of experience in forest and fire ecology.

For the past three years our team has been conducting an extensive field study of vegetation and fuel dynamics following the Biscuit Fire. Our study employs a

replicated and statistically rigorous design to assess the effects of individual management treatments across the broad portion of the burn targeted for salvage.

Paucity of studies

The recent publication of a paper[1] from our study has generated intense discussion in the public and scientific communities. The very fact that a one-page paper has generated this discussion underscores the paucity of direct scientific information that exists on the effects of management intervention following natural disturbance events.[2]

By way of example, consider two important works germane to this topic. The first is considered the bible of fire ecology in the Pacific Northwest, containing much of what we know about fire in forests of the region.[3] The second exemplifies a vast body of knowledge regarding reforestation after timber harvest in the region of our study.[4] Salvage logging and post-fire management are arguably where these two bodies of knowledge meet. Yet neither text has a chapter on salvage.

Before moving on to the specifics of our paper, I want to note that decisions regarding intervention after disturbance are driven by management objectives. The relevance of science is to provide information within this context.

Results and implications of the recent Science paper[1]

What this study contributes

Previous to our research, very few published studies existed on the effects of salvage logging with respect to forest regeneration and fire hazard. Of the very limited number of studies, most have been retrospective and confounded—they could not disentangle the effects of logging from those of slash treatments or tree planting.[5] Moreover, none of these prior studies implemented an experimental design including pre-treatment data, replication, and controls. Pre-treatment measurements and short-term data provide critical reference points for understanding long-term processes. This study contributes all of these aspects.

Limitations

In our paper we presented data on the immediate effects of salvage logging two to three years after the Biscuit Fire in southwestern Oregon. Strictly speaking, the scope of inference of this study is limited to that timeframe and set of conditions. Like all fire studies, it is a case study in time and space. The long-term effects of salvage logging on the Biscuit Fire remain unknown.

Rather than characterizing the entire Biscuit Fire, we conducted our research in mature forest stands that were identified as potential logging units following the fire. Similarly, we did not set out to measure all different logging methods, but measured representative and commonly employed practices (helicopter and cable yarding).

Conifer Regeneration

In this study we sampled the Biscuit Fire on portions that were expected to be the most problematic for conifer establishment in the critical first years following the burn. One source of that problem was thought to be a lack of seed source in large burned areas with no surviving trees.[6] However, we found substantial conifer establishment 2 and 3 years after the fire and that seedlings were surviving multiple years. The wildfire area is a mosaic of live and dead trees. Mature trees distributed throughout the burn that were not killed by the fire probably acted as seed sources, underscoring the importance of surviving trees to forest regeneration.[7] The seedling densities observed thus far exceed what would be planted under current management plans. Other factors in addition to density are important in determining whether regeneration is "adequate," but this too depends on management directives.

These findings suggest a need for caution in extrapolating knowledge gained from post-timber harvest studies to post-disturbance ecology. Much of what we have learned indicates that ecosystem response to harvest and disturbance differs in fundamental ways.[8] Examples of post-fire conditions that may differ from post-harvest conditions include the following:

- Abundant on-site seed from stress cone crops, canopy seed banks, and surviving trees dispersed throughout the disturbed area[7 9 10 11]
- Favorable soil seedbed conditions (exposed mineral soil)
- Temporary reduction in competing ground vegetation
- Increases in nutrient availability
- Differences in microclimate afforded by the dead trees

Salvage Effects

We conducted our measurements after logging and prior to subsequent fuel treatments. The regeneration we observed was reduced by 71% as a result of the salvage logging operations. This was due to soil disturbance and burial by woody materials. We also, to the best of our knowledge, published the first study quantifying the effect of logging fire-killed trees on surface fuel loads. We saw an increase in the amount of surface fuels of a magnitude that may well be significant with respect to fire potentials. This underscores the importance of subsequent fuel treatments if mitigation of short-term fire risk is an objective.

While the results are not necessarily surprising, they raise important questions. For example:

1. Does the increase in fire hazard associated with salvage slash exceed acceptable levels?
2. How will fuel loads and fire hazard compare between logged and unlogged stands over time?
3. What are the specific effects of subsequent slash treatments in post-fire ecosystems?
4. What role might natural processes play in attaining management objectives?

A mechanistic understanding of the effects of post-fire management activities will emerge from studies that isolate the effects of each step, followed by re-integration of the knowledge gained to form a complete picture. This approach will vastly improve our ability to predict whether various strategies will succeed in achieving management objectives. Our study represents a beginning to such a process.

Salvage logging as a management tool

Our study was not designed to critique salvage logging as a management tool; it serves only to provide information on the immediate ecological response.

Where management objectives include rapid reforestation as a goal, it is useful to note that salvage has consistently been shown to reduce natural regeneration that is underway by 2 years after the fire.[1 7 12] The implications of this depend on the specific objectives for a site. We do not know of any evidence of an ecological need to log a burned site in order to plant it. To the contrary, studies of salvage and regeneration indicate a need to replant because of the logging.[1,7,12] These studies underscore a need to conceptually separate the activity of salvage logging from reforestation activities, which can occur with or without salvage. However, this does not preclude salvage as a management option. Rather, with information from this study and additional ones that isolate the effect of different harvest techniques and timing, any undesirable impacts of salvage could be minimized.

In Closing

Because the knowledge base from timber harvest has limited inference for post-fire ecology, our understanding of the effects of post-fire intervention will only advance with well-designed experiments that include controls and pre-treatment data. Furthermore, quantifying short-term responses and isolating individual management actions provide critical reference points for understanding long-term processes. In light of this, we intend to expand our research across a broad range of time scales, ecosystems and fires in order to address many of the questions currently being raised as a result of our paper.

Some additional closing remarks:

- Retention of surviving trees and other legacies will likely contribute to ecosystem response following disturbance.
- Knowledge of ecosystem responses must be combined with management objectives to determine whether actions need to be taken following disturbance.
- Considerations of post-disturbance intervention should be placed within the context of fire regime, landscape conditions, and forest type.

Thank you again for the opportunity to present our findings.

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Mr. WALDEN. Thank you, Mr. Donato. We appreciate your being here.

Dr. Kolb, welcome. We look forward to your comments this afternoon. Please find a microphone and go ahead. Maybe Mr. Donato's can be moved. Actually, that's the public broadcasting mike, so it doesn't do the P.A. System any good.

Mr. KOLB. I usually don't have a problem being heard, so I'll——

Mr. WALDEN. Well, but they are cable—somebody's audio system.

STATEMENT OF PETER KOLB, EXTENSION FORESTRY SPECIALIST AND ASSOCIATE PROFESSOR OF FOREST ECOLOGY, MONTANA STATE UNIVERSITY

Mr. KOLB. OK. Well, I would like to draw your attention to the screen as I have prepared a PowerPoint program for you. And as that comes up, I'll be glad to continue.

OK. I would like to present to you some research that we conducted upon fires of the southern Bitterroot Valley in which 356,000 acres burned in 2000, of which roughly half burned severely or moderately.

We scrambled pretty quick and established eight study blocks that looked at fire severity or vegetative response on severely burned, moderately burned, and lightly burned areas as might be demonstrated by this transect. We also established plots on adjacent state forest land that was salvage logged within six months following the fire, again represented by these transects. Twenty million board feet or, in addition to that, fire killed or harvested within six months of fire on this study area.

This is what the study area looked like prior to salvage logging, immediately after the fire. This is what it looked like one year afterwards. Trees that had any propensity to survive were left with a pretty liberal margin. Many of them have subsequently died.

Logging debris was left to maximize soil stabilization. As you can see, debris was left on the contour to slow down water movement. As opposed to natural forest land where in the first year nothing happened with the exception of some road rehabilitation, as might be shown here.

Briefly, before fire many of these forested sites had heavy organic layers. In this case here's an example of four inches. Light or low severity burn does not consume that, for the most part, as is demonstrated. Here is one of our plots in a light burn one year after the fire, three years after the fire. This is the stand where it occurred in, and revegetation was very—very good, pretty much back to prefire situations. And this is what we call beneficial fire, as opposed to severely burned areas where the entire organic layer is consumed.

This is a study plot on an unsalvaged log site one year post-fire, three years post-fire. You see a lot of noxious weeds moving into these zones.

This is a salvage log site, severely burned, one year post-fire. The repeat photo three years later is in the red square. And I made this a little bit larger because these severely burned areas that don't recover are typically where we saw large diameter fuels consumed, generating a lot of heat and essentially baked the soils underneath. And the recovery is very slow.

Just for reference, this is—tree species respond differently. This is a ponderosa pine seedling, which can handle the high soil surface temperatures following fire. Here's a Douglas fir seedling that does not handle these high temperatures very well and many of these die. This is an area where we did see natural regeneration, and I'd like to point out that we often see the less heat tolerant seedlings regenerating underneath logging debris in the shade. And the difference in temperature when measured can be 80 degrees difference, wherein the open soil surface can be up to 180 degrees Fahrenheit, which is lethal, whereas under the shade of this debris it will be 100 degrees, which these seedlings can tolerate.

So our results:

One, we found no difference in vegetative recolonization between salvage logged and nonsalvage logged sites. More extensive data is presented in the written testimony.

Second, 57 percent of our sample area, which included equal amounts of low severity and moderate severity and high severity, had scarce conifer natural regeneration three years afterwards. This is supported by a parallel independent survey by the Department of Natural Resources in conservation of 12,000 acres. 2,910 sample points showed that 87 percent of the area had scarce or no conifer regeneration.

The response was affected by at least eleven variables, independent of salvage logging, fire severity, aspect, landscape position, et cetera. So, yeah, these are complex and variable systems affected by a lot of different things.

All study plots on lower elevation Doug fir sites showed good recovery rates of grasses, forbs and brush, indicating they are not as fragile as might be suggested. However, with the exception of erosion potential during the first year.

And, finally, salvage logging restoration plan that was developed and administered by professional foresters did no harm to natural revegetation establishment on salvage log sites and assisted the recovery of the burned area to forest.

Now, there's a key point, because if you leave them alone, they'll do just fine, but they may not come back to forest. So, yes, this is a social decision: Do you want forest or do you want conversion to grass or shrubland.

So—and the final point I'd like to make on this is I'm a strong advocate of science and scientific research. However, we train people in colleges to go out there and be able to think critically, observe, and adapt their management. These are very intelligent people.

If we wait for science to solve every answer that we have out there, consider the complexity of these systems. A common quote is that one teaspoon of biologically active top soil can have 20,000 organisms. To fully comprehend every little thing that happens out there, we could study these things for 100 years and not be sure.

So we need to know how much science do we need to have before we proceed and not neglect the experiential knowledge and the ability of management actions to coincide with scientific studies.

Thank you.

[The prepared statement of Mr. Kolb follows:]

Statement of Dr. Peter Kolb, Extension Forestry Specialist and Associate Professor of Forest Ecology, Montana State University

Good afternoon.

For the past 21 years I have studied and worked in the forests of Idaho and Montana specializing in forest regeneration, restoration, and the roles of disturbance processes on forest ecosystem health. Over the past 9 years I have worked specifically on applied research and restoration practices following wildfires and insect and disease outbreaks with private landowners, industry foresters, and public land managers. I would like to present the results of post-fire vegetation research conducted following the Bitterroot fires of 2000.

First, I'd like to point to a few general observations that can be made about post-fire recovery, based on my experience, the scientific literature, and the experience of other forestry professionals:

- Harvesting fire killed trees before natural revegetation takes place would have the least impact on plant recolonization. There is a wealth of research examining natural post-fire plant recovery, the effects of prescribed fire on forest plant communities and impacts of various harvesting practices on natural tree regeneration. This literature provides significant information that is needed to make good decisions about post-fire management practices.
- Furthermore, research examining the conditions that favor tree seedling regeneration and survival indicates that some disturbance of the of soil surface organic layers, including ash, that exposes mineral soil might favor natural tree regeneration.
- A comprehensive literature review of post-fire mitigation impacts was published in 2000 that indicated contour felling, often part of salvage operations, had been shown to have the greatest impact on soil stabilization, often a major concern after wildfires.
- Although scientific experimentation is a critical component, and requires adequate funding, it is important to recognize the experiential expertise and knowledge that exists in the current forestry workforce.

To demonstrate these points and other information about the forest recovery and reforestation following wildfires, I'll share with you findings from a study conducted following the Bitterroot fires in Montana. In 2000, approximately 356,000 acres burned across the Bitterroot National Forest (307,000 ac), the Sula State Forest, and private ownerships in Montana. The southern Bitterroot Valley provided a remarkable opportunity as a post- fire study area because of the large area affected by the 2000 wildfires that burned in diverse topography at various levels of fire

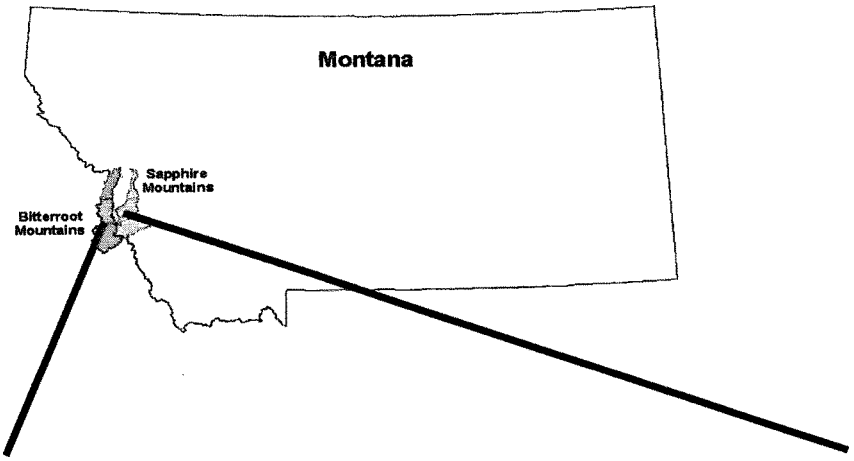
severity. Approximately 101,000 acres of this area burned with high severity, 71,500 acres with moderate severity, and 183,500 with low severity effects (USDA Forest Service 2000).

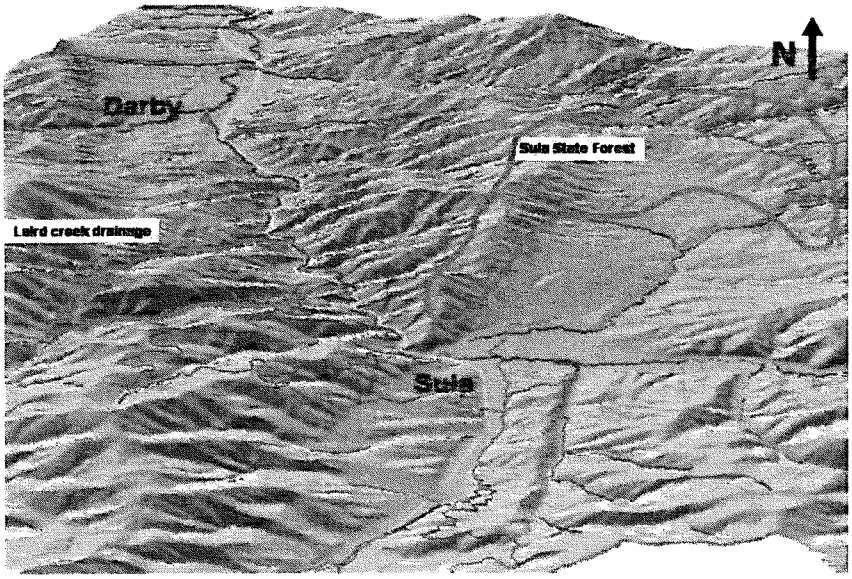
Following the fires, a team of professional foresters consulting with scientists and logging practitioners developed a salvage plan for post-fire management in Douglas-Fir forest types in western Montana. We conducted a study after the management plan was implemented. Our findings include:

- There are many variables that affect post-fire recovery.
- Salvage logging implemented under the specific conditions specified by the post-fire recovery management plan, did achieve a desirable outcome with respect to vegetative recovery and soil stabilization.
- That the forest ecosystem we sampled appears to have a natural resilience to disturbance, whether it is natural or human related. Although without human intervention a significant portion of the study area will convert from forest to grass and shrubland, from an ecological perspective this is not destructive. From a human perspective it may, however, be undesirable.

Study Background and Design

The Bitterroot Valley is located in western Montana nestled between the Bitterroot Mountains to the west and the Sapphire Mountains to the east (see below). The Bitterroot National Forest (BNF) surrounds the valley like a large horseshoe, encompassing both mountain ranges above the wildland/urban interface. The Sula State Forest (SSF) is located in the southeastern portion of the valley between the privately owned French In the spring of 2001, eight post-fire study blocks were established within the 2000 Bitterroot fires perimeter, where each block consisted of a 0.5—0.75 mile transect with three 1/10 acre plots and twelve 50-ft subtransects. Four of the eight blocks were located in the Bitterroot Mountains within Sula Ranger District of the Bitterroot National Forest (BNF) in the Laird and Warm Springs drainages (Picture 1). The remaining four blocks in the Sapphire Mountains were above French Basin in the Cameron Creek drainage, with one block on the BNF and three blocks on Sula State Forest (Picture 2). Since the Valley complex fire burned in a mosaic of severities, each block was located to cross all three fire severities along one contour (Picture 3). The study area encompasses approximately 20,000 acres of fire affected landscape. Fire severity and vegetation recovery were sampled within these blocks in 2001 and again in 2003 (Pictures 4-12).





All blocks were located within the Douglas-fir habitat type series. The five study blocks located on the Bitterroot National Forest (BNF) had a broad spectrum of past management activities including no past management, thinning treatments, shelterwood, seed tree, and overstory removal harvests. None of the study areas on the Bitterroot National Forest experienced immediate post-fire salvage harvesting prior to the 2001 sampling. Several of the study plots were salvage logged during 2002 and 2003 prior to their remeasurement in the summer of 2003. These treatments were not statistically comparable since they occurred on only a few plots. A non-statistical comparison of these later salvage logging impacts did not show any differences from comparable non-salvage logged plots. Three study blocks within the Sula State Forest crossed severely burned sites that had been salvage logged during the winter of 2000 to 2001 on snow-covered ground with a ground based mechanical harvesting system, rubber tired skidders, and cable yarding on steeper slopes.

The purpose of this study was to investigate post-fire vegetation recovery in western Montana by exploring the influence of fire severity, topography, and management. The specific research objectives included:

1. Compare post-fire vegetation recovery on severely scorched soils based on the influence of independent variables such as topographic position, forest structure, habitat type, tree fire impacts, etc.
2. Compare individual plant species ability to colonize across severe, moderate and mildly fire impacted soils.
3. Compare the vegetation recovery of salvaged with unsalvaged sites to determine if there are any differences in plant species occurrence, distribution, overall plant cover, and natural conifer regeneration.
4. Model plant recovery to determine which independent variables (fire severity, topographic position, plant community type, etc.) best predict understory vegetation cover by the third year post-fire.

Summary of Results

Fire severity and forest plant community type affected plant recolonization. The plant colonization results varied significantly for each species and across fire induced variables such as overstory severity, understory severity, and by existing plant community type. Numerous species showed affinities for certain environmental factors and fire effects as demonstrated by successful colonization.

There is much variability in the initial recovery and subsequent rate of recovery of vegetation due to naturally occurring gradients across the landscape. Overall plant resprouting and colonization can be summarized by the amount of total vegetative cover present on sampled sites. Table 1 shows a sum-

mary of vegetative cover as stratified by some of the variables encountered in a post-fire landscape.

Much of the initial post-fire vegetation recovery occurs within the first growing season following a fire event for the sites we studied, and then increases at a much slower rate. This point is demonstrated in Table 2. In general, the 40% average plant cover occurred on patches of soil that had not been severely scorched within the first year. By year three, moderately scorched soil surfaces had been colonized. Severely scorched soils had a very slow rate of vegetative recovery on them with many of the more severe patches showing minimal recovery even 3 years post-fire.

Colonizing plants originate from a variety of sources. Table 3 shows sources of plants that sprouted in the sites, including on-site and off-site sources. Three survival strategies describe the immediate response following a disturbance. On-site species are represented by two forms: survivor and residual colonizer. Survivor plants have fire avoidance mechanisms that enable species to resprout from the root crown, stolons, or rhizomes. Residual colonizers include germinating seeds and fruits that survived the fire through heat resistant properties or by being located in fire avoidant sites. Off-site sources include seeds and fruits that are transported by wind, animals, or water, and is often the means by which exotic weedy species invade. On-site sources dominated the post-fire community in 2001 and 2003. This leads us to conclude that a healthy pre-fire understory plant community can ensure a faster plant recovery following a fire.

Salvaged logged sites showed similar vegetation recovery as unsalvaged logged sites, indicating that salvage does not necessarily damage vegetation recovery (see Table 4). It is critical to point out that for this analysis to be meaningful, sites that had similar burn severities must be compared. Therefore, only sites that had experienced similar fire impacts and no post-fire manipulation were used for comparison. Salvage logging occurred on sites within the Sula State Forest that had experienced severe overstory fire effects where more than 80% of the trees had been killed. Salvage logging encompassed approximately 10,000 acres with an average of 5,000 board-feet per acre removed (DNRC harvest statistics). Although logging occurred during the winter using a combination of mechanical harvesting and skidding along with cable yarding on steeper slopes, mild conditions often resulted in minimal snowpack and unfrozen ground, thus some soil disturbance occurred. This was actually favorable for our study since we had speculated that disruption of the thick organic ash layer by equipment travel would actually enhance vegetative recovery. Although there is some evidence of higher plant cover on salvage logged sites the differences are not statistically different. Similarly several of the plots on the Bitterroot National Forest experienced selective salvage harvesting two and three years after the fire. We did not have enough of these plots to make statistically valid comparisons; however, the limited data did not show any observable differences on these plots with associated plots on similar fire severities without salvage logging. Considering the number of variables that affect post-fire recovery more study plots would have been needed to make meaningful statistical comparisons among all variables.

Natural conifer regeneration was closely correlated to the occurrence of seed producing mature trees, and the prevalence of shade from either surviving trees or northern aspects. A record was kept of residual tree cover survival for both 2001 and 2003 sample periods, natural conifer tree seedling abundance, insect and disease activity, and presence of invasive exotic weeds (Table 5). Only 19% of our sample area had abundant conifer natural regeneration (more than 49 seedlings per 1/10 acre plot), 24% of our sample area had moderate natural regeneration (between 21 and 49 seedlings per 1/10 acre plot), and 57% of our sample area had scarce natural regeneration (1—20 seedlings per 1/10 acre plot). There was no correlation between salvage logging and seedling abundance, nor was there any correlation between the presence of invasive weeds and salvage logging.

Bark beetle activity on residual surviving trees was present on 76% of the plots.

Corroborating data

In 2002, the Montana Department of Natural Resources and Conservation conducted an independent survey of the 12,000 acres of fire affected lands within the Sula State Forest. A survey sample grid of 2,910 plots that were 1/300 acre in size was measured. The results showed that only 13.3% of the area had naturally establishing seedlings and that 18.9% of the area was within 200ft of trees capable of producing seed. This survey indicated a need to plant tree seedlings across 86.7% of the fire affected forest to ensure adequate tree regeneration.

An additional study conducted by the Montana DNRC monitored soil erosion on burned sites across the Sula State forest in the year following the fires. Although there were areas that exhibited severe post-fire erosion, salvage logged sites did not show any greater propensity for erosion than sites that were not salvaged. In a second study of salvage logged areas following the 2003 Moose fire in northern Montana, soil impacts from salvage logging were found to be "less than 15% of detrimental affect considered to acceptable...Levels of soil erosion and disturbance observed on logged sites are not expected to affect long-term soil productivity compared to unlogged sites."

Conclusions

The study of trends within nature is very difficult because of the many variables that influence a single event. Wildfires across a forested landscape add another dimension of variability by burning in a mosaic that is influenced by topography, wind, fuel, fuel characteristics, and past human management activities. Once these fires have stopped burning, the vegetation response is equally variable, and depends on seed availability, microclimate, animal influences, weather trends, and continued disturbance processes. The ash left by a wildfire may be a good seedbed for some tree species, and a poor seedbed for others. On some sites the burn severity has affected the soil surface to such a degree that it presents an inhospitable seedbed. In other instances the desired tree species may no longer be in the vicinity to provide seed or even capable of producing viable seed. For forested sites that are water limited and prone to high summer temperatures, even adequate seed may not ensure a desired survival rate. Alternatively, cooler moist sites with a good seed source may regenerate with an over abundance. Considering that we have been experiencing a warm dry climatic trend, which is partially responsible for the wildfires in the first place, it should come as no surprise that natural regeneration is severely inadequate on many sites that formerly supported trees within our study area.

It is important to note that this study is based on one forest type in one ecological region. However, its findings combined with other scientific analysis and practical experience demonstrates:

- A need for localized management prescriptions based on local experiential knowledge of site conditions and vegetation responses, professional forestry expertise, and scientific data.
- A need for additional research that is conducted cooperatively with applied land managers to help refine management prescriptions.
- Timely salvage, using the appropriate equipment and management prescriptions can produce desired outcomes while limiting the negative consequences of wildfires.
- Natural regeneration, while desirable, does not always occur following wildfires in forests. Tree planting may be needed to return an ecosystem into a forested condition.

This study was initiated to add basic knowledge of how vegetation recovers following wildfires across a mosaic of severities on the Douglas-fir habitat type of western Montana. It was also designed to measure if salvage logging, combined with logging debris manipulation to stabilize soil would impact natural vegetation recovery. Although the desire was to establish more study plots, the data we gathered was adequate. Although not yet published in a peer reviewed journal, the study was the basis for the Master's Thesis of LaWen Hollingsworth and was reviewed by three other well respected and prominent scientists with expertise in statistics, fire behavior and fire ecology.

Table 1. Mean understory cover stratified by independent variables

Independent variable	Category	N	Understory cover (%)		
			2001	2003	Δ
Overstory severity	Low	32	39	41	2
	Mixed	28	31	46	15
	High	40	26	41	15
Understory severity	Low	44	39	45	6
	Mixed	32	25	44	19
	High	24	26	36	10
Habitat type group	Warm/dry	68	28	38	10
	Cool/dry	32	40	52	12
Aspect	North	16	36	51	15
	Northeast	28	36	45	9
	East	12	38	51	13
	Southeast	16	25	30	5
	South	4	32	39	7
	Southwest	4	40	26	-14
	West	8	14	35	21
	Northwest	12	29	47	18
Slope (%)	0 - 20	24	34	40	6
	21 - 40	44	34	42	8
	41 - 60	32	26	45	19
Position on slope	Bottom	20	45	41	-4
	Mid-slope	44	34	48	14
	Top	36	22	37	15
Vertical slope shape	Linear	64	31	42	11
	Convex	24	24	36	12
	Undulating	12	53	56	3
Horizontal slope shape	Linear	16	27	39	12
	Concave	44	35	45	10
	Convex	40	29	41	12
Firegroup	4	20	34	50	16
	6	80	31	41	10
Pre-fire tree cover (%)	1 - 30%	32	35	49	14
	31 - 45%	32	31	44	13
	>45%	36	29	35	6
Post-fire tree cover (%)	0	48	25	41	16
	1 - 25%	28	36	43	7
	>25%	24	40	45	5

[1]n = number of transects

Table 2. Change of vegetation cover from 2001 to 2003

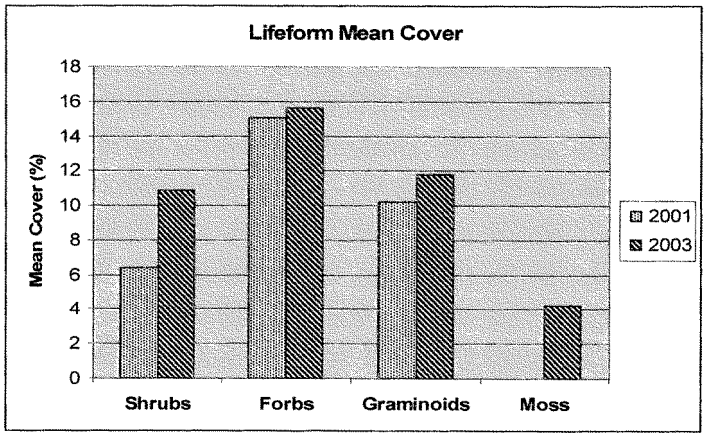


Table 3. Colonizing plant sources

Seral origin	2001	2003
Survivors	**24**	**42**
Root crown	5	9
Rhizomes	15	29
Stolons	1	1
Caudex	3	3
Residual colonizers	**2**	**5**
Buried seed	1	3
Fruit	1	2
Off-site colonizers	**5**	**15**
Light seed	3	12
Fruit	2	2
Other	-	1
Total	**31**	**62**

Table 4. Post-fire Vegetation response following salvage logging

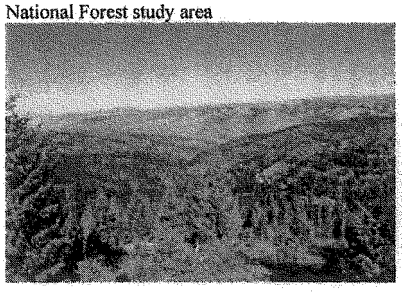
Description	Test variable	No salvage 2001	No salvage 2003	Salvage 2001	Salvage 2003
Dep. variable	Mean patch size (m)	8.2	1.5	7.9	2.1
	Black patch mean size (m)	7.0	1.2	7.0	1.5
	Understory cover (%)	26	45	32	39
Richness	ICE	19.68	28.82	20.63	31.76
	Chao 2	23.88	32.68	23.04	37.12
Diversity	Shannon index	1.82	2.31	1.72	2.2
	Simpson index	5.82	8.32	4.17	6.78
Evenness	Shannon	0.655	0.71	0.621	0.674
	Simpson	0.364	0.32	0.261	0.261

Table 5. Stand characteristics, pests, pathogens, regeneration and weed summary.

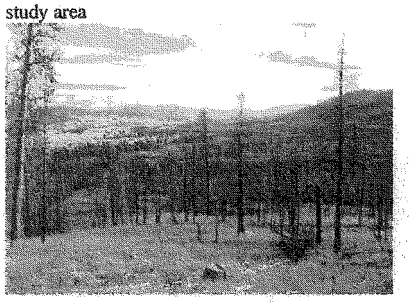
Block no., Plot no.	Pre-fire tree cover (%)	Post-fire tree cover 2001 (%)	Post-fire tree cover 2003 (%)	Harvest activity	Insect activity	Disease activity	Conifer regeneration	Mean understory cover 2003 (4 transects)	Noxious weeds[3]
3,1	40	35	30	-	BB	-	abundant	34%	CEMA
5,1	50	25	20	-	-	-	-	21%	CEMA
2,1	50	35	35	-	BB	-	moderate	25%	CEMA
9,1	60	50	45	-	-	-	abundant	64%	scarce
7,1	50	30	30	2003	BB	-	scarce	29%	-
1,2	30	25	25	-	BB	-	scarce	39%	CEMA
6,3	35	35	30	2000	BB	-	abundant	58%	CEMA
4,1	50	50	50	-	BB	-	scarce	58%	CEMA
1,3	20	0	0	-	BB	-	-	40%	CEMA
3,2	45	0	0	-	BB	root/stem	scarce	41%	CEMA
5,2	55	25	10	-	-	-	scarce	26%	-
2,2	25	15	15	-	-	-	abundant	53%	scarce
7,2	30	10	10	-	BB	-	moderate	62%	-
4,2	45	25	25	2003	BB	root/stem	scarce	57%	CEMA
1,1	35	25	20	-	BB	root/stem	moderate	46%	CEMA
6,2	25	0	0	2000	BB	root/stem	moderate	39%	CEMA
9,3	35	0	0	2000	-	-	scarce	34%	-
3,3	70	0	0	-	BB	-	scarce	25%	scarce
4,3	60	0	0	2003	BB	-	scarce	33%	scarce
5,3	50	0	0	-	BB	-	-	38%	CEMA
6,1	20	0	0	2000	BB	-	scarce	38%	-
9,2	40	0	0	2000	BB	-	scarce	43%	-
7,3	30	0	0	-	-	-	scarce	67%	-
2,4	40	0	0	-	BB	-	moderate	42%	CIAR
1,4	30	0	0	-	BB	-	-	53%	CIAR

[1]Insect activity BB = bark beetle
[2]Noxious weed species where CEMA = *Centaurea maculosa* (spotted knapweed) and CIAR = *Cirsium arvense (Canada thistle)*

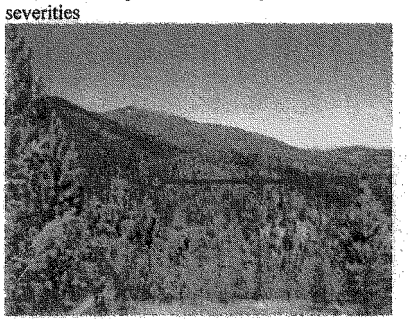
Picture 1. An overview of the Bitterroot National Forest study area



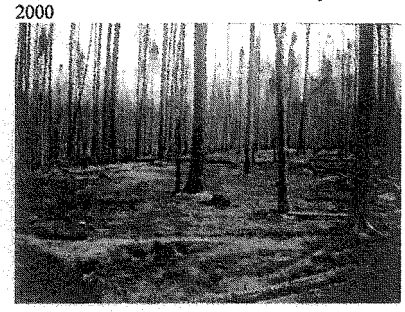
Picture 2. An overview of the Sula State Forest study area



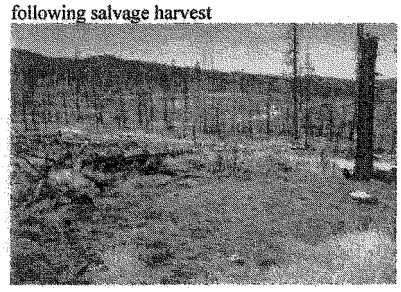
Picture 3. Sample transect with plots in 3 fire severities



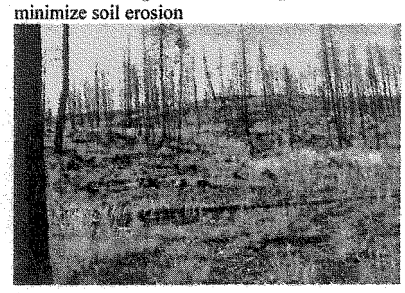
Picture 4. Sula state forest immediately after fire 2000



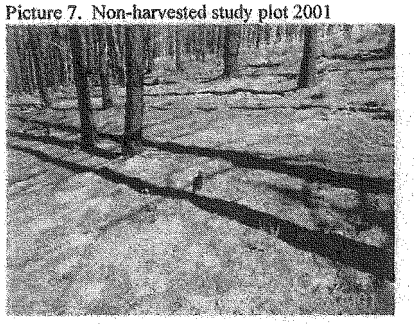
Picture 5. Sula state forest summer 2001 following salvage harvest



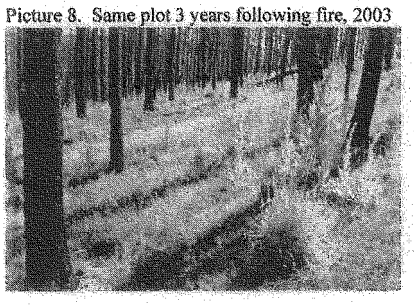
Picture 6. Salvage harvest debris placed to minimize soil erosion



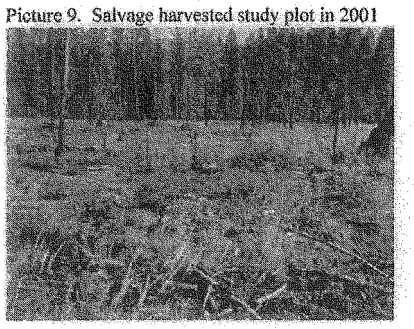
Picture 7. Non-harvested study plot 2001



Picture 8. Same plot 3 years following fire, 2003

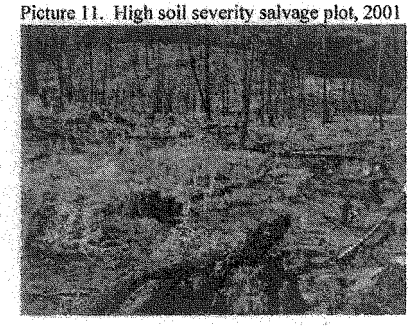


Picture 9. Salvage harvested study plot in 2001

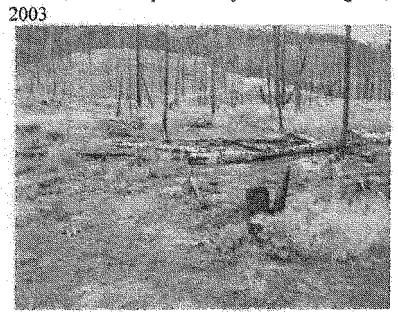


Picture 10. Same plot three years following fire, 2003

Picture 11. High soil severity salvage plot, 2001



Picture 12. Same plot three years following fire, 2003



Mr. WALDEN. Thank you, Dr. Kolb. We appreciate the research you do and your time here with us today.

Mr. Lorensen, welcome. We look forward to your comments this afternoon. Thanks for joining us. And I assume your mike's turned on.

STATEMENT OF TED LORENSEN, ASSISTANT STATE FORESTER, OREGON DEPARTMENT OF FORESTRY

Mr. LORENSEN. Chairman Walden, Members of the Subcommittee, I'm Ted Lorensen, Assistant State Forester, Oregon Department of Forestry.

One nice thing about going last is I can respond to some of the earlier comments, and they were very thoughtful and did perk my interest in making some deviation from my written remarks.

Representative DeFazio talked about removal of wood from streams for the purpose of fish restoration back in the '50s, '60s, '70s, '80s, '90s. That was done and it was done despite a substantial body of science that showed the importance of wood in streams. In fact, in the '30s and '40s in Pennsylvania they were starting to put wood back in streams to recover fish.

The science that was applied in this case was not thorough nor well tested. And the experience that was applied and used in making the decisions was also based upon fairly unique and localized circumstances that have been applied to the landscape. So that's kind of a bad example maybe of the use of science and experience in making some inappropriate and overextended decisions.

Mr. Donato had mentioned the Tillamook burn. I do need to explain a bias here. I come from an agency that is—took on the Tillamook burn back in the '50s and restored it after a series of fires that were called the six-year jinx. And we do have a lot of experience about what we can expect in some cases in terms of reburn of the large-scale intense fires. And, again, these forests reburn on a six-year period. It wasn't until we did some snag management, created corridors and salvage logging and then took on the first massive reforestation project really in the world that that became the forest that it is today.

And so seeding and planting were both done. We learned a lot from that. There's a tremendous amount of information that supports opportunities, but it is one issue and one experience that's—that isn't applicable to a broader scale, but certainly has some importance in this topic.

The Board of Forestry, of which Dr. Hobbs is Chair, clearly works on a range of forest issues; really have to separate values and science. The only scientific uncertainty is a key part of using science. And as we looked at this issue, the Board of Forestry is exploring a number of ways to better address science and dealing with uncertainty, in setting policy.

And I think you've heard from a number of folks about the notion of active adaptive management. And, again, that's a concept in your bill. We believe very strongly that active adaptive management is a way to apply a diverse set of treatments and allow us to learn from a range of actions on a diversity of sites. This approach recognizes there's no single best option to achieve all our values, but it does speed up our learning process by placing multiple treatments across the landscape, much the same way that a scientific experiment would.

We can place a range of active and passive management options side by side in a landscape, measure the outcomes over time, and compare how the results of each option match our values. This is a key component of the Board of Forestry's Forest Management Plan for the Tillamook and Clatsop and other state forests.

However, to be successful, the resources must be in place and ready to go to capture learning moments like the Biscuit Fire. And my experience is that that's often not the case, and hopefully your bill will address that.

Another process the Board of Forestry's been looking at is what's called systematic evidence review. It's a new way of dealing with conflicting science. It provides a systematic approach for reviewing or synthesizing scientific literature. Many different management situations like post-fire recovery conflicts over what is or what is not best available science frequently occur. Problems also arise when interest groups use selective studies with conflicting results to challenge public land management decisions.

Former Oregon Governor John Kitzhaber suggested to the Oregon Board of Forestry that natural science—natural resource decisions might strongly benefit from developing a process similar to the systematic evidence review process used in the medical field. This process differs in some important ways from additional literature review by using a preestablished explicit protocol for finding, screening, grading and integrating primary research studies to answer specifically narrow, defined question.

A key difference with systematic evidence review is that the protocol spells out in advance how information will be gathered to reduce bias in the selection and inclusion of studies. Plus it indicates an evidence quality hierarchy to guide researchers in assessing the quality applicable with different studies. The Board of Forestry is looking at this process and we'd welcome involvement of Federal agencies in its use. We have presented background on that to the regional forester, and I think we're going to continue to use this as a way of exploring some better opportunities in the use of science.

I do provide some comments on the importance of expedited salvage process, and again a lot of the study that you've heard about today, some of the outcomes depended upon when they started it and what were the circumstances. Our view of the world as an expedited salvage process gives you a whole lot more options, may reduce some of the value conflicts, and we encourage again that process being improved.

Very clearly in time further scientific studies will likely calm the scientific divide over post-fire forest response if the studies are sufficiently broad and long term. The science alone will not settle this policy choice. It is a choice that reflects public policy in the case of public lands and desires of forest owners in the case of private lands.

Policy seeks certainty of outcome for complex issues. Science cannot deliver either certainty or solutions to complex problems that are beyond the realm of science or outside the daily gathered, analyzed and debated. The proper role of science is to help inform people on some of the possibilities and consequences of choices. To do that, science must be thorough and well tested. People must understand and accept the limits of what science can do to inform complex social choices that must consider other nonscientific factors.

In closing, I just offer one thought. In my experience with scientists, and I'm one non-Ph.D. here probably and maybe Mr. Donato will become one eventually, but I have been in the interface between policy and science for a long, long time, and I've always been amazed at how often we invite scientists to speak to policymakers. And the first thing they want to do is go off task and talking about science to telling people what should be done. And I think it's also incumbent upon policymakers to say hold it, stop,

let's get back to the science. And, again, I think that's an important corrective measure. And I encourage that all policymakers think about their role in the use of science as well.

Thank you.

[The prepared statement of Mr. Lorensen follows:]

Statement of Theodore Lorensen, Assistant State Forester, Oregon Department of Forestry

Introduction

Mr. Chairman and members of the Subcommittee, thank you for inviting me to talk with you today about science and forest management. Policy makers must consider both science and values in setting policies. Forest managers must consider science, experience and values to get their job done. Based on the values reflected in federal policy, federal forests produce a wide range of outputs including water, wildlife, timber, and recreation. In hotly debated policy issues, like the issues surrounding post-fire salvage, there is a tendency to mix science and values.

The controversy about the new study provides a perfect object lesson in the need to distinguish between science and values, each of which must play a role if we are to derive the greatest possible benefit from the richness of our forests. The experts who carry out forest management on the ground use science and their experience to achieve objectives that are based on values—the values of landowners, shareholders, or those of policy-makers like Congress who craft the law and policy that guide the management of public land. If a landowner wants to emphasize a particular forest objective—or to achieve a broad range of benefits—and is willing to leave the details to the forester, in most cases we have ample science and experience to provide satisfactory results.

However, science will not decide whether to salvage log and reforest, or not. That choice is not a scientific issue, but one of values. It is a choice that must reflect public policy in the case of public lands and the desires of forestland owners in the case of private lands. The proper role of science is to help inform people on the possibilities and consequences of those choices, and to do that the science must be thorough and well tested. It is not the role of science to tell people what those choices should be.

As the Oregon Board of Forestry has worked on a range of forest issues, they have strived to separate values and science while setting policy. In this effort they have recognized that scientific uncertainty is part of the problem and they have explored ways to better address science and its uncertainty in setting policy.

Dealing with Scientific Uncertainty

Science is often incomplete and sometimes even contradictory. Ecosystems are very complex, and there remains some scientific uncertainty about how to provide the values we want from our forests after a large fire or other disturbance. Some scientists suggest that aggressive salvage and reforestation will provide the "best" recovery of a burned area, while others suggest that the area will "best" recover without human intervention. While what is "best" is primarily a value based decision, scientific uncertainty has also played a role in the current debate.

There are many sources of uncertainty surrounding post-fire recovery. There is a degree of uncertainty related to our ability to predict future outcomes in the forest. Events like weather and climate introduce a range of random elements. Natural reforestation success and future stand development contain large random components that are not predictable at every scale. While we might be able to predict the average development of a large number of forest stands, we might not predict with certainty the outcome in any one particular stand. Ecosystems are dynamic and forest stands that start with similar characteristics can take a number of different successional pathways and end up with very different characteristics depending on random events like fire, wind-throw, and insect epidemics. There are substantial differences in the scientific community over how post-fire logging and reforestation studies should be designed and interpreted. All this adds to uncertainty.

Active Adaptive Management

Even though there is uncertainty about the outcomes of using different forest management treatments, there are ways that policymakers, scientists, and managers can deal with this uncertainty. Active adaptive management applies a variety of diverse treatments and allows us to learn from a range of actions on a diversity of sites. This approach recognizes that there is no single best option to achieve all our values. Active adaptive management speeds up our learning process by placing

multiple treatments across the landscape in much the same way that a scientific experiment would. We can place a range of active and passive management options side-by-side on the landscape, measure the outcomes over time, and compare how the results of each option match our values. To be successful the resources must be in place and ready to go to capture learning moments like the Biscuit Fire.

"Systematic Evidence Review"

Another way to deal with conflicting science would be to develop a systematic approach for reviewing and synthesizing scientific literature. In many different management situations, like post-fire recovery, conflicts over what is or is not the "best available science" frequently occur. Problems also arise when interest groups use selective studies with conflicting results to challenge public land management decisions. Former Oregon Governor John Kitzhaber suggested to the Oregon Board of Forestry that natural resource decisions might benefit from developing a process similar to the Systematic Evidence Reviews used in the medical field. This process differs from a traditional literature review by using a pre-established, explicit protocol for finding, screening, grading and integrating primary research studies to answer specific narrowly defined questions. A key difference with a Systematic Evidence Review is that the protocol spells out in advance how information will be gathered to reduce bias in the selection and inclusion of studies, plus it includes an evidence quality hierarchy to guide researchers in assessing the quality and applicability of different studies. The Oregon Board of Forestry is currently evaluating the usefulness of incorporating a systematic approach into their decision-making and would welcome the participation of the federal agencies. Attached is the Executive Summary of an evaluation done about the applicability of Systematic Evidence Review to natural resource issues prepared for the Oregon Board of Forestry by the Institute for Natural Resources at Oregon State University.

Importance of an Expedited Salvage Process

If salvage is going to be a viable option, the processes leading to approval of a salvage operation needs to be expedited or the economic values will greatly diminish or be lost entirely. Post-fire salvage operations on federal lands have become increasingly contentious and difficult for federal forest managers to implement. The complexity and length of Environmental Impact Statements and other NEPA documents has grown to the point where post-fire salvage operations normally take between one and three years to implement. Because of this delay in implementation, much of the salvageable value in the burned timber stands is being lost to decay. It is worth noting that on state-owned land in Oregon, salvage can and does commence within a few weeks of a fire.

The merchantable value of small and mid-sized diameter trees is especially time sensitive, and delays in harvesting may result in substantial or complete loss of value from these trees. The reduced value of the smaller trees means that most or all of the economic value in the stand is contained in the larger trees that are also most valuable as future stand structure and wildlife habitat. This basic relationship of the large trees being the major source of both the economic and the environmental values is part of the value based controversy over recent salvage sales.

One way to help address this issue is to reduce the time associated with planning and implementing salvage sales. Reducing the time it takes to plan and implement a salvage sale would allow more of the value of the small and mid-diameter trees to be captured and allow greater flexibility to leave larger trees, while still maintaining the economic viability of the timber sale. However, to be socially acceptable, reducing the time it takes to implement a salvage operation must not cause a corresponding reduction in environmental protection. Therefore, a carefully crafted set of design criteria needs to be developed that will ensure both the provision of economic benefits and environmental protection.

Another value at the heart of this debate is reducing the risks of future wildfires. Speeding up the decision to salvage burned timber has the advantage of reducing the standing fuel load while leaving options to use natural regeneration available. If salvage is done promptly, natural regeneration can be used if it is desired. Experience with wildfire has taught us that snags are lightning ignition sources, burn for long periods of time, and increase fire spread though torching and spotting. Therefore, managing standing fuels through salvage logging can reduce both fire risk and hazard to some degree. If the salvage logging is done promptly, before natural regeneration occurs, land managers can take advantage of natural seedlings without causing the mortality that can be associated with logging equipment.

In Conclusion

Forests touch us all, providing benefits that contribute to our economic well-being, the health of our environment and the quality of our lives. Consequently, we are

all *obligated to remember that science is always evolving, and to maintain a clear distinction between science and values. Conflicts over forests have often been perpetuated by ignoring this distinction.

In time, further scientific studies will likely calm the scientific divide over post-fire forest responses if the studies are sufficiently broad and long term. But science alone will not settle this policy choice. It is a choice that reflects public policy in the case of public lands and the desires of forestland owners in the case of private lands. Policy seeks certainty of outcome for complex issues. Science cannot deliver either certainty or solutions to complex problems that are beyond the realm of science or outside the data gathered, analyzed and debated. The proper role of science is to help inform people on some of the possibilities and consequences of choices; to do that the science must be thorough and well tested. People must understand and accept the limits of what science can do to inform complex social choices that must consider other non-scientific factors.

The lesson is this: Science must be addressed distinct from values. Science and values each have an important role to play if we are to agree on a course for managing our forests to provide a sustainable flow of a wide variety of benefits. Values shape our views about what we expect and cherish in our forests. Science, as it evolves, helps us achieve those results. Blurring the difference between science and values only fuels the conflict and rancor that is gripping our forest management decisions.

This concludes my statement, and I am glad to answer questions.

Appended Material

Behan, Jeff. December, 2005. Executive Summary: Applying systematic evidence reviews in Oregon forest policy: Opportunities and challenges. Institute for Natural Resources, Oregon State University, Corvallis Oregon. 10 pp.

[Additional information submitted for the record by Mr. Lorensen follows:]

APPLYING SYSTEMATIC EVIDENCE REVIEWS IN OREGON FOREST POLICY:
OPPORTUNITIES AND CHALLENGES

DECEMBER, 2005
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Executive Summary

Use of "best available science" to inform natural resource policies is codified in federal and state statutes. Forest management stakeholders consistently agree that the best available science should be used in policymaking. But conflicts over what is, and is not "good" science and selective use of studies with different conclusions by competing interest groups continue to challenge public land managers. These conflicts point to a need to develop a method of synthesizing technical information that relates to particular forest management questions in a way that will be more readily accepted as objective and definitive.

In June 2004, former Oregon Governor John Kitzhaber presented testimony to the Oregon Board of Forestry (BOF) on a number of forest policy issues, including the problem of "dueling science". Dr. Kitzhaber introduced the Systematic Evidence Review (SER) process and explained how it is used to rigorously evaluate evidence on treatment efficacy in clinical medicine. He suggested that this process could be adapted and brought to bear on developing a more credible evidence base for forest policy making.

The BOF subsequently incorporated exploration of the SER process into the Oregon Department of Forestry (ODF) State Forests Program work plan. ODF contracted with the Institute for Natural Resources (INR) at Oregon State University (OSU) to prepare a report on SERs. The Institute works to provide Oregon leaders with ready access to current, science-based information and methods for better understanding our resource management challenges and developing solutions. The BOF and ODF requested that INR develop:

- Background information on SERs;
- A comparison of medical research studies and natural resource research studies to identify any differences that affect the ability to develop methods for evaluating the quality of research evidence; and
- Proposed principles for a simplified SER-like research evidence evaluation process for ODF to use to organize, present, and synthesize scientific information for use in BOF decision making.

How does ODF currently gather and assess scientific information to use in forest management policies?

- ODF utilizes scientific knowledge in its duties to (1) manage Oregon state forests for the "greatest permanent value" to the people of Oregon, and (2) regulate commercial forest operations on non-federal forests through the Oregon Forest Practices Act.
- ODF policies are informed by science through (1) internal science reviews, (2) external reviews commissioned by the agency to assess the scientific validity of its planning documents and regulatory proposals.
- Despite well-intentioned and in many cases quite involved efforts to use the "best science available," ODF is regularly challenged by groups suggesting that they really are not doing so.
- These challenges may stem from disputes over which pieces of technical evidence were, or were not considered, or over how particular pieces of evidence were interpreted, weighed and applied in policymaking.
- The core of disputes over use of technical information may involve broader disagreements over forest policy goals, and the appropriate course of action when outcomes are uncertain, rather than disputes over scientific evidence per se.

What is a "Systematic Evidence Review" and how do SERs work?

- An SER is rigorous, transparent, reproducible process for assessing scientific and technical information, used primarily in clinical medicine.
- An SER focuses tightly on a specific question, or small set of questions, which frame decisions about what evidence is relevant to the review, and what is not.
- SERs differ from traditional literature reviews in their use of pre-established, explicit protocols for finding, screening, grading and integrating primary research studies.
- SERs are designed to be as comprehensive, exhaustive and objective as possible, which means they are typically time consuming and expensive.
- Systematic Evidence Reviews and evidence based medicine have been described as a "paradigm shift" in healthcare, but there is still considerable debate about how SERs are conducted and used.
- Costs of medical SERs range from $50,000-$250,000. A natural resource SER may cost considerably less because the evidence base is likely to be smaller, but this would depend on the nature of the question.

History of Systematic Evidence Reviews

- Since emerging in the 1980's the SER approach has been widely adopted in the fields of clinical medicine and public health, and continues to expand rapidly.
- The largest international entity that conducts and disseminates SERs is the Cochrane Collaboration, which maintains a database of over 2000 SERs, develops and refines review methods, and offers training on conducting SERs.
- In the United States, SERs are conducted and disseminated by the Agency for Healthcare Research and Quality (AHRQ) through its 15 designated Evidence-based Practice Centers. Oregon Health Sciences University in Portland is one such center.
- Interest is growing in adapting the SER approach to other areas of public policy, including wildlife conservation, but SERs are not well suited for all policy areas, or to all questions within a particular field.

The Systematic Evidence Review process in clinical medicine

- SERs require specific, tightly focused review questions to (1) clarify the purpose and delimit the scope of the review, and (2) strengthen linkages between the questions and subsequent steps in the review process.
- SERs use explicit protocols that spell out in advance exactly how evidence will be gathered, assessed, collated and summarized. Documenting all steps in the SER ensures that it is transparent, replicable and can be updated later if necessary.
- SERs are characterized by vigorous and thorough efforts to compile all available research and technical information that pertains to the review question(s), including unpublished and "gray" literature.

- Quality assessment of individual studies is a key characteristic of SERs, providing more rigor than traditional reviews. Quality assessments are used to (1) decide whether a relevant study should be included in the review, and (2) to rank included studies in an evidence quality hierarchy, usually based on study design and methods.
- Quality assessment is labor intensive and remains controversial. Random controlled trials and other tightly controlled study designs are favored in medical SERs, but there is no general consensus on standardized quality assessment criteria.
- Synthesis consists of tabulation of study characteristics, quality and outcomes for the primary purpose of investigating whether results are consistent across included studies, and if not, investigating reasons for apparent differences.
- A narrative synthesis is used to qualitatively compare and synthesize included studies. Qualitative synthesis may be all that is possible if differences in population, intervention, outcome measures, designs and quality preclude meta-analysis.
- Quantitative synthesis, such as meta-analysis may be used to statistically combine study findings, as long as the studies are similar with regard to population and intervention under study, outcome measures, study design and quality.
- The strength of a body of evidence (all included studies) is assessed by examining aggregate study quality, the quantity of evidence (number of studies, sample size), consistency of findings across studies, and coherence of the evidence as a whole.
- SERs obtain their rigor partly through efforts to identify and explicitly acknowledge ways in which bias could enter into and affect results in primary studies, and to reduce bias during selection and review of these studies.
- SERs can be, and often are updated when new information emerges that will significantly strengthen or change the outcome of an existing review. Explicit documentation of how the review was conducted makes updating possible.
- A key use of SER information is developing clinical practice guidelines: "systematically developed statements to assist practitioner and patient decisions about appropriate health care for specific clinical circumstances."
- More progress has been made in rigorously assessing available evidence through SERs than in incorporating this evidence into medical policy due to problems accessing clinical guidelines and because many patients prefer tailored care.

Critiques of SER methods and cautions about using SER information

- Research quality assessment criteria are a cornerstone of SERs, but there is still no consensus on what these criteria should be and how different types of quantitative evidence should be weighed.
- There is growing criticism within the medical community of rigid study exclusion criteria and the practice of ranking evidence quality on the basis of research methodology alone.
- There are growing calls for including a broader range of evidence in SERs, including qualitative evidence and expert opinion, but finding ways to include, and weigh, such disparate types of evidence are major challenges.
- Framing questions in the tightly focused, specific way that current systematic review methods require may skew the review away from important issues that are more difficult to focus.
- Absence of evidence regarding the effectiveness or safety of a health care treatment or medication does not mean that the intervention is not safe or effective. In other words, "absence of evidence is not evidence of absence".
- Strength of evidence in and of itself is not related to the magnitude of effectiveness of an intervention. There may be very strong evidence that the intervention has little impact or, conversely, the apparent impact of the intervention may be large but the evidence regarding the impact may be weak.
- How strong the evidence needs to be when making a particular type of decision should depend, at least in part, on the potential consequences if assumptions about the outcomes of an intervention turn out to be wrong.

Applying SERs to Natural Resource Issues: Challenges and Opportunities

Disentangling questions about evidence from those about values and preferences

- Forest and ecosystem managers usually lack the widely agreed upon single objective (better human health) that clinical medicine practitioners enjoy.
- Clarifying and obtaining consensus on the underlying objective (e.g., the proposed management action about which the information is being collected) may be critical to conducting a successful natural resource SER.

Differences between medical science and ecosystem science as fields of inquiry

- Compared to clinical medicine, ecology is a younger science that involves a greater proportion of observational field-based studies to laboratory experiments.
- Ecological research typically involves greater methodological diversity, fewer laboratory controls, less replication and more "nuisance" variables than medical research.
- Ecology deals with larger spatial scales, longer timeframes and more complexity associated with multiple interacting species, habitats and ecological processes than medicine, which is focused on a single species.
- In general, there is less certainty about scientific conclusions in ecological studies than in clinical medicine.

The challenge of delimiting evidence that applies to a forest management question

- SERs are best suited to synthesizing research focused on whether a single medical intervention "works" or "doesn't work". In the natural resources arena, SERs would be best suited to analogous, single variable questions.
- Complex, multifaceted forest management questions might be difficult to address using the SER approach, and for simpler questions, there may be little focused research evidence available.
- Much evidence concerning forest ecosystems consists of studies in which several variables are considered simultaneously in order to accurately describe real world ecological relationships.
- Synergies among species and processes are common in forest ecosystems. Thus, it may be impossible or misleading to isolate a single ecosystem component or single outcome of a management action as the focus of an SER.
- Delimiting the evidence that applies to a forest management question may also be challenging due to uncertainty about extrapolating results from studies to other areas with significant biological, physical, climatic or land use history differences
- For a forest management question structured as suggested by SER guidelines, there is likely to be a range of tangentially related research that falls somewhere between direct relevance and complete irrelevance.
- A feasible natural resource SER may require a compromise between a holistic approach that is closer to reality, but impractical for defining relevant studies, and a reductionist approach that may limit the review's relevance.
- A related challenge may lie in structuring a question with a degree of specificity that allows inclusion of enough evidence to make the review worthwhile, but also limits it to a manageable scope.

The challenge of assessing evidence quality in forest ecosystem science

- There is likely to be a paucity of relevant, focused experimental research and a greater proportion of potentially diverse observational evidence available to address a natural resource question.
- This type of evidence is typically graded as "low" quality in medical SERs, e.g., often observational with few controls, frequently with confounding interactions.
- If the same criteria used to assess evidence quality in medical SERs are deemed appropriate for a natural resource SER, these criteria would probably need to be applied less stringently to assess forest ecosystem research.
- Depending on the nature of the SER question and evidence available to address it, it may also be necessary to develop significantly different criteria for assessing the quality of forest ecosystem research.
- There is a lack of consensus on quality assessment criteria used in medical SERs. Achieving consensus on if, and how, such criteria should be used in forest ecosystem SERs may prove difficult.
- There may be no single set of quality assessment criteria that will work for all natural resource SERs. Assessment criteria may need tailoring to fit the evidence that pertains to a particular SER question.
- In cases where the evidence consists of studies and monitoring with disparate methods, locations and outcome measures, there may be no clear rationale for saying that one piece of evidence is "higher" or "lower" quality than another.
- With all else being equal, studies that involve relatively larger spatial scales, more replication, more controls and longer timeframes are likely to produce the most reliable results.
- However, "all else equal" assumptions often don't hold true. Greater complexity and diversity at larger scales can introduce more, rather than less uncertainty.

Locating the evidence

- Archiving of medical research abstracts and peer reviewed papers is more organized and standardized than in ecosystem science. Comprehensive literature searches in a natural resource SER may be harder to achieve than in clinical medicine.

The role of qualitative research, expert judgments and experience

- Expert knowledge and experience play a greater role in ecosystem research than in medicine because investigators must rely more heavily on expert judgment when interpreting results.
- Natural resource management also involves high levels of expert judgment because scientific information is often not available.
- Experiential knowledge may constitute an important part of the overall evidence base, but incorporating this evidence into quality assessment and ranking framework in the context of an SER remains problematic and controversial.
- One potential way around this debate is to understand scientific and expert knowledge as complementary, and equally important in ecosystem and natural resource management.

Opportunities for applying Systematic Evidence Reviews to natural resource issues

- Applying SERs to natural resource issues will be challenging, but early proponents of the SER approach in medicine faced significant challenges as well.
- Despite differences, there are a number of similarities between clinical medicine and aspects of conservation and natural resource management.
- These similarities include the common use of interventions (essentially experiments in progress), the need to make decisions on the basis of imperfect information, and the complementary role of evidence and experience.
- Some components of SERs could be incorporated into science reviews (e.g., better documentation of how studies were selected for inclusion, investigation of quality differences) in order to increase their objectivity and transparency.
- Conducting a synthesis of available science on a natural resource topic using SER techniques could highlight gaps in the evidence base and suggest relevant areas for future research.
- In combination with ecological monitoring and incremental updates, a synthesis of available science using SER techniques would mesh well with landscape-level adaptive management.

Principles, Guidelines and Considerations for Applying Systematic Evidence Reviews to Forest Management in Oregon

- "Evidence," in an ecosystem management context, is more than just data and hard facts. It involves contextual information and interpretation. Scientific evidence consists of scientifically guided empirical observations combined with background information, logic, and scientific expertise.
- Sweeping generalizations about the appropriateness of particular statistical or research methods over others are unwarranted, and laboratory experiments do not necessarily carry greater weight than field experiments in forest ecology. All types of data can add to the evidence base.
- Evidence does not have to be quantitative or gathered by a scientist. The key is that the information was collected and interpreted as objectively as possible and can somehow be verified.
- The weight given to a particular piece of evidence should not depend on the type of observation but on the match between the observation and the question being asked.
- Medical SERs are, by design, rigorous, exhaustive and comprehensive, and thus time consuming and costly. A "small scale, practical approach" to science assessment is fundamentally different than SERs as they are defined in the medical field.
- Despite this inconsistency, some aspects of SERs could be readily adopted and incorporated into the internal and external science reviews that ODF already conducts.
- A systematic review of evidence pertaining to a forest management question may be feasible for ODF if (1) the question is tightly focused, (2) the evidence base pertaining to the question is not large, and (3) there is consensus on the boundaries of the evidence base.
- Natural resource SERs are more likely to be feasible for focused questions involving a single intervention and/or a single species. Multifaceted questions that involve more than one species or more than one outcome would be more difficult to address using the SER process.

- Independence from stakeholders is a fundamental aspect of SERs. An SER is more likely to be considered objective by all stakeholders if it is conducted by an independent entity, rather than internally by ODF.
- An SER process may reveal general consensus on the scientific evidence that is masked by fundamental differences of opinion on what outcomes are most important and what actions are appropriate in the face of imperfect evidence.

Three options for using the SER approach in Oregon forest management

A full-scale SER on a complex forest ecosystem science question could be a major undertaking compounded by the need to recruit and train an external SER team before commencing the review itself. The feasibility of natural resource SERs and circumstances in which they would be most useful are not clear. Much could be learned by testing the SER approach, which offers some clear improvements over traditional literature reviews.

ODF could take an incremental approach to adapting the SER process to forest policy making in Oregon. Three tiered options for doing so are outlined below. These options roughly parallel the three existing approaches to science review at ODF: (1) routine internal reviews, (2), external reviews commissioned by ODF to review long-term planning documents, and (3) other external reviews completed as part of broader policy initiatives such as IMST reports for the Oregon Plan.

The form and details of each option are provided as a starting point and could benefit from further management and stakeholder review and discussion. The agency could develop a hybrid approach tailored to its needs in a particular circumstance.

Option 1: Incorporate SER techniques into ODF's "in-house" science assessments and any external review of this work. The primary aim here would be to make existing ODF internal science review processes more transparent. This could be achieved with adjustments to what is already being done, primarily by adopting components of SERs to better document how science information is gathered and reviewed.

Under this scenario, ODF would not be rigidly bound to assuring that the review was an absolutely exhaustive and complete examination of all available evidence. As with all science reviews however, credibility would be predicated on perceptions of the degree to which the review was thorough and objective. This option would be best suited to cases where the available evidence is relatively clear, uncontroversial and limited in scope.

> Option 1a: Conduct the science assessment "in house" as described above, with the additional step of soliciting external review of the draft final document. This process would approximate that used during the Independent Scientific Review of the Draft Western Oregon State Forests Habitat Conservation Plan, as described in Section II. The key differences would be use of SER procedures during the "in house" phase, and that external reviewers would be asked to assess the quality of evidence used and upon which they base their review and comments.

Key components of Option 1:

- To the degree possible, develop tightly focused, specific questions to delineate the purpose and scope of the review.
- Develop a simplified SER-like protocol to explain how the review will be conducted, using the example shown in Appendix 2 as a starting point. Development and use of a formal evidence quality hierarchy and ranking system is probably not be feasible at this level of review, but a narrative discussion and comparison of study quality could strengthen the review.
- Document in a systematic way which studies were included, what they said and how the information was interpreted. If studies were identified as relevant, but not included for quality or other reasons, document these reasons.
- If/when documents are sent out for external review, include in the review process an expectation that reviewers will also provide a quality assessment of the information upon which they based their review comments.

More specific guidelines for how this option might be implemented are offered in Appendix 4.

Option 2: Commission an SER by an external, independent entity. Under this scenario, a review of evidence would be contracted to a qualified independent entity. Such a review might be triggered by politically sensitive or difficult scientific questions about which ODF staff sought external scientific review. External review should assume impartiality and take advantage of academic expertise in specialized subdisciplines within ecological science.

The overall aim would be to prepare a defensible SER for a natural resource question, or a limited set of questions, with corresponding effort to obtain all relevant

evidence and review it in formal, documented fashion. As with Option 1, this would not require an entirely new process. Existing external science review entities would consider using the SER approach.

Key components of Option 2:

- ODF would develop tightly focused questions to frame the purpose and scope of the SER. The additional step of vetting the SER questions with stakeholders could be considered. Questions would be refined in collaboration with stakeholders and SER review team.
- Develop a protocol that explicitly lays out how the review will be conducted. The external SER team should take the lead, or at least be included, in this process. If the review team believes it is feasible, develop and apply a formal set of evidence quality assessment and ranking criteria to the included studies.
- Publish results of review on ODF website and in academic journals.

Option 3: Collaborate with other state and federal agencies to address regionally significant, highly policy relevant questions of using the SER process. Many forest management issues transcend agency boundaries and should be addressed at the landscape scale. Some of these issues are controversial and challenging, and more than one agency could benefit from synthesis of all available evidence into a package of "best available science" that all participating agencies could then use. Post-wildfire "salvage" logging and restoration is an example of a topic for which it may be worthwhile for ODF to initiate and/or participate in multi-agency efforts to identify key questions and support an SER process to address them.

Topics would need to be carefully considered because of the time and effort that would likely be required to coordinate a multi-agency SER. Various approaches are possible. For example:

Option 3a: Bring together an SER team comprised of technical specialists from within different agencies (e.g., ODF, Oregon Department of Fish and Wildlife, USDA Forest Service, USDI Bureau of Land Management, Fish and Wildlife Service, National Park Service, NOAA Fisheries) to develop questions, a protocol and conduct the review.

Option 3b: Conduct an external SER as described in Option 2, but solicit and coordinate support from other agencies.

Key components of Option 3:

- Similar to Option 2, but with interagency collaboration in (1) identifying and refining questions and vetting them with stakeholders, and (2) locating evidence, particularly unpublished monitoring data and other agency-specific information that may not be widely available, and (3) providing support to conduct the SER.

Conclusions and looking ahead

A pilot test of a modified SER process could shed light on the accuracy of many of the untested perspectives and assumptions in this report regarding the potential for SERs in natural resources. There is no way to really know how accurate the analysis contained here is without testing it in practice. The best way to do this is by applying a modified SER process in a pilot test on a carefully selected but relevant natural resource question. It would be important to start with a question that is limited in scope and for which it is reasonably certain that enough evidence exists to conduct a useful review.

Mr. WALDEN. Mr. Lorensen, thank you. That's precisely what we intend to do and have been doing in our hearings, is say what does the science tell us, what can we learn from it, and how do we come to reach better policy decisions because of it. So thank you for your comments today, and thanks to all the panelists.

We'll now go into a phase in the Committee for our audience. We'll each have five minutes to ask questions of the panelists. My hunch is we'll probably do two rounds for this panel, maybe more, but we also have to maintain a bit of a schedule here. And I know Mr. Inslee has a flight to catch at some point. He rearranged his schedule to be able to join us here.

So why don't I go ahead and start off. And I have a question I hope you can answer kind of briefly, but I recognize that's hard to do. But five minutes is five minutes, and I've got a bunch of them.

And so for Mr. Hobbs and I think for Mr. Kolb and Dr. West and maybe Mr. Lorensen, how important is timing in post-fire treatments? We were out on a stand today. We've heard about Judge Hogan's decision, you know, something several years long. We've read Mr. Donato's research about what happens if you wait two years and start to do post-fire recovery, salvage logging, whatever it is.

Can you just briefly comment from your experience perhaps at this state and the research you've seen nationally how—what is it about the timing that's critical that we should know.

Mr. HOBBS. Well, I can start to try and address that issue.

And I think that timing is crucial for a number of reasons, but let's take southwestern Oregon as an example of why it's so important.

Typically after a disturbance, whether it be timber harvest or some other sort of disturbance—it could be wildfire—you're going to get the associated vegetation on those sites that are quite frequently well adapted to those types of disturbances or those site conditions to recover very rapidly. And we've seen this on the Biscuit Fire. I know that I was down here, looking at it, in the late fall after that fire occurred and already the field brush, the tanoak, the madrone were sprouting very vigorously. And the problem you have is that these are very well adapted competitors, and they are going to have a significant effect on conifer establishment and subsequent growth if you do not get conifers established quickly, whether it be by natural regeneration or artificial regeneration, i.e., tree planting.

Mr. WALDEN. All right.

Mr. HOBBS. So that's just one.

Mr. WALDEN. Dr. West, a brief comment.

Ms. WEST. I would concur with Dr. Hobbs. And I would like to add that—I think Dr. Kolb mentioned this—we lose those learning opportunities. And if the management objective is to reestablish vegetation on that site to meet wildlife requirements or aesthetics or for wood production, it's essential to go in for the reasons that were stated. And we lose that opportunity.

Mr. WALDEN. All right. Dr. Kolb, briefly.

Mr. KOLB. Well, I concur. Timing is critical, and I would add one thing. We seem to be in a period of climatic uncertainty. And if you want a certain desired vegetation back with this uncertainty, it's critical to get these plants on the site as quickly as possible before competition exacerbates any climatic uncertainty, such as drought or higher temperature, et cetera.

Mr. WALDEN. All right. Briefly, Mr. Lorensen.

Mr. LORENSEN. I think science has demonstrated the impact on timber values. I think that's important to restate.

I also agree that climate/weather issues are huge and again may well have been a factor in the results in this particular study, but again you lose options to the extent that you wait.

I guess I would state, if I could, the policy of the State of Oregon, established by Oregon's legislature, is they direct the state agencies

to begin salvage as quickly as possible, in recognition of those multiple values and certainties. And the Department of Forestry typically begins salvation operations and put up the timber sales within weeks or months.

Mr. WALDEN. Within weeks or months.

Mr. LORENSEN. Yes.

Mr. WALDEN. Thank you.

Mr. Donato, I have a couple of questions obviously for you. I'm glad you're here, and I thought it was important to give you an opportunity to address some issues that you may have heard or read about, because they've been sort of out there, so—

Based on your comments, I don't get the impression that you blame the Bureau of Land Management for mistreatment or make claims of a scandal or heavy-handed treatment.

Do you believe, given your original submittal that had references to legislation, that there were legitimate concerns with proper notification, the BLM had reasonable cause for review?

Mr. DONATO. Yeah, I think there were some issues that—where there was some miscommunications and some perceptions of certain verbiage that raised some questions. And I don't necessarily question that.

Mr. WALDEN. OK. And let me ask about that sequence of events, because this has been out there in the public and we're trying to get answers and you're the guy. So lucky you.

In terms of the protocols—I'm not the scientist like my—some of my colleagues. In terms of the protocols you were required to follow, were you supposed to—did you have a project investigator that you were supposed to report to prior to submission to any publication of your work? Was it——

Mr. DONATO. That was less than clear, I have to say, that the communication between the agency and the university turned out to be sort of an unclear two-way street. And we have consulted with the agency throughout the course of the project, including for the data presented in this paper. We presented these data at the Joint Fire Science Program meeting in November. And we also presented to the project inspector in December, the day that we were planning on submitting, so—

Mr. WALDEN. So and was that the December meeting that Mr. Sensenig asked you to attend.

Mr. DONATO. Yes.

Mr. WALDEN. And in that meeting you told him you'd submitted the science.

Mr. DONATO. That we were submitting a paper, yes.

Mr. WALDEN. You did? Because he has an e-mail that we have in our record that doesn't indicate that at all. It's a much different version. Have you seen that e-mail?

Mr. DONATO. No, I'm afraid I haven't.

Mr. WALDEN. All right. There's an e-mail from Tom Sensenig, the principal investigator and project inspector to the contracting officer, Mr. Shapiro, which we'll be glad to—do we have a copy we can give to him?—that indicates that he called the meeting with you in early December to prepare for a conference. Scheduled meeting for December 15th in Corvallis. And he says, and I quote here: "Despite having already prepared and submitted their paper to

Science, Dan did not offer any information regarding the other authors' involvement or the fact that they had submitted a paper for publication.''

Mr. DONATO. This really harkens to just a miscommunication as to the level of consultation required. This is an issue that has been resolved between the university and the agency as a miscommunication. It really was.

Mr. WALDEN. Because he goes on to say: ''Had I not scheduled this meeting, there would not have been any communication between any of the authors.'' And——

Mr. DONATO. Well, how that—how that went was we presented at the Joint Fire Science Program meeting. And at first we were under the impression that all the P.I.s were going to be there. And when we found out that Dr. Sensenig would not be there, we unofficially scheduled a meeting for some time down the future—in the future. And that's when that occurred.

Mr. WALDEN. But this would indicate that he met with you on December 15th. Do you remember that meeting.

Mr. DONATO. I believe it was earlier than that, actually. I don't know the exact date.

Mr. WALDEN. Well, he said: ''I scheduled a meeting for Thursday, December 15th, in Corvallis, Oregon.'' And he goes on to say: ''Although the studies''—let's see.

He says: ''I've scheduled the meeting, not them,'' and that it—''and it had nothing to do with their publication. Both Dan and Joe showed me some PowerPoint slides that they had prepared. Joe discussed the wildlife aspects of the project, mostly on deer mice. Although the study is comprehensive and involves many types of data, Dan only prepared slides on seedling counts and fine and coarse wood transects. He did not discuss any other aspects of the study.

Curious about this, I asked about the other parts of the study. He indicated he did not have time to look at these data yet and that regeneration and fuel hazard are two factors in which pending House Bill 4200 is based. As I wasn't familiar with bill at that time, I asked him to explain what he was talking about because these projects were not complete, it was preliminary, and because they kept their publication from me. I had no reason to suspect any wrongdoing at this time. In closing, I asked them to send me any information. I did not receive any information until January 4th when Dan e-mailed the paper to my office. Had I not scheduled this meeting, there would not have been any communication between any of the authors with me prior to publication.'' I'll just give you this to read because——

Mr. DONATO. Sure.

Mr. WALDEN.—it really raises questions about this issue that is so much in the press that I think every one of us here has weighed in to defend academic freedom, but we also have an obligation to make sure that the contractual obligations that you and your colleagues are involved in are met. I mean, that is, we have to be stewards of the tax dollar.

Mr. DONATO. We agree, that is an important issue, and we did work to resolve that between the agency and the university. We did.

Mr. WALDEN. OK. My time has expired. Mr. DeFazio?

Mr. DEFAZIO. Mr. Chairman, I'm only driving north on I-5. He's got to catch a plane, so I'm going to let him go ahead of me, if he wants.

Mr. WALDEN. Mr. Inslee.

Mr. INSLEE. Thank you, Mr. Donato. I appreciate you being here and your research and your testimony for a couple of reasons. One, I think you've expressed appropriate humility for a scientific investigator; that your research really opens doors and really adds to more questions and is not resolved. It is not the end all, be all scientific research. I found your study to be critical in leading us to conclude rightfully we need more research on this issue and that there is some evidence you have suggested, at least has some suggestion, that logging may have some consequences we did not fully understand on regeneration. So I appreciate your humility in that regard.

I also appreciate, I think it's fair to say, just a modest amount of courage in this regard in your research. And the reason I say that is that regardless of what happened in this specific situation—I don't want to get down in the weeds on that—but we really are in a country today that is living into a cloud of suppression of science from this administration trying to suppress information coming out of our principal global warming administrator on global warming and out of NASA, suppression of science out of NOAA on the same subject, right out of the White House, suppression of studies of Dr. Susan Wood about birth control. I was up at Western yesterday. There were researchers I talked to that are very concerned about this.

And what happened in your situation is in large part because of that cloud that we're under, and I just want to sort of relate that to you, that is not a cause or effect of you, but it's simply a fact of life under this administration. And it's caused us all a great deal of concern.

I wanted to ask a specific about your conclusion that the regeneration we observed was reduced by 71 percent as a result of the salvage logging operations. Could you just briefly describe how you reached that conclusion for us laypeople.

Mr. DONATO. OK. Well, it's a design with a series of plots set out across the areas designated for salvage, and about half of those plots get logged and about half don't. And before the logging, we measure all of the plots and we do seedling counts systematically. And the logging occurs, and we remeasure all of the plots again after the logging, and we follow the before and after data in the log stands. We compare the median value of seedlings beforehand and the median value afterward. And that's where the 71 percent reduction comes from.

And then we followed the unlogged stands through time to make sure that it's not just a time effect that we're seeing, that the 71 percent of the seedlings just don't die anyway.

Mr. INSLEE. Got you.

Mr. DONATO. And so we documented that there is no significant difference within the absence of logging, so it isolates the effective logging as producing the regeneration.

Mr. INSLEE. Thank you.

I have a question I want to make sure of all the witnesses. Do any of the witnesses believe that we need to eliminate the need for requirements, the National Environmental Protection Act requirements in our decisionmaking regarding salvage logging? Do any of you advocate for the elimination of the NEPA requirements in regard to salvage logging management decisions? Do any of the five or six witnesses advocate that today?

Mr. Kolb, you do. None of the—so we have one that would advocate for getting rid of NEPA in that regard.

Mr. KOLB. Not getting rid, but modifying.

Mr. INSLEE. Modifying. OK.

Second question. Do any of the witnesses advocate for removing from protection of our forests the roadless area policy as it applies to post-disturbance salvage logging? Do any of you advocate for getting rid of the roadless area policy in that regard? Nobody.

So we've got one out of the ten questions I've asked, doing quick multiplication, or twelve, depending on how you count.

That's important. I'll tell you the reason I asked that question. This is what the whole issue is on this hearing. The legislation that has been proposed would gut the National Environmental Protection Act policy of asking our Federal employees to consider science when they make these management decisions. But nine out of ten or eleven out of twelve, depending on how you count scientists today, have not advocated for doing that.

And this is exactly my concern about this proposed legislation, because I think it creates the potential that we will make the same type of mistakes in the woods that we have made on a bipartisan basis, I may add, in not looking at the science before we make these decisions.

Now, Mr. Kolb, I want to ask you just one other issue about—there are other values certainly of standing dead limber—lumber—other than aesthetic or commercial.

I want to read to you a statement from Dr. Richard Hutto, Professor and Director at the University of Montana. He says, quote:

If you salvage these special biologically unique burned forests, birds disappear as perhaps do many of the other organisms unique to severely burned forests. In fact, every study ever conducted on the issue has shown that all bird species are less abundant in completely salvage logged than in uncut burned forests. Even partially salvaged forests reveal that all but possibly a few species are negatively affected. And, once again, none of the species most specialized on most—on most restricted to post-fire conditions have been shown to benefit.

Basically, I understand by lay terms Dr. Hutto's saying that standing timber can have a commercial value, but it causes a significant cost to the American citizens to the extent that they have values of our feathered friends in the forest. And we got to see two of them today, a red—or one of them—a red-tailed hawk, and we heard about a red-headed woodpecker that was out in these forests that were supposed to have been cut but were blocked by litigation. And everybody gets mad about this litigation, but the habitat that supported the woodpecker that we almost saw today, but heard

about, would have been destroyed had that salvage logging taken place.

And just the question I have, do you agree with Dr. Hutto in his assessment of the impact on avian species of salvage logging?

Mr. KOLB. No, I do not. And I've had many discussions with Dr. Hutto about this. And here's the basic rationale.

And, by the way, studies have shown that flickers and red-tailed hawks actually benefit from areas that are harvested versus dense forests. They're egg species. The only species that's been—the bird species, woodpecker, that's been documented to benefit from dense standing dead timber is the black-backed woodpecker.

There are actually many species that have been shown to respond very favorably to logging. And really if you look at the compendium of research on avian response to fire, it shows that it's really a mixed bag. There are species that respond well to salvage logged areas and some that do not. But as a whole there are just as many studies that show positive responses as negative responses, but depends on the species.

Now, with regard to Dr. Hutto's statements about the value of these dead standing trees, there is a value to dead standing trees. It's a question of magnitude. And the argument and the comment I make to Dr. Hutto is: If 500,000 acres of dead standing trees resulting from a fire is necessary to support these bird species, where did they come from? We had 70 to 80 years of fire suppression where we didn't see fires of that magnitude. Now all the sudden these species are dependent on these huge black patches.

So fire is important to provide habitat to some degree. It's a question of magnitude. I'm all for leaving patches of dead, fire-killed trees out there, but do we need 500,000 acres of it.

Mr. INSLEE. You raise a very interesting point, where did they come from. And if the presence of forest depends on human intervention in the forest after fires, the question must be raised: Where did these forests come from before the appearance of industrialized man? They came from an ecosystem devised through thousands of generations before our appearance in the Northwest. And I think we ought to think about that.

By the way, I just want to mention that the gentleman I just quoted, Dr. Hutto, is Director and Professor of the Avian Science Center at the University of Montana. You know, we'll have to draw our own conclusion in that regard.

By the way, if I may submit to the record the letter and information that Dr. Hutto—what came from that. If I may just have one more——

Mr. WALDEN. Yes. Without objection.

I'd also like to submit for the record the e-mail I referenced earlier that we're providing for Mr. Donato. So without objection, both will be in the official record.

Mr. BAIRD. Would the gentleman—would my colleague, Mr. Inslee, yield for just one moment.

Mr. INSLEE. Sure, if I can catch my plane.

Mr. BAIRD. It'll be brief.

To your knowledge, what percentage of the Biscuit Fire would have been harvested?

Mr. KOLB. I'm not familiar with the Biscuit Fire other than what I've read on it, so I don't feel——

Mr. BAIRD. I believe we were told it's seven-tenths of one percent.

Ms. WEST. Six percent. Six percent.

Mr. BAIRD. Six percent. Six percent would have been harvested. So we would still have 94 percent of the area available for that bird habitat.

Thank you. I appreciate the clarification.

Mr. WALDEN. Mr. Inslee, I know you have to go to catch a plane. I'm anticipating a second round. Do you have anything else you want to ask before you have to leave.

Mr. INSLEE. No. I may try to sneak in a couple minutes after your next round. I'll just see.

Mr. WALDEN. Oh, I thought you had to leave at 2:30.

Mr. INSLEE. Thanks for your courtesy.

Mr. WALDEN. All right. Congressman DeFazio, five minutes.

Mr. DEFAZIO. Thanks, Mr. Chairman.

I'm just—Brian, just I'm pretty familiar with the Biscuit. And just to be clear, there's a perimeter within which we lump all and say this is the Biscuit Fire. But it's very much, as are all fires, a mosaic and not everything within that 500,000 acres was burned or substantially burned. Some areas are total toast, and other areas are, you know, still, particularly in weather drainages and some places where it skipped, are still quite intact.

The issue—I was particularly interested in Mr. Lorensen's testimony because it really—it's something that came up in the hearings in Washington and I want to pursue it because I think, you know, there's also some potential grounds for agreement here, even when we seem pulls apart.

And in your testimony, page three, you say: To reduce value of the smaller trees means that most or all of the economic value in the stand is contained in the larger trees that are also most valuable as future stand structure and wildlife habitat.

Then you go on to the next paragraph to say: One way to address this is to reduce the time associated with planning and implementing salvage sales. Reducing the time it takes to plan and implement would allow more of the value of the small and mid-diameter trees to be captured and allow greater flexibility to leave larger trees while still maintaining the economic viability of the timber sale.

This is similar to some conclusions that Dr. Franklin offered in testimony in Washington.

And I guess I'd just like to ask. Does—I would assume Dr. Kolb and others would agree there is value in having a retention standard? That's correct. And then you can agree or disagree over the magnitude or, you know, of the retention standard. But doesn't it make sense, what Mr. Lorensen's talking about here, is if an area is available for timber management, that if you want to go in there you would want to go in quickly and remove and target and get the value of the smaller, mid-diameter trees and then you would have some more or less retention of the biological reservoir of the larger trees.

Does anybody disagree with that sort of premise or idea? Because I'm thinking that's where there might be a little more grounds for

grooming here on the part of the Committee as we move through this debate.

If I could go—I mean I'm a little puzzled because I read—you know, I'm not a scientist, unlike Dr. Baird. But, you know, I read the one-page article in Science, and I don't quite get as excited about it. If you let a stand, the stand burns. OK. It was a mature stand, as I understand it, so these are—was it previously logged?

Mr. DONATO. No.

Mr. DEFAZIO. No. OK. So we're talking old growth, very large trees that are fire resistant. So there was some survival. It was a mosaic kind of thing. They weren't all dead.

Mr. DONATO. There was a mosaic, but we sampled just the stands that burned with high severity.

Mr. DEFAZIO. OK. But they were—there was still some scattering of seed sources and that.

Mr. DONATO. Around them, yes.

Mr. DEFAZIO. So you got—so you got a lot of, you know, natural reseeding and small things growing up. And then you drive heavy equipment over the little trees three years later and they get crushed, right? OK. That to me doesn't require too much, you know, study. No offense. But, you know, I get that.

Now, the key—the key becomes—when we were up at BLM, we saw a stand that was private where they had maximized salvage and maximized reforestation. The BLM stand hadn't been salvaged, but they went in with reforestation. They had very little natural regeneration because it was a previously managed stand and there wasn't much of a reservoir of seeds in the bigger trees to survive.

So the—it seems to me that, you know, the conclusion that can be drawn here, I think the thing to me that was perhaps most compelling or interesting was the concern about the slash and how that infected—affected either future possibility of fire and/or whatever natural seedlings remain. And on the private lands here again they controlled and very much they removed most of the slash, which is not that usual in these operations, but they did and they brought it down the hill down by the road and got it out of there.

So I think one of the conclusions you came to was that—and I saw it here in your testimony—rather with information from this study and additional ones that isolate the effect of different harvest techniques and timing, any undesirable impacts of salvage logging could be minimized.

So, you know, that again does not seem to be a controversial conclusion to me. And I'm a bit—and, you know, we'll hear from Mr. Baird later in terms of his concerns. But let me go this way. If we had a young plantation—I was involved with Mark Hatfield legislating, actually. Salvage has been always controversial. And in order to do salvage on the timber, the Silver Fire, we legislated it and we stopped the building of a very controversial road. We established and we did helicopter logging, and we got fairly substantial salvage. Created a young plantation. A lot of that burned up in this fire.

Now, if you have a young plantation that gets fried, your study wouldn't be applicable because there's really no seed source. Is that correct?

Mr. DONATO. If it had been a plantation prior to the first burn? I'm not quite sure what the question is.

Mr. DEFAZIO. The first burn with the Silver Fire, I think it was pretty much—I think it was pretty much virgin forest. Someone here might know better than me. I mean it was—I don't think it had been entered. It was pretty roadless area. So I don't think it had been entered previously. But it was substantially burned and areas were salvaged and then plantations or—well, let's—maybe that's not a good example. The point is: If a plantation or managed area burns, you're not going to get much natural regeneration, right?

Mr. DONATO. Well, it depends on existing seed sources that surround that plantation.

Mr. DEFAZIO. Right. But if it's a—if it's a big plantation, you know. I mean—what I'm trying to get at is that—and this is for us to decide, which is where it's appropriate to do harvest, where it isn't, and post-catastrophic how you manage those lands. I mean if you have a large plantation that burns in this environment, you're not going to get probably natural conifer regeneration. You're going to get some other kind of regeneration, but it's not going to be conifer, at least for a very long time.

Mr. DONATO. Well, that's not certainly certain. It really depends on the site you're talking about.

Mr. DEFAZIO. OK. All right. That's fair. I mean I don't think any of these things have totally definitive answers. But Mr. Inslee did sort of put out there, but he didn't ask the question, and I asked the question this morning, so I do want to ask it again now, which exactly was the question he asked.

I said so if in this area that, you know, the natural competing vegetation is so good, you know, how did we previously, you know, maintain or regenerate or get these forests? And I think there's a very complex answer to that question. And I'd like anybody who wants to try and address it—I mean because we don't—we don't know exactly and we've got to interpolate backwards, but I mean, you know, hundreds of years. I assume climate change comes into effect, you know, natural fires, lower intensity, more frequently versus, you know, now. But I mean what—how is that? I mean how did it happen without intervention and management?

OK. Dr. Peterson is the guest. OK.

Mr. PETERSON. I'll take a shot at that, I guess.

Mr. DEFAZIO. Sure.

Mr. PETERSON. I think you've already stated most of the reasons for the current day complexity, is that particularly in these landscapes in Southern Oregon where we have what's called a mixed severity fire regime. When fires have occurred in the past, we normally got this mixed pattern of severity. Whereas in the Biscuit Fire, as in the Silver Fire, there were areas that were burned severely, there were areas that were hardly burned at all, and a lot of stuff in the middle. Very complex spatial patterns. And that's just absolutely natural and normal for these types of forest ecosystems. And then you have the wild card of climate that early in the regeneration process for conifers can determine the fate of that particular stand for the next hundred or 200 years.

So we have this—it's a very complex spatial pattern along with these rather random things like weather and climate that come into play.

Mr. DEFAZIO. You know, you said random. We won't even get into that.

Mr. PETERSON. I could have said stochastic.

Mr. DEFAZIO. But you said random.

And I guess what I want to get at, this is one of my big contentions with the Northwest Forest Plan, which is not an issue here, but when lines were drawn and these were called late successional reserves, some of them big old trees, some of them were tree plantations that were actually quite dense. And I asked one prominent scientist once, I said what happens if you draw a line around a tree plantation, what do you get in 50 or 100 years. And he said dog hair. You know, and so I says you would have to re-enter and thin and, you know, really you would have—if you want just to manage ultimately back toward what you say is a natural state or large old trees, you would have to manage back to it. It's going to happen very easily unless the whole tree plantation burns down. I mean—would you like to address that, Dr. West or Dr. Peterson, either one. I saw her nodding. Because I mean that's the thing here. Part of what you're saying is but some of these lands were previously managed and therefore this was not a natural occurrence, which goes to the whole issue of fuel loading and management.

Ms. WEST. And I think we've developed a fairly good understanding of the opportunities to go in and remove some trees from these very fixed width, between trees, you know, patterns to create more of a natural mosaic of trees, creating some gaps in those forests so that it can hasten its development into older characteristics, characteristics of older forests. So that's well documented, that we've got those opportunities if that's a management objective.

Mr. DEFAZIO. OK. My time's expired, but I will have more questions.

Thank you, Mr. Chairman.

Mr. WALDEN. Dr. Baird.

Mr. BAIRD. Thank you.

Mr. Donato, I've survived a thesis defense and a dissertation defense. They're not pleasant, but I didn't have to do it in front of all these folks. So if I ask you tough questions, I'm not picking on you. This is how science works. It's worked for thousands of years this way.

Mr. DONATO. Fair enough.

Mr. BAIRD. Mr. Inslee said that he thought you displayed an appropriate degree of humility. One of my concerns is, frankly, I don't think you did in a number of ways in the study or in your testimony today. And part of scientific integrity is making sure you don't make generalizations beyond the limits of your data. And nowhere in your study or did I hear in your commentary today two critical things germane to our legislation.

First, I never saw reference in your study—maybe I just missed it. I read it a bunch of times, but maybe I missed it. I never saw you say that had the logging commenced prior to the two-year time allowed under the Biscuit Fire, the mortality of seedlings would have been substantially different. So that's one thing.

I think you needed to say it because the entire purpose of our legislation is to allow folks to go in while the existing wood has more value and before you got seedlings coming up and you can do some of the work that Dr. Kolb has testified elsewhere on of crossfallen trees to stop erosion. Did I miss something or did you address that?

Mr. DONATO. Can I address that?

Mr. BAIRD. Please, yeah.

Mr. DONATO. Our goal in the paper was to present the numbers and present the dates and not make management recommendations. We just wanted to present the data.

Mr. BAIRD. I find it disingenuous.

Mr. DONATO. We wanted to present the data.

Mr. BAIRD. Throughout your study are value-laden statements.

[Audience disruption.]

Mr. WALDEN. Ladies and gentlemen, please. We don't tolerate that in Washington and not here either.

Mr. DONATO. Our goal was to present the data and let people draw their own conclusions. We—we in the paper indicate that as a 2002 fire that was—we measured before and after logging, which is 2004.

Mr. BAIRD. I understand. I've read it. I don't want—I'm going to interrupt you.

Mr. DONATO. And I think it's clear that everyone—many people are making that conclusion, and I think that that's a fair thing. And we didn't want to make any specific management recommendations.

Mr. BAIRD. With respect, I think it's disingenuous. With respect, the fact of the matter is that you're going to kill trees if you wait two years. And your title says Post-Wildfire Logging Hinders Regeneration and Increases Fire Risk. But there's no caveat in that title. It's a generic—the grammar of it, my friend, is a generic continuous generalization. And I've read probably 20,000 studies. I've taught this stuff. If I were your advisor or if I were a reviewer, to be perfectly frank, I'd have said I believe your title is deliberately biased, or maybe not deliberately, but will be interpreted that way. And here's why this matters.

People are taking this to imply far more than the study suggests. And it particularly matters, and I'll get to this in more detail in a second, because it is apparent from some of the text of your earlier document that this document particularly was published when and how it was to influence policy, which it seems to me ethically to make it far more incumbent upon you to express the caveats.

The second caveat I didn't see was any discussion about the possibility of reforestation efforts and how that might be affected.

Now, our legislation again addresses not only prompt harvest, but also prompt reforestation through diverse species, which could certainly supplement any—any mortality of natural regenerated trees. So I just put that out there.

Let me ask you a couple of questions. When I requested the material that you had, the full data set, I also asked through my staff, what did Science magazine request. And the reason I did it is because I wanted to see if Science had done due diligence. And, frankly, I don't think they had.

You essentially said there's the one-page article itself and about a page and a half of supplementary material available on the Web. And I think your language was: What you see is what you get.

Did at any point the reviewers from Science magazine ask you for raw data?

Mr. DONATO. No.

Mr. BAIRD. OK. So what you saw was what you got?

Mr. DONATO. That's right. That is all—everything we submitted.

Mr. BAIRD. Well, we have an hour and a half here. I could talk about and I will talk about in a second why I think that's problematic.

One of the key variables from this is the interpretation that the median regeneration is reduced by, what, 71 percent, something like that. You're taking continuous data. You're taking an absolute number of trees. I want to walk people through this. A brief statistic lesson.

This is what you call a measure of central tendency. We're familiar with the average, right, where you add everything up and then you divide by the total number of data points. That's called the average.

The median doesn't encompass nearly that data. The median says the point at which there are equal number of data points lower than this value and an equal number of data points above this value.

You've got, as I understand it, five cells, five study cells broken into four quadrants per cell.

Mr. DONATO. That's not quite right. It's nine plots distributed amongst five sites.

Mr. BAIRD. OK. I'm not sure that's clear in the data, but I'll stay with that.

The concept—your "N" was nine, but I looked at the study a lot and I didn't get an understanding. You had five sites, each of which had four transects, right?

Mr. DONATO. No. We had nine plots, each of which had four transects.

Mr. BAIRD. Well, I—well, you'll have to sit with me afterwards and show me where that's reported in.

Mr. DONATO. I could—I could do that.

Mr. BAIRD. Yeah. Good.

Here's the problem with the median data. If you look on there, this is just hypothetical data I created. If you had the first prelogged values on the top, 5,100, 767, 1,000 and 2,000. And the second set—in the top set there, the post-logged were one different except for that middle median. You could look like there's quite a substantial difference in the median value, but in all the other plots there's not such a difference, is there? In fact, there's a difference of one on all the other plots, but those other plots aren't spoken to by this data.

Now, in contrast, the chart below has the exact same median difference, but quite a lot of difference among the other plots.

Now, my question to you was: Why not present that data? Why not give it to me? And why didn't the reviewers in Science look at it? Because I want to understand this question.

Mr. DONATO. Well, submission of raw data to a journal for peer review is almost unheard of.

Mr. BAIRD. Well, wait a second.

When a paper is accepted for publication in Science, it is understood that any reasonable request for materials, methods, or data necessary to verify the conclusion of the experiment—

My point is: You have chosen a methodology for analysis and data report that is subject to significant misinterpretation. And this is not, my friend, a subtle academic issue; this is a matter of important policy decisions. Because if it is the top graph, then in many cases the plots were not that different pre/post than if it were the bottom graph, and merely reporting the mean is specious. And I can't tell without that data which is the case.

Mr. DONATO. Can I address that?

Mr. BAIRD. Please.

Mr. DONATO. Using the mean, given the distribution of the data set, would be statistically indefensible.

Mr. BAIRD. Well, describe that.

Mr. DONATO. And it would misrepresent the data.

To use the mean, the average value, you need to have normally distributed data. It's a bell curve. And these data are what's called skewed.

Mr. BAIRD. I understand.

Mr. DONATO. They're right skewed. And the best measure of central tendency for that is the median.

Mr. BAIRD. Correct. But the median is ordinal level data. And by looking at 71 percent you've performed a ratio level operation, and going back to Stevens in the '50s you can't do it.

Mr. DONATO. Can I also point out the statistical test that I used, which is the Wilcoxon signed rank test, which is used on before/after data for each plot, which completely takes care of this problem, 100 percent.

Mr. BAIRD. No, it doesn't.

Mr. DONATO. Yes, it does.

Mr. BAIRD. It does not. It does not deal with the magnitude. I'm sorry. With respect, it doesn't. It does not deal with the absolute magnitude of the difference. It rank orders the variables or the plots on which ones are different. It rank orders the magnitude, but it doesn't tell the absolute magnitude. It just doesn't.

Mr. DONATO. The median is a measure of central tendency of all nine plots beforehand and all nine plots after.

Mr. BAIRD. No, it's not.

Mr. DONATO. Yes, it is.

Mr. BAIRD. It is not.

Mr. DONATO. Yes, it is. I disagree. I have to assure—I would like to——

[Applause.]

Mr. BAIRD. I understand the applause.

Mr. WALDEN. Congressman.

Mr. BAIRD. Let me ask you this question. Anything wrong with the logic of that chart I put up there? Is it possible that the median could obscure that data? I mean I'm asking you folks here, is it possible. I'll ask the other scientists here. Could a median report obscure differences in the cells such as I described, and if you really

wanted to insure that such differences—I won't ask Mr. Donato this; I'm going to ask some other folks—is it really possible that reporting only the median data could have obscured substantial misinterpretation.

Mr. PETERSON. I think with data like this where the sample size is small, which is a constraint of many of our studies in forest ecosystems, it's incumbent on the investigator to look at a variety of statistical approaches in order to get a fair representation of the distribution of the data and the variance in the data.

Mr. BAIRD. Would it be incumbent upon the reviewers to do so as well?

Mr. PETERSON. Certainly incumbent on the reviewers. Of course that's the luck of the draw when you submit it to a journal.

Mr. BAIRD. How much effort would it take—would you assume that before someone submitted a—I mean Science and Nature are probably the two preeminent scientific journals in the world, broad-based journals. Before you submitted an article to Science, would you not at least have wanted to look at this to just insure that the median, which is a pretty basic measure of central tendency, was not obscuring some kind of pattern that——

Mr. PETERSON. If I were the reviewer, I guess that would be one of my comments, is to ask the author to display more about the data and the statistical approach.

Mr. BAIRD. Yet the reviewer didn't ask you that.

Mr. DONATO. Well, at one point we had—we had mean values presented for the woody debris data. And the reviewer actually made a decision that the median was a better representation.

Mr. BAIRD. Now, when I—I understand that. When I asked—when I asked you, I don't think you provided that information. I just frankly disagree with the viewer in this—the reviewer in this case.

Mr. DONATO. Fair enough.

Mr. BAIRD. And will you provide this data to me, Mr. Donato.

Mr. DONATO. Appreciate that I represent a team of researchers. It's not really just up to me. And I represent an institution who is concerned about the ability to publish on these data in the future. And we are working on going through the appropriate paths to provide the data should that be the appropriate path.

Mr. BAIRD. Well, when you submitted the article to Science, did you intend to adhere to the requirements of submission in Science.

Mr. DONATO. Yeah, I'm aware of those requirements. And the university has advised that there are conflicting directives on that, and they're the ones working on that, because I am not an expert on those matters.

Mr. BAIRD. Mm-hmm. Let me go to one other issue. If a logging sale were let to a contractor who went up into the woods and violated the terms of the sale, my guess is our goods friends on the—anybody responsible would say, hey, you ought to put a stop to that. If they're violating the law, you ought to put a stop to that. You know, you immediately stop. Yet I'm of the opinion that the terms of the agreement with the BLM were violated in this case. And when, based on that, people asserted that we ought to at least take a pause, it was described as an academic witch hunt, it's

censorship, et cetera. And I'm not so sure it is. I mean let me read you the terms of the agreement.

It's pretty explicit. It's page ten of the Assistance Agreement. It says: Recipients shall not use any part of the government's funds for any activity or the publication or distribution of literature that—and I want to underscore this—that in any way tends to promote public support or opposition to any legislative proposal on which congressional action in not complete.

Now, explicitly in the publication of the original draft—one of the drafts of your document, plus in one of the drafts of the Science publication, you specifically referenced this bill.

Mr. DONATO. We specifically reference it, but certainly offer no endorsement or opposition to it.

I would like to read you a passage from the National Science Foundation Web site.

Mr. BAIRD. Mm-hmm.

Mr. DONATO. Basically, they—first I'll paraphrase, that it's becoming increasingly important for scientists to not relegate themselves to the ivory tower and make their findings relevant to the boarder societal context, and they consider grant applications to be competitive only when they address those broader issues. And the following examples are included on their Web site as potential ways to achieve this.

Quote, ''Provide information for policy formulation by Federal, state, or local agencies.

Present research and education results in formats useful to policymakers, Members of Congress, industry, and broad audiences.

Demonstrate the linkage between discovery and societal benefit by providing specific examples and explanations regarding the potential application of research,'' end quote.

It was in this spirit that we referenced an important policy issue. And while no endorsement or opposition was ever offered, those references don't appear in the final published version.

Mr. WALDEN. Mr. Baird.

Mr. BAIRD. I'll yield back. I'll have some more questions.

Mr. WALDEN. Thank you for yielding back nothing. You're in a long line here of going over the clock, including me, so—

Mr. BAIRD. I figured I was OK.

Mr. WALDEN. We're here to get answers.

Mr. BAIRD. When you follow Peter, you're always in that line.

Mr. WALDEN. That's all right.

I want to—part of what is troubling, I think, is this conflict over the publication of your data. And this is government money we're talking about, not independent research, $300,000 to look at. And later we have somebody testifying—I don't know if you've read Mr. Drehobl's testimony, but it's pretty sharp as well. And he comes after this, so I want to give you an opportunity to respond. Because he specifically cites that the agreement that you and your colleagues had in this research required, and I quote, the recipients must obtain prior government approval for any public information releases concerning this award, which refers to the Department of Interior or any employee. The specific text, layout, photographs, et cetera, of the proposed release must be submitted with the request for approval.

And that the agreement further states, government requirement: Provide timely review and comments on the document produced by this study and work and partnership on this project. And he goes on to express some other concerns.

And I just have to go back to this e-mail because Mr.—and maybe you can help me. Mr. Sensenig was the project investigator and principal——

Mr. DONATO. Project inspector.

Mr. WALDEN. And principal investigator, correct.

Mr. DONATO. I'm unclear on whether he was the P.I. or not.

Mr. WALDEN. He indicates he is in this memo.

Mr. DONATO. I know.

Mr. WALDEN. And you knew that. It says——

Mr. DONATO. No, I have not known that for sure.

Mr. WALDEN. Who then did you believe to be your project investigator or principal contact at the BLM?

Mr. DONATO. Well, the principal contact at the BLM was Tom Sensenig.

Mr. WALDEN. And so in terms of compliance with the agreement of the $300,000 grant for you and your colleagues to do the research, if you were to comply fully with what has been—what is in that agreement, would Mr. Sensenig have been the person that you would have needed to get approval of to do any kind of publication.

Mr. DONATO. Actually, I have to say that was unclear too. I really want to stress that the communication breakdown between the agency and the university is a two-way street and that when Tom Sensenig moved from the BLM to the Forest Service, we weren't notified who the contact was.

Mr. WALDEN. Did you know when you got—did you know the requirements for prepublication approval when you got the agreement—or you got the funding.

Mr. DONATO. No.

Mr. WALDEN. You never knew that you needed to consult with anybody before you submitted for publication.

Mr. DONATO. Not to the level specified in that agreement, I didn't.

Mr. WALDEN. So you—none of your researches knew that either.

Mr. DONATO. I can't speak for the rest of the researchers.

Mr. WALDEN. Did—who signed the agreement for the funding, do you know? I mean I would think—I mean I'm just trying to figure this piece out.

Mr. BAIRD. I think it's a university person who signs it for whoever administers the grant.

Mr. WALDEN. All right.

Mr. DONATO. Yeah. And this all occurred before I was even here at OSU.

Mr. WALDEN. All right. So you never knew you were supposed to get approval.

Mr. DONATO. That's correct.

Mr. WALDEN. You just submitted to Science.

But when you met with Mr. Sensenig, so it never crossed your mind that you should——

Mr. DONATO. Yeah, I really want to stress that this is just a lack of clarity on the level of consultation required.

Mr. WALDEN. I would think—and I was never a graduate student. I did get a journalism degree. But I would think if I were meeting with somebody from the agency who I knew to be my contact on a $300,000 research project that I had submitted to Science magazine, one of the preeminent science magazines in the country, I'd be pretty proud and I think I'd be blowing my horn a little bit.

Did you share what you submitted to Science magazine with anybody else before it was published?

Mr. DONATO. No.

Mr. WALDEN. So no other organization out there had—had a copy of your report and your findings prior to when Science magazine either printed it online——

Mr. DONATO. I may have e-mailed it to a couple people the week before or a couple days before, but——

Mr. WALDEN. Who, do you recall.

Mr. DONATO. I don't recall.

Mr. WALDEN. I think it would be interesting to know who that might have been.

Here's—here's the other piece. And I want to get back to the title because I think that's part of what others have used to say your report claims certain things. And it does talk about, you know, that this hinders—Post-Fire Logging Hinders Regeneration and Increases Fire Risk. And Mr. Sensenig—obviously you've seen the e-mail to you from—to him where he writes and says he disagrees with that and he pretty forcefully describes that.

And I want to kind of rebuild those and then how your research applies to it, because if—you know, our bill does not mandate any particular action in the woods. We do not mandate in here they go salvage logs. In fact, they have to meet a criteria to even be able to use the expedited processes to do whatever the forest plan requires, correct? You've read our bill, I assume.

Mr. DONATO. I'm not terribly familiar with it.

Mr. WALDEN. And I'm not asking you—I'm not trapping you or I'm not asking you to comment whether you like it or dislike it, because I know you're still a researcher.

But having said that, if—based on what you know from your research—I'll try and couch this so I'm not causing you any other problems; that's not my intent—you would have fewer seedlings destroyed if the activity, if it was determined to be salvage logging, occurred sooner rather than later as in the first month or two months like the State of Oregon—Mr. Lorensen has testified the state tries to do on a very rapid basis, as opposed to two years later, correct?

Mr. DONATO. Yes, that is correct. In this case that would have been the case.

Mr. WALDEN. So faster actually, because I think we've heard this from Dr. Franklin and others, that if the societal choice or the—is to go in and take out some trees, that you're better to do it earlier rather than later; you'll do less damage.

Mr. DONATO. In this case that's—that's true.

Mr. WALDEN. So you see why some people have said post-fire logging hinders, you know, reforestation and creates problems, have

taken that title to imply that in every case that is the outcome. And indeed I don't think that is what you meant.

Mr. DONATO. No, I think we should be—we should be aware ourselves of overinterpretation of that to all fires and all situations.

Mr. WALDEN. And it really gets—it seems to me, and again you all are scientists and foresters and done this a long time and I'm still learning all this stuff, but it seems to me that you have to do it on a site-by-site basis. And as I travel all over Oregon and eastern Oregon, literally what happens on one slope is different than what happens on another in terms of moisture, vegetation, tree type. You go in the Hood River Valley, my home, one side of that valley gets probably ten or twelve inches more rain than the other. You cross over to Mosier and you've got scrub oaks and limits of pine and then it sort of disappears into grassland very rapidly.

And so—but there are times when you have the need to get in and take actions in a rapid fashion to prevent erosion or to do other restoration work that doesn't even involve cutting trees, correct?

Mr. DONATO. What is the answer—what is the question?

Mr. WALDEN. There are times when acting quickly—forget cutting trees for a second.

Mr. DONATO. Sure.

Mr. WALDEN.

Just to stabilize soils, maybe put logs in streams to help, you know, stop a washout, those sorts, need to happen quicker rather than slower.

Mr. DONATO. I think that's correct. Some of those actions if they're going to be taken are better off done sooner.

Mr. WALDEN. All right. And I've expired my time. Thank you very much. I appreciate your being here today.

Peter.

Mr. DEFAZIO. Thanks, Mr. Chairman.

I guess since—I mean I understood this ruling to be a hearing sort of on a post-fire recovery relationship, salvage logging, but since again you've characterized your bill several times, and I have some concern, let me say what my—I agree with all the objectives that you talk about in the bill and the way you characterize. I don't think the language quite gets us there, and I've expressed this to you and your staff.

I think it gives unbelievably broad discretion to political appointees. And as I said to the Douglas timber operators, you might like that with Mark Rey and Gale Norton, but God forbid what if Bill Clinton or Hillary Clinton comes back and you get another Katie McGinty and Bruce Babbitt. And they go, oh, my god, no, we can't have that.

So, you know, I really think we need to be more prescriptive and we need to continue that discussion and debate in this bill to go—to really get to class, forest type treatment, retention. And those are the kind of things I think the next panel can address who have read the bill and have some—you know, have varying opinions about it.

But to get back to this. And, you know, you're never supposed to ask questions you don't have an idea what the answer is going to be, but I'm going to do it because—and I hope I don't put you

in a really tough spot here. But, again, I read the article. I—like you drive a D9 over a little tree; it gets crunched. You know, I got it. OK. You know, you leave a bunch of slash on there. You know, no big deal.

The BLM told us, for instance, that when we were viewing their site that it wouldn't be impossible and they do have experience in salvage logging, selectively salvage logging in sites that they have previously reforested very early on, and they require it to be done in a way that minimizes the mortality of the seedlings in terms of the equipment that's used and how the activities are conducted.

So your—your—in this case I assume there was no intent, I mean the loggers weren't told, hey, try and preserve the natural regeneration. They didn't because the idea was they were going to come in—not them, but another contractor was going to come in and do reforestation. Is that correct?

Mr. DONATO. That is correct.

Mr. DEFAZIO. But you do say in your testimony, which you don't say in there, that in fact you could minimize some of those impacts with different techniques in terms of slash removal and/or harvest techniques.

Mr. DONATO. That's specifically why we didn't go into all the different possible management recommendations about logging early or logging differently in an 800-page—or 800-word paper.

Mr. DEFAZIO. Right.

Mr. DONATO. Yeah, that would be another option, is to if you identify existing natural regeneration, you could do a logging technique that protected that.

Mr. DEFAZIO. OK. That's good.

Now—but here's the question. I probably—again, I don't want to—and, you know, you can take the Fifth or whatever. But the thing that I think people find most inflammatory about the article is the title, which does seem, as Mr. Baird said, to draw a overly broad conclusion. And I guess the question is—I mean I write out bids all the time and they stick titles on them, and I go, oh, I can't believe they put that title on my bid, that's not what I was trying to communicate at all.

Did you choose the title?

Mr. DONATO. Let me explain the title.

I make no—no excuses for it, but do appreciate that there's an 800—eight-word limit on a title for the Science Brevia section. And by the time you say effects of post-wildfire logging on, you've got like two words left, if that. And so—and do also appreciate——

Mr. DEFAZIO. Debatable would have been a better term.

Mr. DONATO. Yeah. Yeah. And people have asked that we put the word "delayed" in the title too. It's like no, used all eight words, sorry.

And—in any case wording of titles in high tier journals that is strong, that states the, you know, the results that you found, instead of just saying the effects of X on Y, you say here's the results we found. And most of the time it's a study that says plant pathogens accumulate in snail tissue, and no one cares about it. And it just happens to be that in this case people, you know, read that it was too broad because of the particular topic, but that's where it is.

Mr. DEFAZIO. An educational moment.

Just back to Mr. Lorensen. I just want—I mean, you know, we visited the site. The BLM had proposed some selective salvage. They weren't—they were restrained by the courts. But the point is they were going to do some selective salvage. But next door was private land which had been, you know, much more robustly salvaged and reforested, and it looked like it was doing pretty good in terms of the regrowth. And it sounds like the state would conduct operations similarly on state forest lands.

Mr. LORENSEN. We have a range of management prescriptions——

Mr. WALDEN. Peter, can you try to turn on that mike? And get a little closer perhaps. Thank you.

Mr. LORENSEN. On state-owned land we have a range of management objectives, and we would tailor our prescription to those objectives. But, again, the objectives are fairly clear, and then the methods we use, the expertise and science are out there to implement them.

Mr. DEFAZIO. Right. So if the objective is to create fiber or grow trees for harvest, you would conduct similarly to private.

Mr. LORENSEN. As we would—also we'd grow structure and other forest conditions that are similar to the Federal objectives that we would also implement in a similar active way but through different techniques. We use the full range of tools, and again——

Mr. DEFAZIO. Different treatments for different objectives.

Mr. LORENSEN. But with a full range of tool box. And that's probably the biggest difference.

Mr. DEFAZIO. And is that set by law or the management plans are written to—I mean are these catastrophic events anticipated in your management plan, so with this management objective this is the prescription you'd apply, or do you have to develop it after the fact.

Mr. LORENSEN. We do not have that in our current plan. We've talked about incorporating that, but we do it on an ad hoc basis based upon the circumstances. It's preferable to get them done very quickly.

Mr. DEFAZIO. But would that be—I mean if we had the resources and the time, would that be a prudent thing to do, because that way if you knew it was an area that was reserved for fiber production, didn't have sensitive species, watershed, tribal soils, whatever issues, that you're going to get in there quick, salvage and reforest. I mean would it be desirable to sort of anticipate those different things with a cross of different classes in different areas.

Mr. LORENSEN. That's correct. And we basically have a desired future conditions.

Mr. DEFAZIO. I know you say this, or your bill does, but I'm not sure we quite get there in legislative language, Brian. And we can—again, we can have that debate later. But I just want to establish that that's a desirable thing to do.

Mr. LORENSEN. On all arranged desirable future conditions we have active management centers we implement to accomplish those in a timely way.

Mr. DEFAZIO. OK. That's good.

Anybody else of anything I've asked here want to, because this is going to be my last round, anybody want to comment on any question I've raised, anything the other people have said?

Yeah, go ahead, Dr. Kolb.

Mr. KOLB. Well, I just want to get back to a question that Mr. Inslee asked me.

Mr. BAIRD. Well, he's gone.

Mr. KOLB. Why are forests here. And I don't want to be misunderstood on this.

Nature does not need us. Nature is just a series of processes that's been doing its thing for a long time. Whether forests are here or not, nature doesn't care. And as climates have fluctuated, so have our forests. We, however, need nature. It provides for us what we need. And this is where this gets—this is where my comments are on. If we have a landscape designated to grow forests for us, if we let nature do its thing and nature decides no more forests, that's going to be really hard on us. And that is the whole point of trying to manage nature, to help us while maintaining the integrity of the processes that are out there.

Mr. DEFAZIO. OK.

Mr. LORENSEN. And if I may. Again, I apologize for Representative Inslee also not being here. He did ask the question of do we advocate something or not, and I guess I want to be clear. I didn't say yes or no. It's not my role to advocate, and I'm a state employee. My job is provide policymakers decision information and help support their decisionmaking processes. So that's my answer, and I guess it's not a yes-or-no question, but he asked it that way.

Mr. DEFAZIO. Well, I think the answer, and going back to what Dr. Kolb said, it depends. It depends on the objective and/or the classification of that particular tract of land.

Mr. LORENSEN. But I also think other beliefs that came out with Representative Inslee was the notion of man and forest, and it's fair to say that man was here prior to European input and there was management of forests well before we got here through fire and other means. It's also fair to say due to fire suppress we now have forests and woodlands where they weren't before. And so it works both ways. And we need to be cautious about both those roles. We can either create forests or we can manage and modify forests.

Mr. DEFAZIO. No, I mean and that's a point. I mean we're not into—I mean that's why, you know, we adopted legislation to move forward on fuel reduction, because we realized we created the problem. I mean you can see photos of settlement in 1870 and there's a house and there's some big ponderosas around and you look now and you can't see the house. And that's because of the repression of fire, and it isn't what the preexisting regime was with natural prairie fire and other things.

Or just one other quick thing, because a lot of people like to focus on diameter, which is a really poor measure of what you should take or not take in a lot of cases, and it's a great example. And I just want to put it out here because I like to educate as we go along and I learn as we go along.

I was visiting a guy who's done a really great job with his property over in eastern Oregon. And he's, you know, thinned it out

pretty nicely, moving back toward what, you know, I would see in the 1870 picture with the ponderosa. Right next door is Federal Forest Service. It's been repressing fire. And here's this big old Doug fir that's now 90 years old, growing right up into the crown of the ponderosa on the Federal forest land, but it's over 20 inches in diameter.

The screens say, well, you shouldn't take—the fir shouldn't be there, but also if you have an indiscriminate screen, you'd say, well, you can't take it out, it's over 20 inches in diameter. Well, the question is: Do you want to save the big old ponderosa if there is a fire or do you want to lose both of them?

And, you know, so I mean there are no easy answers to this. And that's ultimately why we ask scientists, you put all your stuff out there. I'm just not as heads-up about this whole publishing of the article. I mean it's like I read stuff I disagree with all the time. I mean it's like—you know, I mean if I read stuff I only agreed with, I'd be, you know, on Fox or something.

So, you know, it's just—you know, I'm not offended by it, so I invite you all to continue to challenge this because we definitely don't know everything we need to know.

Thank you.

Mr. WALDEN. I look forward to the day you're on Fox, Peter.

You know, before I go to Dr./Congressman Baird, I just want to say—and I look forward to working with you. We've worked on a lot of these issues together and we sometimes start from sightly different viewpoints and try to find common ground, and I think we did that with the Healthy Forests Restoration Act. And I think—and I'm hopeful we can do that here, because again I'm hearing some of the same things Brian and I have talked about, come to terms with and hopefully with language we, all of us, can, because I want to rely—yeah, if we can get Doug to write the right words.

Because I still believe, just as you say, these decisions have to be made on the—sort of plot by plot or forest by forest or plant regime or whatever your terminology is by plant regime. And we've—we've learned, as I said in my opening statement to some snickers, actually learned from these hearings. We have drafted amendments to the original law that say we want to be prescriptive about leaving habitat trees behind. We want a dedicated funding source for the research. We have adopted some of Dr. Franklin's recommendations on how we phrase independent third-party peer review. I think that's probably not the exact right wording, but we've tried to refine the peer review piece and tried—in fact, one of the issues, and Jay's gone now, but in his and Tom's bill talks about, you know, trying to predetermine what to do if a fire were to go through a region.

We in the, as you know, in the Healthy Forests Restoration Act created the community wildfire planning process as bringing together very disparate individuals and groups to try and say what do we want in our forest-surrounded communities.

The Resource Advisory Councils have done that, brought together people that sometimes in some communities have been at war forever to say, you know, we all love these forests, how do

we—how do we come together and say what's best for management.

We're also modifying our bill to take advantage of that wildfire community planning process to say let's do look out and say if a fire were to go up the Applegate or over into a watershed, here is a community, what we think should happen in a post-fire recovery process. Start that planning process now so that we can have some guidance so that if we need to act, so we don't run over, you know, seedlings two years after, let's do what's right for the forests, for watersheds.

Anyway, I'll stop.

Brian.

Mr. BAIRD. We're going to save for another time, you and I have a chat about Wilcoxon rank sum test itself and——

Mr. DONATO. I would love to.

Mr. BAIRD.—the importance of the median.

I will—I will assert that the median speaks to one of the many possible cells and therefore can be misleading. I think that's pretty clear.

But let me ask you. Something that I think is interesting is emerging out of this. Rightly or wrongly, intentionally or unintentionally, largely based solely on the title of your article and then what the press made of it subsequently, this study is becoming as if it were the total body of literature about post-fire logging. And people show up at townhalls with how could you dare put forward this bill when science has proven this. And we have buttons about scientific integrity. Scientific integrity is a lot more complex than that.

The question from me would be, Mr. Donato, and then I want to ask a separate one of everybody. Do you think it would be an accurate or an inaccurate use of your study, given its limitations and its strengths, to suggest that your study alone should guide this particular piece of legislation or should be used as evidence that we should or should not, in and of itself, that we should or should not engage in post-fire logging and reforestation?

Mr. DONATO. No, I don't think that this study is a wholesale threat to this bill. And I think that it provides some important information, but it does not provide a lot of other important information.

I guess I'm going to leave it at that.

Mr. BAIRD. Would you say that it concludes that all post-fire logging would hinder regeneration of an increased fire risk.

Mr. DONATO. You said—you asked me if it was all post-fire logging?

Mr. BAIRD. Mm-hmm.

Mr. DONATO. Definitely no.

Mr. BAIRD. Thank you.

Let me ask everybody. We'll go through one by one.

Mr. Inslee, one of the problems I had with my good friend—Jay and I differ. One of the problems I had with his characterization was he said that our legislation would take science out of the process. What we're really trying to do is put science into the process. Right now the process is a litigious process, not a scientific process. And because of that litigation, we are wasting millions of dollars

of the taxpayers' monies not with hardly any environmental benefit and at significant economic cost.

As you may know, our legislation proposes the establishment of preapproved management plans, and the gist of that is based actually on some concepts from our reading of the scientific literature that says, look, given that we know that woody material decays rapidly after a fire and therefore if you're going to do anything, you ought to do it quickly, given that we know that other plant material can grow quickly and thereby suppress forest regeneration and therefore further you ought to do something quickly, can we not, analogous to what my good friend Peter was saying, use our existing knowledge in advance to identify plant association groups, soil types, types of fire, and in context with that general information and the intentional use of the land, or the allocation of the land, come up with reasonable plans where we use the best science to make decisions about both economic and environmental interests so that we can make these more expeditiously for both the benefit of the environment and the economy.

And I'm going to ask you. Do you think we have both the knowledge to do that, Dr. Hobbs?

Mr. HOBBS. Yes. As a matter of fact, I think we do in many—in many cases. But I'd also like to add another dimension to that, and that is not only should we be prepared for these contingencies, but I think we also simultaneously need to have research plans in place so that when we have a catastrophic wildfire or some other type of natural disturbance, we are able to move quickly to implement the types of experimentation that is necessary to address these crucial questions.

Mr. BAIRD. I appreciate that.

Mr. HOBBS. So I think you need—I think you need both of these.

Mr. BAIRD. It's actually in the legislation, and I think more than any other Federal statute pertaining to forest management that I know of, it provides for it as part of the process of post-fire response and also it contains a research element for funding.

Mr. DEFAZIO. Would you yield for a second.

Mr. BAIRD. I would be happy to.

Mr. DEFAZIO. Again, this—you know, we write laws, and this is again one of the areas where I have a concern. When you look at catastrophic event research projects, it says the secretary concerned may. May does not mean that Gale Norton will develop these things. She may if she so wishes. And given the aversion of this administration to science, she probably wouldn't.

So I'm suggesting there are ways in which we need to negotiate parts of this bill and say "shall."

Mr. BAIRD. But I think——

Mr. WALDEN. Can I interrupt just a second, since I actually have this little gavel here.

This is about whether or not they do projects.

Mr. DEFAZIO. Right. And he is suggesting we should have and he's saying that's exactly what we're doing. We should have projects ready to move forward out of the can.

Mr. WALDEN. Right. Right. But what we didn't want to do is mandate that every single time they had to do a project.

Mr. BAIRD. That's why we put "may" in there.

Mr. WALDEN. Yeah, because if you've got fire—oh, sorry. Go ahead.

Mr. DEFAZIO. Well, but—well, then you need to say that—if I could then, gentleman, yield it.

I just think given what he's saying and what other scientists have said, I think "may," given the prejudices of this administration, is going to lead to one thing, and "may," given the prejudices of the last administration, would have led to endless study and no action.

So, you know, it's like we—I believe we need to be more specific, and I'd be happy to work with the two of you on that.

Mr. BAIRD. I appreciate that. That's a good point. Thank you.

Return to the question at hand. Dr. Peterson.

Mr. PETERSON. Thank you. I have a couple of comments I'd like to say about that.

First of all, the Federal agencies often do write fire management plans in anticipation of things that may occur at different portions of the landscape. So many of the national forests have those. Many of the National Park Service properties have those. They are always being looked at again and revised and so forth. So I think to the extent that some of the things you've mentioned could be further incorporated, that would be a terrific idea.

Regarding the body of knowledge that can be used for making scientific decision, there's always some uncertainty. And that——

Mr. BAIRD. There always will be.

Mr. PETERSON. And it always will be, and that's a judgment call of policymakers and management as to how they want to deal with that uncertainty and how risky they are and so forth.

There's a huge body of literature on the effects of logging individually on forest ecosystems going back to the 1960s. There's hundreds and hundreds of papers on them.

There's a huge body of scientific literature on the effects of fire individually on different forest ecosystem components going back to the 1930s. There's a much smaller body of literature specifically on post-fire tree harvest. There was a literature review done in 2001 by Dr. Jim McGeever, who currently works with Oregon State University, and they found 21 studies that had been done on that topic. As far as I know, since then there's been two more, so that's 23. Mr. Donato's is study number 24.

There will be another study published later this year by Dr. McGeever that will provide results—at least the study was set up rather similar to what Mr. Donato's study is. The difference—and this is something that hasn't been mentioned yet today, I don't think—is that he is taking a long-term view of the effects on post-fire logging slash——

Mr. BAIRD. He being the study you're referring to, not the Donato study.

Mr. PETERSON. Correct. This is Dr. McGeever's study. They used a simulation technique to project forward into time. And that hasn't been mentioned here today. That, you know, I think it's really important to get that initial result after the management action.

And because of the constraints of funding, and a lot of the institutions we're with, we typically have short-term, small-scale

studies. That's all we can forward. That's all we have personnel for, whatever.

But the thing that's going to make the biggest difference in terms of reducing uncertainty in the science in this issue is long-term research and monitoring. Track this through for at least a couple of decades.

Mr. BAIRD. Mr. Donato, any comments.

Mr. DONATO. Can we just repeat everything that Dr. Peterson said for my—for my bit.

Mr. BAIRD. Dr. Kolb.

Mr. DEFAZIO. Is he your thesis advisor or what.

Mr. KOLB. I agree with a lot of what Dr. Hobbs commented, and just as an aside, the research that I presented will be submitted for publication. We've been very careful because of the volatile nature of this type of research. We want to have all our T's crossed and I's dotted. And, basically, I begged and borrowed and conducted this research with $15,000. So when I read that Mr. Donato had $300,000, I turned quite green with envy.

And this—the research that we need, I agree with Dr. Peterson on additional components.

Another thing that has always been thrown out here is logging does this, logging does that. We need to recognize that logging is also very varied and there are many, many different types of logging. So it's unfair to categorize logging per se.

And this—all of this whole process of what we need to know and can we do things preemptively and prescriptively relates back to my lone dissension, I guess, about the question about NEPA. And you must understand half of my job is as a scientist; the other half is providing that information to practitioners. And basically I give them options and consequences; they make the decisions.

And what I see with my Federal colleagues is that the questions that NEPA poses are very relevant and needed. The process that it takes doesn't work because it takes so long. And I would say imagine you come down with an illness and you go to your doctor and your doctor says, well, let's do this analysis, and a month later you say, well, we ran out of funding, we'll have to wait till next year, and finally three years later your family gets the news of what to do. In the meantime you're dead.

This is kind of the feeling of NEPA, is that it doesn't have the ability to react very quickly. And that was the basis of my response to Dr. Inslee on that.

Mr. BAIRD. I would just add, I don't see any evidence necessarily that delay is always beneficial to the environment.

Dr. Lorensen.

Mr. LORENSEN. Well, I appreciate being elevated that way.

Mr. WALDEN. Yes, I was going to say it's actually Congressman Inslee, Dr. Baird. We'll call you Mr. Lorensen.

Mr. LORENSEN. Thank you.

Mr. BAIRD. I'm not sure it's an elevation.

Mr. LORENSEN. We often, for those of——

Mr. BAIRD. Either Congress or doctor.

Mr. LORENSEN. I would have to agree with maybe both. But certainly for those of us in the lower ranks, Ph.D. has some other meaning than Ph.D.

Mr. BAIRD. Hey there. Give back the balance of my time.

Mr. LORENSEN. I do agree with my boss on my far left there, that I think a research plan does need to be available and created ahead of time. There's clearly legitimate debate about how studies should be conducted, and you don't want to have that debate after the event. But we do also argue that it needs to be done in the context, given limited resources, of active adaptive management, which is going to do something different than strict research may do.

And, again, back to the systematic evidence review concept, one advantage of doing that, it does allow us to gather the available science and really make a decision about how do we move forward from where the current status quo and the current research is and also allows us to say we made an incremental change in terms of the knowledge, and it may be time to do another SCR. And so it's a different process, but I think it's worth looking at. And I encourage your exploration of that.

Mr. BAIRD. Thank you.

Mr. WALDEN. Dr./Congressman Baird, thank you. And I want to thank our panel of witnesses. You all have been most helpful and insightful. And, Mr. Donato, I don't want you to go away from here thinking this is like the worst experience of your life, even though it might have been. I really appreciate your willingness to come here voluntarily, your willingness to answer very—yeah, we didn't have to subpoena you—and your willingness to answer some very difficult questions and follow-up with Mr.—with Congressman Baird.

And part of the reason I thought it made sense, and I think I could speak probably for Congressman Udall, although I'll not, to have this hearing was so that you could address some of these issues. I mean we get these things that say calls needed now, oppose Walden logging bill, new science study shows bill is flawed. And then we have the one on, you know, how where it says scandal over academic freedom and suppression and, you know, we're eliminating funding. And here we've all said no, that's not what this is about.

And so it really helps us to have you talk about what your study shows, how you conduct your research, what misunderstandings, if there were some, are there and clear up the record.

And so good luck in your future studies. You have accomplished something that I dare say the other 237,000 studiers haven't done: You've achieved great prominence and press coverage for a study that is a page long, I think, or two, so—

Thank you all. We will—thank you for being here.

We will call up our next panel of witnesses. I'll read you a little about each one as they make their way up here.

Rich Drehobl, retired BLM Field Manager from Medford, Oregon. He has 33 years of experience as a land manager with the Bureau of Land Management, including the past 18 years as a field manager for the Ashland Resource Area. During his 33 years as a practitioner of applied science with the BLM, he has gained on-the-ground experience with all the facets of wildland fires, including suppression, hazardous fuels reduction, post-fire stabilization and rehabilitation, and salvage logging. He graduated from the

University of Arizona in 1972 with majors in Forestry, Range Ecology and Natural Resource Planning.

Dr. Hal Salwasser, Dean of the College of Forestry, Oregon State University. Prior to joining OSU's faculty in July of 2000, Dr. Salwasser was Director of the U.S. Forest Service Pacific Southwest Research Station in California, regional forester for the northern region of the Forest Service in Montana, Boone and Crockett Professor of Wildlife Conservation at the University of Montana, Director of the New Perspectives/Ecosystem Management for the U.S. Forest Service in Washington, D.C. He holds a Ph.D. in wildland resource science from the University of California, Berkeley. In addition to serving as Dean of the College of Forestry at Oregon State University, Dr. Salwasser of Oregon's Forest Research Laboratory at the University and Fellow of Society of American Foresters.

Dr. Jerry Franklin, who has been—both these gentlemen have been before our committee before and we welcome you back. Dr. Franklin is a Professor of the College of Forest Resources at the University of Washington. Dr. Franklin, who must have started at age seven, has 52 years of experience in forestry, including fire fighting, practicing silviculture and managing forest properties. The majority of his career has been in conducting research in silviculture, forest ecology, forest ecosystem science and disturbance ecology. He's published on these topics and also teaches them primarily at the University of Washington and Oregon State University. His experience is primarily in the Pacific Northwest, but Dr. Franklin has also spent time in other forest regions in the United States, including the Sierras, Alaska and the eastern United States.

Dr. Dave Perry, Professor Emeritus of OSU. Much of Dr. Perry's research since the mid-1970s has focused on factors influencing the recovery of beneficial soil organisms following clear cutting, with particular reference to biological legacies such as big dead wood and sprouting shrubs/trees. In Montana and southwest Oregon his studies included degraded clearcuts such as those in which reforestation attempts had failed. In all cases research included comparisons with stands that have been established by fire at some point in the past. Dr. Perry also spent time on the ground with the U.S. Forest Service personnel observing burn patterns following the 1987 fires in southwest Oregon.

And, finally, Dr. Thomas Atzet, Atzet Ecological Consulting of Merlin, Oregon. Dr. Atzet worked as Area Ecologist for the Rogue River, Siskiyou and Umpqua National Forests from 1974 to 2004. A major objective of his work was to define successional pathways and their modifications by disturbances, such as fire, by plant association. He helped define natural fire regimes for southwest Oregon and has participated in developing post-fire Environmental Impact Statements for the Silver fire of 1987 and the Biscuit Fire of 2002. He has a B.S. in Forest—I'll rephrase that. He has a Bachelor of Science degree in Forest Science from—I have a B.S. in journalism, which is kind of a double—from Humboldt State University and a M.S. in Physiological Ecology and a Ph.D. in Forest Ecology from Oregon State University.

Gentlemen, we really appreciate your all being here and your help with our hearing today.

If you would please stand, I'll administer the oath and then we can begin. If you'll raise your right hand.

[Witnesses sworn.]

Mr. WALDEN. Let the record show they all agreed to the affirmative. Please be seated.

Dr. Atzet, for your statement please we certainly welcome. Thank you for being here, sir. And you're up first.

Do we need to change out a little bit. You don't want to give Mr. Drehobl's. We're doing Dr. Atzet. That's what I'm told.

Mr. ATZET. I could do yours.

Mr. DREHOBL. I appreciate that.

Mr. WALDEN. And as this is setting up, I hope our friends who are here today to observe this, first of all, I want to thank you for the way you all have conducted yourselves in a topic that has at times produced some smoke and fire and heat, shouting. Thank you for the way you've conducted yourselves.

And, second, I hope you can appreciate the caliber of witnesses that we have this wonderful opportunity to hear from. Tremendous background. It really helps in the process, and we're thankful for them being here.

Mr. ATZET. Good afternoon.

Mr. WALDEN. Is that microphone on.

Again, for those of you, if your mike—if your light in front of your microphone is out, that means it is on. And so if it's lit, it is off.

Mr. ATZET. Is this working?

Mr. WALDEN. That is. Thank you.

STATEMENT OF THOMAS ATZET,
ATZET ECOLOGICAL CONSULTING

Mr. ATZET. Good afternoon. My name is Tom Atzet, and I'm delighted to say that I no longer have any affiliation whatsoever other than my family. And I appreciate everyone being here because I believe everyone wants to seek excellence in science.

Back at the turn of the century when Representative Bob Smith asked for a historic accounting of old growth, I likened the Klamath Mountains to a library where the species were the books and the processes created the shelves or the niches. We have many books representing millions of years of nature's wisdom in this area, and my objective today is to provide the background about the creation of this unique library.

And that's just showing you that I've put in a few plots in my lifetime, 8,000 and a hundred—1,500 permanent plots.

Now, I've spent my career pretty much as a public servant, bringing sound and unbiased science to our decisionmakers.

Mr. WALDEN. You know, you really are going to have to be close to the mike. Maybe we could hand him that hand-held mike. That would be——

Mr. ATZET. That would help.

Yeah, I really need to see what's going on up there.

I spent my career as a public servant, bringing sound science and unbiased science to the decisionmaker. Fraud science leads to poor

policy and poor decision. It's just a matter of garbage in, garbage out.

I strongly feel my role has been and is to provide only the science and steer clear of policy and decisionmaking. Science is and was, still is the life blood of what I do.

First a bit about a current diversity. Geological diversity brought about by plate movement, volcanism and erosion is the foundation for our ecosystems here in the Siskiyous.

Go ahead.

Vegetationally, I've described 15 plant zones. Go ahead. Thirty plant associations and a hundred—whoops, go back. Thirty plant associations—30 plant groups and 130 plant associations. Plant associations are the basic unit for predicting successional pathways and reaction to disturbances such as fire.

Go ahead.

To fully appreciate how our library was created, here's a bit of background on the Klamaths. The Klamath Mountains first appeared near Mexico City as an island arch and gradually rotated their way into the present position. So it's not like what stays in Las Vegas remains there.

And so at this current position you could see that the Pacific Coast high pressure cell is what gives us our fire weather and it dominates a lot of the summer climate. And we were far enough south to not be ravaged by the Ice Ages and have our library eliminated. So we came through the Ice Ages with our library intact. But this ecosystem developed over 300,000 years ago—300 million. I'm sorry.

When I helped create the late successional reserves for the Northwest Forest Plan, I considered the Cascades as a barrier between the eastern and western Oregon ecosystems. But the Columbia Gorge—go back. One more. OK. Go on.

OK. The Columbia Gorge and the Klamath River breach that barrier, and that's the only place in the Cascades that the barrier is breached.

The processes that I was considering here were migratorial and dispersal processes. And the Klamath River allowed the breach of that barrier in order to have east/west mixing of the species that we have in southwestern Oregon. So each area is now considered just a bastion of diversity.

So—go on. Now, imagine the Northwest as a gigantic H and the Klamath as a cross bar and the Cascades and the coast ranges as legs. So for over 60 million years the species have been going in four directions, up and down these legs, and the Klamath is like Grand Central Station. It processes what comes there and acts as a source and a sink for our genetic library. So it's a very special place in the—in the Pacific Northwest.

Go on. Go on. That was my subliminal slide.

OK. Local gradients also add to the diversity. We have marine climates from the coast grading into the continental, and we have high elevation grading into low elevation that complicate the matter. Just another way of adding diversity.

And let me leave you with two thoughts. One is that evolution keeps what works and discards failure. OK. And the processes—go on—that are necessary for evolution are basically three: Super-

fecundity, stress-related mortality, and the ability to transfer that knowledge from one generation to the next through DNA. All of these organisms and processes contribute to the library and our diversity and therefore the resilience.

Second and last is the concept of saving the tails. Suppose you used the strategy for hiring people where you continually pick from the center of a normal distribution. What would that do? It would guarantee you basically a uniformity and a mediocrity of your work force. So you really need to save the tails of the fire regime. High-severity and low-severity fire are essential to maintain the diversity in our fire regimes. We've tried to cutoff those tails over the years and dismiss them as catastrophic. I got to tell you, I hate the word catastrophic. Accepting the tails as part of the natural process will insure us the diversity we need to maintain the resilience and health of an ecosystem, in other words, a fully stocked library.

Thank you.

[The prepared statement of Mr. Atzet follows:]

Statement of Thomas Atzet, Ecological Consultant, Medford, Oregon

Good afternoon. I am Tom Atzet and I am delighted to admit that I no longer have any particular affiliation other than family. I was however, the area ecologist for the Rogue River, Siskiyou and Umpqua National Forests for almost thirty years. Both my advance degrees were completed here in the Klamath Mountains. You all have access to my specific background, so I will go on.

It is an honor to be here among colleagues that have dedicated their careers to studying and understanding ecosystem and the processes that maintain them. I have great respect for all of you. I also appreciate the time and effort my government has taken to help assure and maintain excellence in science.

I spent 36 years as a public servant, bringing sound, and unblemished science to the decision makers. They expected nothing less to care for our public ecosystems. Science was, and is, the "life-blood" of what I do.

Today my objective is to review some of the major processes for promoting our renowned ecological richness (biodiversity) of the Klamath Province. I believe this background helps provide context for planning and applying research in southwestern Oregon. It is similar to taking a psychological profile before attempting to treat a patient.

Diversity of process creates structural and compositional diversity, the essential element of resilience and sustainability. Although average climatic conditions are often used to describe ecosystems, such as average annual temperature or average annual precipitation, it is the extremes that more often determine survival, growth and reproductive success. I will highlight process and emphasize why it is necessary to "save the tails", to maintain diversity.

We tend to vilify extremes (for example, extensive fires) as "catastrophic" and on the other hand, accept those of less acreage as part of the "norm" in the normal distribution. That strategy cuts off the tails, the extremes. If we used that strategy in hiring, we would be assuring ourselves of uniformity and mediocrity. The stresses of acute change continually hone organismic process of reproduction, survival and growth. This overarching process, called evolution, discards failure, keeps what works, and passes the learning on to the succeeding generations.

To provide a detailed profile of the history of the Klamath would take a major treatise. Instead, I have provided an outline of the major factors involved and some detail for selected factors.

Outline of major factors affecting diversity in the Klamath Geologic Province

1. Geology and associated compositional and structural diversity
   a. Triassic (300,000,000 years old) through recent alluvium.
      i. Volcanic island arch intrusion and erosion produced shallow sea sediments and resistant volcanic peaks.
   b. Plates hosting ancient ecosystems slowly rotated northwest from 20 degrees south latitudes (Mexico City)

c. Volcanics and sediments metamorphosed (folded, faulted and re-crystallized) pressured by the Gorda Plate part of the Pacific Plate
d. Nevadian Orogeny inserted granitic and dioritic peaks
e. Sea floor (Josephine Ophiolite) scraped off onto the continental terrain
f. Continued metamorphosis and erosion through the Ice Ages

2. "Library" of genetic material for evolving and migrating flora & fauna
   a. Old conifer species and continued recombination (Triassic)
      i. A sink for tropical and arctic sources during plant migrations
         1. Climate change the driver
            a. Recombination of the Tertiary floras
            b. Invasion of chaparral flora during the Xerothermic Period
            c. Influence of the "Little Ice Age" on species regeneration and migration processes.
      ii. Klamaths were a genetic source for emerging surrounding terrain
         1. Building Cascade ranges received species from the Klamaths
         2. Emerging California & Oregon Coast ranges were populated by the Klamath species migrations
   a. Angiosperms evolved 60 million years ago (Cretaceous)
      i. Added new reproductive processes
3. Present Global position affects diversity of climate and rates of change
   a. Continental ice spared southwestern Oregon plant communities.
   b. Scattered alpine cirques and glaciers provided northeast facing coves
   c. Within the transition zone between Temperate and Mediterranean
   d. Pacific Coast High Pressure area promotes dry summer fire weather
3. Pacific marine influx grades into inland continental climates
4. Transverse orientation (rather than north-south) of the Klamaths
   a. Blocks cyclonic storms stabilizing adjacent systems to the north and south
   b. Links Coast Ranges and Sierras forming an "H" pattern
      i. Allows for continued migration and genetic mixing
      ii. Maintains the sink-source character of the Klamath Province
5. Elevation grades from sea level to above timberline
   a. Provides temperature and precipitation gradients and niche breadth
6. A variety of disturbance agents and regimes increase diversity
   a. Fire, the primary agent, provides an acute rate of change
   b. Insects and diseases, usually secondary provide chronic stress and change

The "H" configuration

From a satellite view only the major rivers, valleys and mountain ranges stand out. The Cascade-Sierra chain and the California-Oregon Coast ranges appear as north-south parallel tracks, with the Cascades appearing as occasional white-capped volcanic peaks. The Klamath Geologic Province stands out as a crosstie joining the tracks, like the crosstie of a gigantic capital "H.' The Klamath and Columbia Rivers completely breach the Cascade barrier. They appear as deep, winding gorges allowing water, air, spores, seeds, fish and other animals lowland passage through the Cascade mountain barrier. The Klamath River effectively joins east with west, sagebrush, juniper and aspen with Sitka spruce, madrone, Douglas-fir and shore pine.

In the Klamath Province, the backbone or "crosstie" of the Siskiyou Range provides a high elevation east-west corridor and a sink for genetic material uninterrupted by the glacial advances. The Siskiyous have been an "intersection" for migration and dispersal of fauna and flora for at least the last 60 million years. Genetic material from the Oregon and California Coast Ranges, the Sierras and Cascades, the Klamath River corridor and southern lowland chaparral species, migrate in, recombine and disperse. Wittaker and Axelrod both alluded to the Klamath's "central significance" on the west coast.

Transitional Latitude

Southwest Oregon, transitional from Temperate to Mediterranean ecosystems, is habitat for 29 conifers including endemics such as Brewer spruce, Baker's cypress and Port-Orford-cedar. It is the latitudinal extreme for coast redwood, silver fir and Alaska yellow cedar. It has approximately ten fold more sensitive species than typical Temperate forests to the north.

Geologic Diversity

Geology ranges from the ultramafic ophiolites of the Josephine Peridotite Mass to the scattered granite plutons of the Nevadan Orogeny that poked through existing metamorphosed volcanics and metamorphosed sediments of Triassic and Jurassic age, including the limestone at Oregon Caves. Continual deformation of the terrain,

by forces associated with the Pacific Plate, has resulted in steep, complex geomorphology and chaotic drainage patterns.

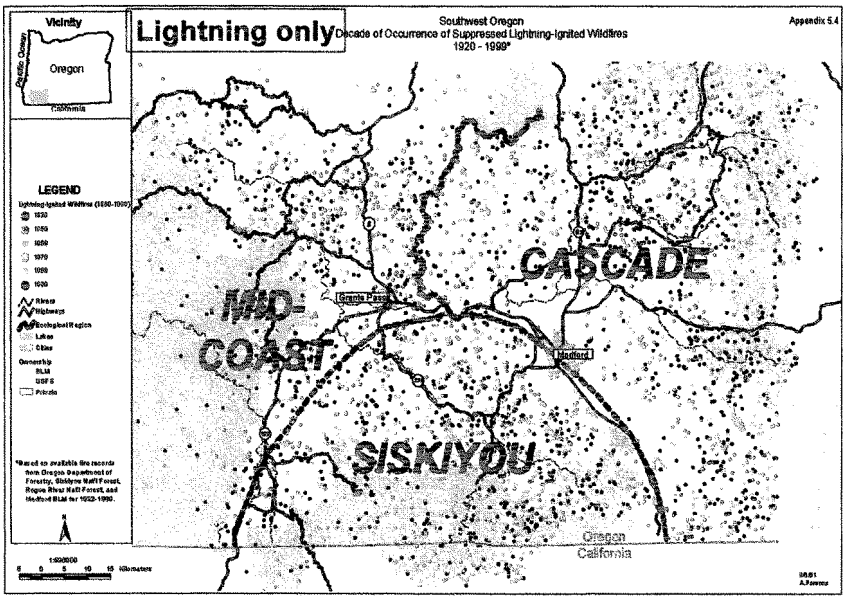
Elevation ranges from sea level to just over 7,000 feet at Mt. Ashland, the highest peak in the Siskiyou Range. Pacific fog often reaches inland valleys even during the early summer, supporting Port-Orford-cedar, particularly in protected drainages, such as Grayback creek.

Recent Climate Change

Recently the Xerothermic (8000 to 4000 years before present) and the Little Ice Age (1400 to 1850) have modified local vegetation. On south slopes, new migrants from southern California (ceanothus and manzanita species for example) were frequently burned. To this day south slopes have shallow soils and xeric vegetation. Looking north from any Siskiyou lookout provides a view of sparse vegetation and occasionally grassy balds. The north aspects on the other hand support older and denser forests.

Since the average forest on Federal land in southwest Oregon is less than 300 years old, most stands were generated during the Little Ice Age, when selective and competitive stresses were likely different. Survival may have favored species that tolerated higher frequency, intensity and duration of frost. Today as processes, particularly fire, create mortality and opportunities for regeneration, a new generation of genetic material will be selected under different selection criteria. Fire adapted, fire resistant, or species that avoid fire may be increasingly favored. Suppressing selection, by dampening mortality, regeneration and disturbance extremes may result in lowering resilience and diversity in the long run.

Agents of Change: Lightning suppressed fires in southwest Oregon



Lightning has always been a dependable ignition source. Humans have become increasingly active. Native Americans, for example effectively used fire to manage ecosystems for game, crops and water. Natives were much more than an incidental ignition source. Forests were repeatedly and consistently burned and thinned creating vegetation mosaics and plant communities. Natives also stimulated root and berry crops, planted crops, burned to maintain habitat for game, and cultured materials for tools, ceremonies and lodging. Shrub cover was low, and herb and grass vegetation was constantly recycled. Ranchers and miners burned to replace forest cover, control forest pests, and for fun on a Saturday night.

Today records indicate, in southwest Oregon, about 60 percent of the 200 to 300 yearly fires are human caused. On the Siskiyou national forest (included in the Oregon Department of Forestry Database) the proportions are about the same (60

percent human caused), but the average number per year is about fifty. The Oregon Department of Forestry suppresses 70 percent of their fires before they reach a tenth of an acre. Eighty-eight percent are less than one acre. Since 1920, approximately 15,000 fires have been suppressed.

The Future

Decades ago Leopold, Weaver, Biswell, Kilgore Arno, Agee, Mutch, Martin, Atzet, Skinner, Pyne, all predicted the consequences of fire suppression:

- an increase in total forest biomass
- an increase in the percentage of high severity fire
- an increase in the number of total acres burned/time
- an increase in insect activity
- an increase in the occurrences of diseases
- an increase in extent and abundance of exotic species
- a decrease in vigor of older stands
- lowering of crown ratios, increasing inter-tree competition
- increasing risk to late seral landscapes and early seral pines
- increase in hardwood carbohydrate reserves (hardwoods on steroids)
- decreasing conifer abundance and extent
- change in competitive relationships

Our attempt to suppress process (fire in this case) and force stability on ecosystems has resulted in unwanted consequences. Change creates stress, but stress creates diversity. Dampening the extremes, cutting off the "tails", in the short run, may eliminate what we consider "catastrophic" events, but in the long run may magnify unwanted consequences.

Mr. WALDEN. Thank you, Doctor. We appreciate your comments. I just have one really brief question. When you were talking about the Klamath River and the Columbia, was that the Missoula flood? Is that what you were saying, when it breached.

Mr. ATZET. Well, the Missoula flood did breach the area, but the—both those rivers allow migratory processes back and forth between the east side and the west side.

Mr. WALDEN. The corridors.

Mr. ATZET. And that's why we have Aspen in the western part of the Klamath geological provence.

Mr. WALDEN. OK. Thank you. We'll now turn to the Dean of the College of Forestry from Oregon State University, Dr. Hal Salwasser.

Doctor, thank you for being with us once again. We look forward to your comments, sir.

STATEMENT OF HAL SALWASSER, DEAN, COLLEGE OF FORESTRY, OREGON STATE UNIVERSITY

Mr. SALWASSER. Thank you, Chairman Walden, Members of the Committee.

I'm Hal Salwasser, the Dean of the College of Forestry at Oregon State University. I have submitted written testimony with two coauthors, and I want to tell you why I've done that.

I had a conversation, oh, a month or so ago with a member of Representative DeFazio's staff, and the conversation got around to the need for some more specific detail on the kind of research that would be done after fires in the bill. And I told Dave Drayer, the staff fellow, that I'd get ahold of Jerry Franklin and toss some ideas around. And we started an e-mail conversation about what maybe we'd like to see considered, not necessarily tell you what you all have to put in the bill, but some things you might like to see considered.

And my colleague, Professor Norm Johnson, entered into the conversation, and we were cranking along on this thing until about the 6th of January and we got distracted. We got distracted by some other things, and it kind of rested for a while. And then I got a call from Doug Crandall here saying we're thinking about holding an oversight hearing. And Norm said, you know, we really need to dust off that e-mail traffic and see if we can find some common ground on the kinds of things that research needs to focus on post-fires.

And so we did that. And we found it to be a very productive conversation. And our written testimony reflects the conversation that we had over the past several months.

We also did something else. We've had some less than pleasant experiences at the university lately with people reading things that we wrote and drawing inferences from it that we didn't think we were trying to say. And so we thought we'd send our draft testimony out for extensive review, and we sent it to a very wide network of people, everybody in the college actually and a fair sampling of people outside the college. And we processed something like 25, maybe 30 comments back and folded those into our final version of our testimony. So we presented peer review testimony for you here today, Chairman.

There's just a few things that I'd like to highlight from the testimony. And given Dan Donato's very correct statement about the paucity of peer-reviewed scientific studies on post-fire logging, we feel it's very important that any legislation that's going to provide policy direction regarding post-disturbance management activities, that it would call for and fund both short and long-term research as well as long-term monitoring of the ecosystem responses and effects of any management activities.

We also think that post-fire experimental studies should take a look at the consequences of different kinds of management activities on ecological protected social and economic objectives if those are appropriate. These studies should be conducted at scales that are sufficient to assess and contrast how the plants respond, soil fungi, inspects, small mammals, song birds, aquatic ecosystem responses, and especially important that's popped up lately is we need a better handle on how to identified in a feasible manner trees that are allowed to die so that we can know which trees are likely to survive and which trees are likely not to.

We also think that reasonable combinations of post-event strategies should be included in the research, taking care to insure that assessments of the effects of logging and the effects of reforestation are handled independently and not confounded.

It's very appropriate that a stable and permanent source of funding be created to support post-event research, outreach and monitoring. One of the concerns that the scientific community has had about proposed post-fire studies is that the funding runs out and they stop doing the studies. The Silver Fire is a classic example where they ran out of money to do monitoring in the mid-1990s, and it would have been wonderful to have had that data for a longer time.

And then finally I can't be up here without encouraging you to call for agency and university collaborations, teams of scientists,

managers working together to integrate the research and the outreach with the post-fire management strategies.

And I'll just give you one last suggestion, that a really good topic for these teams of managers and scientists to start working on right now is what would a preapproved management strategy look like, how would it be done, how much detail, and what kind of public input process, how would public input be handled in developing a preapproved management strategy.

I'll conclude my testimony with those comments.

[The prepared statement of Mr. Salwasser follows:]

Statement of Hal Salwasser, Dean, College of Forestry, and Director, Oregon Forest Research Laboratory, Oregon State University; Jerry F. Franklin, Professor, College of Forest Resources, University of Washington; and K. Norman Johnson, Professor, College of Forestry, Oregon State University

Recent scientific reports on the potential and actual effects of various management actions following large fires have generated enormous interest in the scientific community, the media, and the public on such topics as post-fire logging, fuel treatments, and reforestation. While the reports to date are informative and useful, they also reveal how little peer-reviewed science has been focused on forest recovery after fires with various management interventions. Extensive recent scientific studies have been made on the natural responses of forests to major disturbance events, results of which have not yet been fully assimilated by resource managers and agencies. Systematic scientific studies of the impacts of various management interventions following disturbances are not as rich, although forest managers have decades of practical knowledge on effects of post-fire management actions on production forests. We need to use that knowledge and build on the body of relevant ecological and management science to improve our capabilities for more reliable forecasting of treatment approaches and effects.

We believe that any legislation that provides policy direction regarding post-disturbance management activities should contain provisions to mandate and fund short- and long-term research, as well as long-term monitoring of ecological, fire, and other management responses to forest recovery projects—essential elements of any credible adaptive management strategy.

Before proceeding, we want to reiterate from previous testimony on H.R. 4200 by Salwasser and Franklin that management objectives for the area in question are the primary consideration in any decision regarding post-fire logging, reforestation, or any other activities. Much of the ongoing controversy over post-fire logging and active reforestation results from inadequate attention to management objectives. The relevant scientific and technical knowledge to inform post-disturbance management decisions depends upon clarity regarding management goals for the forest property in question. Hence, "recovery" and related activities must be defined in terms of the management goals for a post-event landscape. Those goals, together with information on the forest type (or plant association group), post-event conditions in disturbed areas, and future climate trends will largely determine what actions, if any, are appropriate. If management plan direction is not clear for appropriate actions following large disturbance events, plan revisions should provide such clarity. Major disturbances should not be the basis for de facto changes in land allocations or management objectives.

With a clear view of the management objectives, science can play a vital role in helping managers sort out the type and appropriate levels of activities to achieve those objectives. Retrospective and experimental research on post-event landscapes can also help managers, policy makers, and the public better understand when and how actions can help move that landscape toward these goals. Toward that end, we make the following suggestions:

1. Management plans should make clear the primary goals for different areas and provide general guidance for appropriate post-event interventions in those areas, giving due consideration to plant association groups and disturbance event effects on soils, plants, animals, and aquatic ecosystems.

2. Scientifically credible experiments should be undertaken to provide quantitative information on the consequences of different post-fire management activities on ecological, protective, social, and economic objectives. Experimental studies should be replicated and include random assignment of treatments and controls. Treatments should be conducted at scales sufficient to assess and contrast plant

(tree, shrub, and herb), fungal, insect, small mammal, songbird, and aquatic ecosystem responses. In addition, focused research is needed on survival of event-damaged trees to provide credible and practical indicators for predicting whether damaged trees will live or die.

3. Reasonable combinations of post-event strategies should be included, with care to insure that assessments of the effects of logging and of reforestation are independent and not confounded. Strategies could include: management to assist post-event forest recovery without post-event logging; forest recovery actions with varying levels of post-event logging and biomass treatments to reduce impacts of subsequent disturbances; and randomly assigned control areas that are untreated, i.e., no logging or actions to reduce biomass or influence forest recovery. This research should have strategic representation of major plant association groups and fires associated with different historic fire regimes, i.e., low, mixed, and high severity and extent.

4. An additional scientific need is synthesis of existing knowledge and additional research on the ecological roles and functions of large disturbed areas in regional landscapes, including their role in maintenance of regional biodiversity, and short- and long-term natural forest ecosystem responses following major disturbance events.

5. Because forests are highly dynamic ecosystems, post-event management must be adaptive, i.e., responding to feedbacks from monitoring and research. Thus, post-event research and monitoring should be directly integrated into post-event management strategies.

6. Management agencies need to be encouraged and funded to collect and maintain better management records.—On large fires, such as the Biscuit, record keeping tends to be quite uneven—much of it is not useful because of its variable quality and the lack of a central depository available to researchers.——Good, spatially explicit records of pre- and post-fire management would strengthen retrospective research and supplement experimental studies, which because of budget and management realities will be limited.

7. A permanent and stable funding source should be created to support post-event research, outreach and monitoring. Long-term research and monitoring may require data collection for several decades after the event to fully understand forest responses to management actions, thus the need for dedicated, stable funding. With dedicated funding plans for long-term research and monitoring become credible.

8. Linked with establishment of a funding source, authority should be provided to develop and conduct the research and outreach program outlined here, including rapid implementation of post-event experiments, in conformity with management plan direction.

9. University and agency collaborations should be strongly encouraged in post-fire research, outreach education and monitoring as such collaborative programs have been highly successful. Consideration should be given to establishment of interdisciplinary centers of excellence, based on teams of university and federal agency scientists working closely with forest resource managers.

10. As a final point, development and administration of the research and outreach education program outlined here needs to be transparent to stakeholders and incorporate regular review from a broadly representative scientific community, perhaps facilitated by the National Academy of Sciences or some other organization with impeccable scientific credentials.

We believe that the approach to post-event research and outreach described above will produce the science needed to better inform policy makers and the public about the rationale for, and effects of, post-disturbance-event actions and their relation to previously adopted management objectives.

[An additional statement submitted for the record by Hal Salwasser follows:]

2 March 2006

To assist with responses to questions raised during the Medford hearing, we have provided additional information on our consultation process throughout the research project.

We have communicated primarily with the Joint Fire Sciences Program concerning our progress through this research. We believed this was consistent with the lines of communication for other Joint Fire Sciences Program projects. However, we have also communicated with Tom Sensenig, Project Inspector. We have attached a chronology of our contacts and consultation with him. We were never led to be-

lieve that these contacts were insufficient or that we should be communicating with anyone else within BLM.

Aside from interactions with Tom Sensenig, we only received requests for information from BLM once. That was a phone call from Terry Johnson in late November, 2004, asking Douglas Robinson if the project was on schedule with its budget expenditures for that year. She said we could confirm with a phone call or email that we were on schedule. Robinson sent an email confirming that we were right on schedule. Thus, we had no reason to believe we needed to communicate with anyone else at BLM. We felt our communication with the Joint Fire Sciences Program and with the Project Inspector, Tom Sensenig met our responsibilities for consultation. Although Tom Sensenig, the Project Inspector, left BLM for the Forest Service in fall, 2004, we were not notified of a new Inspector. Therefore, we continued to communicate with Tom Sensenig as Project Inspector. Had we known, we would have been happy to share our communications and updates of our progress more broadly within BLM. No clearly defined procedures for consultation were provided to us.

All the investigators were invited to the national meeting of the Joint Fire Sciences Program held in San Diego, California, in early November 2005. Tom Sensenig chose not to attend that meeting. Dan Donato, Joe Fontaine, and Boone Kauffman attended the meeting. Donato presented during an oral presentation the same results that were later accepted for publication by Science. Since Tom Sensenig did not attend the national meeting, Dan Donato and Joe Fontaine offered to show Sensenig the talk and the results. Sensenig told them he would be in Corvallis in Dec so they met with him and showed him the same powerpoint presentation that was presented in San Diego. They told Sensenig they were publishing those results and Sensenig expressed no concerns to them about it. The content of all those presentations contained the same results that were later published in Science.

Finally, we sought input from Sensenig throughout the project. We provide dates below of the times we consulted with him.

Chronology of Interactions with Dr. Thomas Sensenig

The following chronology summarizes the interactions with Dr. Thomas Sensenig, the original project inspector for our Joint Fire Science Program grant.

2002

Fall 2002 Project Inception Dr. Boone Kauffman visits SW Oregon, meets with Dr. Tom Sensenig, discusses finding sites to construct a fire chronosequence. Sensenig and Kauffman tour Quartz fire.

2003

August

27 August. Dr. Douglas Robinson and Joe Fontaine drive to Central Point to meet Sensenig at BLM District Office. Discuss management needs and regulatory climate in morning, tour Quartz fire in afternoon. Sensenig provides Robinson and Fontaine with resource area maps and telephone directory of Medford BLM employees. Sensenig also provides general directions to several fires mentioned in JFSP project proposal.

[Dan Donato begins graduate program in September]

2004

[Fontaine begins graduate program in January]

February

Fontaine and Sensenig exchange emails about BLM personnel with GIS expertise.

March

March 8-12. Fontaine and Donato attend fire conference in Medford.

Donato meets Sensenig for first time.

Donato, Fontaine, Sensenig speak briefly on two occasions about project logistics.

Late March. Donato and Fontaine meet with Sensenig in Central Point to discuss locating field sites. Sensenig provides newspaper articles, aerial photos, and additional contact information for BLM personnel familiar with past salvage logging sales.

April

Donato and Fontaine both hold graduate committee meetings where they present project proposals to their graduate committees in Corvallis. Sensenig is later emailed these proposals. Sensenig does not provide comments or feedback.

May-August

Sensenig contacts Robinson in early August inquiring about the status of the project. Robinson directs Sensenig to talk to Donato and Fontaine who were most familiar with project field sites and status of data collection. Donato arranges a time with Sensenig for a field tour.

September (first week)

Sensenig, Donato, Fontaine, and Adam Pfleeger (field technician) spend day together touring BLM portion of project study area (Galice fire, BLM portion of Biscuit).

Sensenig asks questions, discusses regulatory issues he faces in his job, and gives positive feedback on project status, but no specific scientific feedback (design, ecological considerations, etc) is offered.

October/November

Sensenig moves from BLM to USFS.

2005

April

Fontaine presents revised research proposal to graduate committee. Sensenig is emailed a copy of the document. Sensenig does not provide comment or feedback.

Early June

Donato emails (June 6th) and speaks with Sensenig about access to salvage logging units.

Sensenig emails (June 10th) Lee Fox, head Law Enforcement Officer of Siskiyou National Forest, alerting him to our presence in and around salvage logging units.

July

Donato and Sensenig speak again about permits and gaining access to units with active salvage logging (July 5-14). Sensenig sends several emails to other SNF personnel in an attempt to aid us. Donato and Fontaine's project proposals are attached to one of these emails. Fontaine leaves 4-5 voice mails that go unreturned regarding access to salvage units.

August

Sensenig helps with logistics in permitting process. Sensenig again sends around project proposals to demonstrate validity of scientific work.

Sensenig is emailed a progress report intended for the Siskiyou NF on August 15.

September

Sensenig is emailed the annual project report (and included in the circulation of drafts) written for our funding agency, the Joint Fire Sciences Program. Sensenig does not provide comments or feedback.

Sensenig speaks with Donato and emails Donato and Fontaine about his need for maps of our study plots.

A map of the study area is sent to Sensenig on 9/23. He responded on 9/26 thanking us for our quick response. Fontaine emailed Sensenig and asked him to stay in touch, especially if he was coming to Corvallis. Sensenig is notified several times about Donato's upcoming presentation at the Joint Fire Science Program meeting:

From Fontaine to Sensenig on 9/23 "Dan and I are both eager to represent our project and provide meaningful research results to the USFS and BLM in SW Oregon. Currently, we are gathering the last of the data for this year and beginning to analyze data for our presentation at the JFS meeting in early November. "

From Sensenig to Fontaine & Donato 9/26 "I'll be in corvallis next month so maybe we could get together to look over your data. I'll be in touch."

From Fontaine to Sensenig 9/28 "Hi Tom,

When are you planning on being in Corvallis? Dan and I would really like to get together and want to make sure that we're both around. Also, other than working on our permit renewal, what else can we provide to help you represent our project for the review of Biscuit research?

We are preparing a talk for JFS in early November. We will email the power point presentation to you.

looking forward to seeing you, Joe

"No response was received to Fontaine's 9/28 email.

November

Donato presents results of postfire logging at annual Joint Fire Sciences Program meeting. Results are also presented at weekly departmental seminar in Forest Science.

December

Sensenig was again emailed an annual update and summary of study goals for 2006 on 12/2/2005 by Fontaine (CC'd to Donato and several others).

Sensenig visits Corvallis in December and meets with Donato and Fontaine. Donato and Fontaine show Sensenig presentation that was given at JFSP meeting. This presentation contains the data and analyses presented in Donato et al. 2006. Sensenig accepts results, comments on how unfortunate Fiddler timber sale was in terms of its intensity. Fontaine verbally summarizes progress on wildlife portion of the project, focusing mainly on small mammal results. Donato and Fontaine tell Sensenig that they are submitting a manuscript that contains the presented results. Sensenig has since indicated he did not understand the paper's status at that point. It was not our intent to miscommunicate and Sensenig did, after expressing mild interest, ask for a copy once the paper was in print. Last, Fontaine inquires about collaboration on future JFSP grants investigating woody debris dynamics. Sensenig responds positively. We are confident that our current collaborative effort with BLM to clarify future expectations for consultation will help avoid further misunderstandings.

Mr. WALDEN. All right. Thank you, Dr. Salwasser. We appreciate the work that your college does and help us understand these issues better, and we appreciate the recommendations of your peer-reviewed testimony.

We'll turn now to Dr. Franklin, I believe. Jerry, you were up next. Thank you. We appreciate each time you've testified before us and the conversations we've all had with you, and we welcome your comments today.

STATEMENT OF JERRY FRANKLIN, PROFESSOR, COLLEGE OF FOREST RESOURCES, UNIVERSITY OF WASHINGTON

Mr. FRANKLIN. Thank you for the opportunity. I really appreciate it. And I do very much appreciate the kinds of responses that you've made to earlier testimony, mine and others, with regards to the bill. Mostly what I'm just going to do is supplement Hal Salwasser's statement.

I'm delighted to see the emphasis on management objectives. I think that's absolutely critical, because I think management objectives for the areas, whatever areas they are, in question should probably be the primary consideration in any decisions about what you do post-disturbance with regards to logging, reforestation, or any other activity.

The relevant science and technical knowledge to inform post-disturbance management decisions really depends on clarity in those management goals for that forest property, even to the point that, you know, our notion of what recovery is is going to be different just depending upon what that particular management allocation is directed toward.

Again, you know, I think—I just want to emphasize that the appropriate activities and relative knowledge set's going to vary, and there's a really good way of seeing the contrasts, for example, between areas where timber management is the primary objective as opposed to where perhaps retention of ecological values. And the distinction, as was suggested I think by Representative DeFazio, of distinguishing—no, I guess it was Inslee—but distinguishing

between various types of activities like salvage and reforestation is really critical.

For example, if you are in an area where timber production is a primary objective, aggressive salvage and reforestation with establishment of plantations of commercially important tree species is going to be appropriate. Where in fact you have goals related to ecological objectives, timber production is not a significant element of it and very likely salvage is not going to be appropriate. Reforestation, however, may make some contributions to the desired process.

I also want to point out, it's in our testimony, that there is a great deal of peer-reviewed ecological knowledge about large disturbances, which pretty much has not been effectively assimilated by agencies, by most resource management personnel. You know, a lot of the—there have been a lot of studies done in the last several decades of large disturbances by ecologists, the Yellowstone fires, the hurricanes, Mount St. Helen's, even some experimental research. And it shows, you know, a number of very significant things about how natural disturbances undergo recovery.

There is an additional issue that's emerged from those studies, and that has to do with the role that such areas can play in the ecology of a region such as ours. And these may in fact play very important roles as biological hot spots, as hot spots of biological diversity within a region. So we really need to look at that knowledge, synthesize it, analyze it and see what it has to tell us about our management activities.

With regards to the research that you're going to help us get funded, hopefully long-term research and monitoring, for heaven's sake pay attention to the issue of data management, credible data management activities. And I'm not going to name names, but I can tell you there are some resource management agencies that suffer from the same failings as the F.B.I. They do not have credible data management systems, meaning systems where the data are documented, are properly stored, are made generally available. So that has to be a part of the job.

And I got to tell you, scientists don't like to spend money on that. But it's absolutely critical or you are not going to get the value that you're looking for from these.

My final comment that I want to make is, you know, there's been all of this attention paid to salvage. And certainly we need to pay attention to what we do to recover these large disturbed areas. But I'm concerned that all of this focus on disturbed areas, such as big burns, is diverting us from what I really think is perhaps a more important task, at least equal in importance to it, and that is to get on with the treatment of green forests that are at risk of uncharacteristic stand replacement fires. And, you know, I love big old trees. I love them. And there are in eastern Oregon hundreds of thousands of acres of forests and millions of irreplaceable big old pine trees out there that are at risk of loss. We need to focus on moving forward much more rapidly with the treatment of those so that we aren't doing as we have been doing, picking up the burned pieces after the barn's burned down.

So I'd really, really encourage you to do everything you can to move aggressively so that in fact we retain the green forests and

we aren't arguing about what we should do after they're burned down.

To point out to you on the Deschutes National Forest, they have lost 18 out of 24 areas for Northern Spotted Owls, nesting areas where the—spotted owl habitat area. And we really don't want to see that happen all along the eastern side of the Cascades, so—

And research and monitoring on that process is as important as it is on the salvage.

Thanks.

[The prepared statement of Mr. Franklin follows:]

Statement of Jerry F. Franklin, Professor, College of Forest Resources, University of Washington, Seattle, Washington

I thank the Subcommittee for this opportunity to testify regarding scientific knowledge relevant to appropriate management activities following a major forest disturbance. This testimony supplements a general statement that Drs. Hal Salwasser and K. Norman Johnson of Oregon State University and I prepared on the importance of increasing long-term research and monitoring programs focused post-disturbance management activities. I do reiterate from that statement the critical need for credible data management (e.g., documentation, archiving, and public access) as part of these activities.

At the outset I view it as fundamental that the management objectives for a disturbed area under consideration are an essential consideration in identifying and applying science relevant to post-disturbance activities. Management objectives are probably the most important factor in determining appropriate post-disturbance activities, assuming that we do not want disturbances to automatically result in de facto changes in management objectives. If management objectives for the area are focused on timber production, than one knowledge set based on experience and scientific study will be relevant. On the other hand, if management objectives for the area are directed primarily to sustaining biological diversity and important ecological processes, such as watershed protection, than a different knowledge set will be relevant. Of course, there will be overlap in these knowledge sets but the emphasis is certainly going to be very different.

I personally believe that much of the controversy that has arisen over post-fire logging and other activities relates to stakeholders viewing the appropriateness of an activity through the prism of their own experience and values without adequately considering the defined management objectives for the area under consideration.

There is a very large body of ecological science relevant to management of areas following large disturbances, much of which has not yet been fully assimilated by resource management agencies, policy makers, and the public. The sources include recent studies of such diverse major disturbances as the Mount St. Helens eruptions (Dale et al. 2005), the 1988 Yellowstone Fires (Christensen et al. 1989), and Hurricanes Hugo and Andrew (Walker et al. 1991; Pimm et al. 1994) as well as designed disturbances, such as the artificial hurricane experiments created at Harvard Forest in Massachusetts (Foster et al. 1997).

Rapid natural recovery is commonly observed in these studies, particularly in terms of ecological functions. Such recovery does not always equate with rapid re-establishment of a dense forest of commercially important tree species, however! Results of current studies also reiterate findings from much earlier research on the many ways in which human activities—many of them well intended—can interfere with natural recovery processes. The results provided by Donato et al. (2006), for example, should not have surprised anyone. The negative impacts of post-fire logging on natural regeneration have been reported in many past studies, including one conducted on the Tillamook Burn by the guru of Douglas-fir management, Leo A. Isaac (Isaac and Meagher 1938).

Biological legacies are a key factor contributing to rapid ecological recovery (Franklin et al. 2000). The concept of biological legacies emerged from research at Mount St. Helens but it is applicable to essentially all disturbance types. Biological legacies consist of living organisms, organic matter, and organically-created patterns that persist from the pre-disturbance ecosystem and strongly influence the development of the post-disturbance ecosystem. Living legacies are extremely diverse in form and often abundant, typically ranging from spores and seeds to large trees and sexually mature animals. Legacies of organic matter are also abundant since trees and other plants are killed but very little organic matter is actually consumed or

removed in natural disturbances, including intense wildfires. Legacies of organic matter are most apparent in the concentrated forms of standing dead trees (snags) and downed boles (logs), material often referred to as coarse wood.

Snags, logs, and other coarse wood are biological legacies of extraordinary significance to ecological recovery, second only to surviving trees. The literature on the ecological role of coarse wood is immense; Harmon et al. (2004) and Maser et al. (1988) provide excellent entry points into this literature. The functions of such material are many. Logs and snags provide critical habitat for probably 1/2 to 2/3 of forest animal life (mammals, birds, amphibians, reptiles and invertebrates). Coarse wood is a long-term source of energy and nutrients but, unlike other organic matter, coarse wood is also a site for nitrogen fixation. Coarse wood has significant direct physical influences on geomorphic and hydrologic processes, such as erosion, sediment deposition, and the physical structure of stream and river ecosystems. Residual wood structures significantly modify the microclimatic regime of the disturbed site, which is important in lifeboating diversity and in facilitating the establishment of natural tree reproduction.

Logs, snags and other wood persist and progressively play these and other roles for many decades and even centuries, particularly in the case of larger and more decay-resistant wood and in the case of aquatic ecosystems. Furthermore, where a stand-replacement disturbance has occurred, the resulting pulse of large wood in the form of snags and logs is all of the coarse wood that the recovering ecosystem is going to get for the next 60 to 80 years or more—i.e., until the new forest is large enough to begin generating large snags and logs on its own (Spies 1988). In part, this is the basis for my comment in earlier testimony that, from an ecological perspective, it is better to harvest living trees from an intact forest than to remove dead trees from an intensely burned site.

Ecological science also provides substantial insight into landscape-level issues that need to be considered in any type of post-disturbance management activity, such as ecological impacts of logging (e.g., Lindenmayer and Franklin 2002). All parts of a landscape are not created equal. The special importance of riparian habitats in a forest landscape exemplifies this principle. As another example, post-fire logging programs that are selectively focused on portions of the landscape with high residual wood volumes can have a disproportionately high impact on overall ecological conditions within the disturbed landscape, even though the activity directly impacts only a small percentage of the total area. The potential is there to effectively "high grade" a large disturbed landscape by logging the majority of the areas with abundant large legacies.

Research on natural forest disturbances has also shown that post-disturbance landscapes are important sites for many biota and important ecological processes, such as nitrogen fixation. Because such areas have a rich array of structural legacies and are free of dominance by tree canopies, very high levels of biological diversity are often present in the form of animal, plant and fungal species as well as diverse plant life forms. Forest guru Leo A. Isaac noted such qualities based on his observations in the Tillamook Burn (Isaac 1963). Such naturally-disturbed early-successional habitats are very different from clearcuts in structure, composition, and duration.

The naturally recovering portions of the Mount St. Helens blast zone provide graphic evidence that such areas can be regional hotspots of biological diversity, as exemplified by the extraordinary species diversity and population levels of amphibians, birds, small mammals, and meso-predators found in this landscape (Dale et al. 2005). Such richness of organisms and processes is not to be found within the reforested portions of the Mount St. Helens region although these dense young forests are producing a lot of wood. This contrast makes explicit the importance of management objectives for a disturbed area.

Resource managers do have much knowledge and experience with post-disturbance landscapes but there has been relatively little systematic research on impacts of post-fire logging. Moreover, some of the science described as relevant has limitations. We cannot assume that research focused on solving regeneration problems following timber harvesting in southwestern Oregon are directly applicable to conditions or to management objectives on naturally disturbed areas in the Biscuit Burn. As I hope we have all learned—clearcuts are not just like wildfires! To which I would add, what is good for timber production may not be good for many other forest values. Hence, the importance of management goals for affected properties.

In conclusion, we certainly do need more credible scientific research as well as systematic monitoring to increase the breadth and depth of the knowledge available to guide management. I would emphasize that the research and monitoring need to be sustained—long-term—efforts and, further, that these efforts will be largely wasted without appropriate investments in data management.

Finally, I want to express a concern that all of this attention on salvage and reforestation has diverted us from what I view as a more important task, which is to get on with treatment of green forests at risk of uncharacteristic stand-replacement fires. In eastern Oregon there are hundreds of thousands of acres of forest and millions of irreplaceable old-growth trees at risk of loss. We need to focus on these green forests so that they don't end up as part of policy debate over salvage!

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Ecological Science Relevant to Management Policies for Fire-Prone Forests of the Western United States

Society for Conservation Biology Scientific Panel on Fire in Western U.S. Forests

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EXECUTIVE SUMMARY

Fire is a primary natural disturbance in most forests of western North America and has shaped their plant and animal communities for millions of years. Native species and fundamental ecological processes are dependent on conditions created by fire. However, many western forests have experienced shifts in wildfire regimes and forest structure following a century or more of resource use and management, with some past and present management activities lacking a scientific basis. Changes in wildfire and fuel management policies are needed to address social and environmental problems that have arisen as a result of these activities.

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Incorporation of current scientific knowledge into revised policies and practices is essential to insure that the productivity, biological diversity, and ecological values of western forests are sustained. As an example, implementation of the Healthy Forests Restoration Act (HFRA) of 2003 will benefit from adaptive application of the dramatically expanding base of scientific knowledge. Our review addresses the ecological science relevant to developing and implementing forest restoration and fuel management policies, including activities conducted before, during, and after forest wildfires. An essential principle of ecological variability within and among forests underlies all of our findings.

In this summary and in the background report we use the term "characteristic" in referring to the dominant natural disturbance regime of a forest type or site. For example, some types of dry forests are described as being historically or naturally "characterized by a frequent, low-severity fire regime" while some coastal and subalpine forests are "characterized by an infrequent, high-severity fire regime." These are generalized characterizations of the regimes that these types experience and are not necessarily exclusive. For example, forests characterized by high-severity fire regimes may also experience low-severity events and vice versa. The term "uncharacteristic" refers to disturbances, forest structure, or fuel loads of a scale or type outside the historic range of variability based on site-specific vegetation reconstructions using tree rings, fire scars, pollen, charcoal, or early historical records.

Fire in Western Forests

Wildfire is inevitable and ecologically important in forests throughout much of the western United States, given the fuels, ignition sources, and variable climatic conditions. Nevertheless, characteristic fire regimes—especially the extent, frequency, and severity of the wildfires—are immensely variable. For example, fires historically recurred in western forests at intervals ranging from as frequently as a decade or less in some dry ponderosa pine forests to 250 to 800 years or more in forests at high elevations and along the Pacific Coast. Fires provide important services such as recycling nutrients, regulating the density and composition of young trees, and creating and shaping wildlife habitat at the stand level. At larger spatial scales wildfire influences landscape patterns and affects water and sediment delivery in watersheds. Many native plant and animal species are adapted to postfire habitats and suffer population declines with fire exclusion.

Characteristic fire regimes differ markedly among forest types and regions—as well as within major forest types—and these differences need to be considered in fire and fuel management policies to assure that these policies are effective and sustain ecological values. Managers, stakeholders, and policy makers are challenged by the complexity created by this variability, which defies a simple, one-size-fits-all prescription. Fortunately, plant association groups (PAGs) provide a surrogate classification of this diversity in forest wildfire regimes that is effective and scientifically credible, since plant associations have predictable relationships to characteristic fuels and fire regimes.

Forest Management Before Wildfire

How could forests be managed prior to the inevitable wildfires they will experience, so as to insure that fires will play their characteristic roles in maintaining the composition, structure, and function of the forest ecosystem when they do occur? Appropriate management will vary greatly with the type of forest and its dominant fire regime. Determining the appropriate management and restoration goals requires that the effects of past land uses first be identified so that those effects can be specifically remedied. Then appropriate ecologically based restoration and management policies can be developed. Protected areas require particular management approaches that may differ from practices appropriate in managed forests. Each of these topics is addressed in turn below.

Variable Effects of Fire Exclusion, Logging, Livestock Grazing, and Plantations

The effects of fire exclusion, as well as other activities that affect fire regimes (e.g., logging, livestock grazing, plantations) on forest structure are not necessarily easy to identify or demonstrate scientifically; they also vary significantly among forest types and regions. In some forest types change has been dramatic since European settlement due, for example, to fire exclusion, logging, grazing, or tree planting (singly or in combination), and restoration is clearly needed. In other forest types major changes are not apparent and restoration is not needed. In many cases it has been inappropriately assumed that forests in general or all forests dominated by a particular tree species have been altered in the same way. In fact, these effects are

known to vary, depending upon the forest type and whether fire was characteristically high, mixed, or low severity, each of which is discussed below.

Key Findings:

- Fire exclusion and other human activities have led to significant deviations from historical variability in some forests but not in others. Restoration treatments are warranted, sometimes urgently, in those cases where such activities have led to significant alterations in ecosystem structure, function, or composition, but cannot be justified ecologically in cases where such changes have not occurred. The following sections discuss this for forests with different fire regimes.
- Land uses and fire exclusion do not universally increase fuel loads or fire risk. Such activities may alter fuels in divergent or complex ways that lead to a need for decreases in particular fuels and increases in other fuels, if restoration to the historical range of variability is the goal. For example, fire exclusion can increase tree regeneration and ladder fuels in some cases and decrease tree regeneration and ladder fuels in other cases.

Forests Characterized by High-Severity Fires

Forests characterized by high-severity fires are found in several disparate locations: subalpine forests at higher elevations throughout the West (e.g., lodgepole pine and Engelmann spruce-subalpine fir); the moist and highly productive forests in marine-influenced regions of the Pacific Northwest; and certain semi-arid woodlands, including some dominated by pinyon-juniper and by oak-pine-chaparral. High-severity fires, which are usually infrequent, kill most or all of the trees in large portions of the burn, although such fires typically create a landscape mosaic that also includes some areas of unburned forest and of low- to moderate-severity burn. Forests subject to high-severity fires typically support high densities of trees and other woody plants and, consequently, large fuel loadings. When these dense fuels dry out and an ignition source is present, the resulting fires can spread rapidly and quickly become difficult or impossible to suppress. Many large, high-severity fires are probably associated with either infrequent, severe droughts or short-term synoptic weather patterns or both.

Key Findings:

- Fire exclusion has had little to no effect on fuels or forest structure in forests characterized by high-severity fire regimes—a fact that is especially relevant to fire policy. High-severity fires are relatively infrequent—coming at intervals of one to many centuries—while the period of active fire exclusion in these remote forests has been less than a century. Land uses, including logging, plantations, and grazing, may have extensively modified the structure of these forests in some areas, but evidence suggests that fire regimes have not been fundamentally modified.
- Because fuel structures or tree densities are usually well within the historic range of variability, "restorative" treatments are ecologically inappropriate in forests characterized by stand-replacement fire. Modifying stand densities and fuels to levels that would reduce the potential for stand-replacement fire would render these forests incapable of fulfilling their characteristic ecological roles, including provision of high densities of standing dead trees (snags) and other critical elements of fish and wildlife habitat that are created by fire. Restoration could address other needs, such as restoring native understory plant diversity, where land use is known to have caused changes.

Forests Characterized by Mixed-Severity Fires

Fire is quite variable in severity and frequency in many mid-elevation and some low-elevation forests of moderate to high productivity across variable topography in the interior west and some coastal regions, such as the Klamath-Siskiyou region. In these forests both low- and high-severity fires may occur, with the former often more frequent than the latter. Topographically complex western mountain landscapes may be especially prone to mixed-severity fire, because drier south-facing slopes with lower fuel loads can burn at low severity when adjacent, moister north-facing slopes that support higher tree densities experience high-severity fire. The inherent variability of mixed-severity fire regimes precludes easy detection and analysis of the effects of fire exclusion. Exclusion of fire may have allowed tree densities to increase in some areas but post-fire tree density is naturally high in patches killed by high-severity fire.

Key Finding:

- Scientific understanding of mixed-severity forest landscapes is limited, making it difficult to provide ecologically appropriate guidelines for restorative treatments. These are very often very complex landscape mosaics; hence, it is necessary to plan and conduct activities at larger spatial scales. In mixed-severity forest landscapes where sufficient ecological and fire-history information is available, a combination of thinning and prescribed fire may be useful in restoration. However, only portions of these landscapes will warrant treatment from an ecological perspective that recognizes the spatially complex patterns. More scientific research is needed to understand the dynamics of mixed-severity forest landscapes.

Forests Characterized by Low-Severity Fires

The consequences of many human activities—including fire exclusion, logging, tree planting, and livestock grazing—are most serious in forest types that historically were characterized primarily by low-severity fires. Low-severity fire regimes were typical of many (but not all) pine and dry mixed-conifer forests, which occurred on warm, dry sites prior to European settlement. These fires historically burned fine fuels (e.g., grasses and litter on the forest floor) at regular intervals. These surface fires killed few large fire-resistant trees but killed many smaller trees of all species, helping to maintain open-canopied stands of large, old trees. Human activities since European settlement have dramatically modified the fuel structure in these forests. Logging of large fire-resistant trees has eliminated key ecological elements of these forests, including the large trees, snags, and logs essential to many ecological functions, such as provision of fish and wildlife habitat. Logging also has promoted higher stand densities in many dry forests by stimulating dense natural regeneration, even when it was not followed by aggressive replanting.

Key Findings:

- Restoration of dry ponderosa pine and dry mixed-conifer forests—where low-severity fires were historically most common—is appropriate and desirable ecologically on many sites. Mechanical thinning of small stems and prescribed fire are effective techniques for restoring stand densities to levels that existed prior to fire exclusion, livestock grazing, logging, and plantation establishment.
- Retention of large and/or old live trees, large snags, and large down logs in restoration treatments, such as thinning, is critical to restoring and maintaining ecological function. Also, other key components of these ecosystems, such as native understory plants, must be restored or protected for full restoration of natural conditions, including the potential for characteristic fire behavior.

Priorities and Principles of Ecologically-Based Forest Restoration

Forest restoration varies along a continuum from restoring structure (e.g., reducing densities of small trees and increasing the density of large trees) to restoring the processes (e.g., low-severity fire, competition between grasses and tree seedlings) that create and maintain that structure. The continuum also represents a gradient from symptoms (e.g., uncharacteristically high tree densities) to causes (e.g., exclusion of fire). A well-established principle in land health, as in human health, is that treating symptoms may be necessary in the short term, but that ultimately causes must be identified and treated to restore health.

Appropriate models for restoration will vary with current forest conditions, management objectives, and plant association groups, among other factors. An essential early step in a management program is to identify the Desired Future Condition (DFC) to which treatments are directed. DFCs are often based on conditions that are considered to be within the historical range of variability (HRV). Precisely achieving some past condition is not a reasonable goal, but conditions broadly representative of the historic range of variability can often be approximated through restorative activities. Restoration of processes (e.g., low-severity fire) may allow the re-structured forest to eventually equilibrate with contemporary environmental conditions. The level of threat to particular natural values—such as critical wildlife habitat, watershed and aquatic values, and existing populations of veteran old trees—should be considered in setting priorities for restoration treatments.

Areas in the wildland-urban interface (WUI) may require fuel reduction and fire management policies that are inconsistent with HRV or with maintaining the biodiversity of those sites, even though carefully tailored treatments can maintain some aspects of biodiversity. Growth-management policies could minimize adverse ecological impacts from the WUI.

We provide two case studies—the Klamath Reservation Forest and Rocky Mountain ponderosa pine—Douglas-fir forests—in the background report to illustrate the

wide variety of ecological conditions and ecologically appropriate management and restoration practices in western forests.

Key Findings:

- From an ecological perspective priorities for restoration need to be determined on the basis of ecological considerations and urgency outside of the wildland-urban interface (WUI). High-priority cases are likely to include areas where significant ecological values are at risk of undesirable stand-replacement fire. Many of these are outside of the WUI.
- On lands where ecological objectives dominate, the desired goal will often be a forest ecosystem with its fire regime, fuels, tree population structure, and other living organisms restored to within the historic range of variability. Ideally, the conditions created must be consistent with the characteristic fire regime of the site—i.e., sustainable in the context of the probable fire regime. Deviation from historic conditions sometimes may be necessary, however, to accommodate an altered biota or environment, or to accommodate appropriate social objectives. In such cases the highest conservation values are likely to be obtained by minimizing deviations from the historic range of variability.
- Broader conception and implementation of restoration objectives, beyond fuel and fire mitigation, are necessary to achieve comprehensive, scientifically based approaches to ecological restoration of western forests. An example is the restoration of understory plant communities.
- Restoration plans must recognize and systematically incorporate fire management needed to maintain the restored forest. Forests are dynamic; therefore, any restoration program has to provide for sustained fire management in order to maintain the desired condition. A common-sense goal consistent with ecological science is to achieve restored forests that are low maintenance, such as can be achieved through managed natural fire, and, where this is not possible, to use prescribed fire that seeks to mimic as closely as possible the characteristic fire regime.
- Large trees of fire-resistant species and large snags and logs have high ecological importance and should be retained in restoration projects with ecological goals. Where present, large and old live trees are the most fire-resistant component of western forests and are essentially irreplaceable. Snags and logs on the forest floor are key wildlife features that are deficient in many western forests due to logging.
- There are risks associated with restorative treatment of stands and landscapes including: (1) Uncertainties associated with basing treatments on inadequate knowledge; and (2) Risks associated with not taking restorative actions, including the potential loss of significant ecological values. An example of the latter is potential loss of spotted owl habitat to stand-replacement fire, which is uncharacteristic in some landscapes, such as on the lands that previously constituted the Klamath Indian Reservation in the Eastside Cascades. Again, we emphasize the need to recognize variability, as portions of landscapes that are generally characterized as falling within a low-severity fire regime did experience high-severity fire, at least on occasion.
- Adaptive management, including properly designed monitoring activities, needs to be a part of all major restoration programs. Many proposed research and monitoring activities associated with restoration programs have lacked both sufficient and sustained funding. Creation of a dedicated funding mechanism to support these activities is imperative for proposals to provide critical feedback to managers and, secondarily, to have credibility with stakeholders.
- Credible, third-party scientific reviews are critical when major controversies arise as to the scientific merits of proposed activities. Regular processes or mechanisms for the initiation and nature of these scientific reviews need to be established along with appropriate funding mechanisms.

Protected Areas Are Essential for Managing Fire for Ecological Diversity

Not all conservation needs can be met in managed forests. Reserves of various kinds are a fundamental conservation tool whether they are congressionally recognized (e.g., national parks and wilderness), land allocations (e.g., Late Successional Reserves), or de facto reserves (e.g., roadless areas). They provide essential enclaves for species and serve as control or reference sites for lands managed for commodities. The question of how reserves in fire-prone landscapes should be managed cannot be addressed by application of a simplistic "one-size-fits-all" philosophy, but must be guided by consideration of the vegetation structure and composition of the area in question and its characteristic fire regime.

Key Findings:

- Reserves may be required for species closely associated with late- or early-successional forests in fire-prone landscapes for a variety of reasons. For example, unreserved forests are often fragmented by periodic logging or consist only of stands of trees too small or too open to meet the needs of late-successional species, such as spotted owls. Species typical of natural post-fire habitats (e.g., many woodpeckers), which contain abundant standing dead trees, require substantial areas reserved from post-fire logging.
- The reserve concept does provide for appropriate kinds of management and ecologically compatible human use. Restoring a natural fire regime is most compatible with the reserve concept, but in cases where fully restoring a natural fire regime is not feasible, ecologically appropriate management will likely be needed to restore and maintain biodiversity and the conditions for which reserves were set aside. Some types of management, such as prescribed burning, and some uses, such as ecological research and monitoring, are often essential to the persistence of populations, habitat features, and key ecological processes within reserves. The general goal would be to restore the reserve landscape to a condition within the historical range of variability (where restoration is necessary) and then to maintain it in that state with minimal human intervention, or allow it to equilibrate with contemporary natural conditions.

Management Activities During Wildfire

Fire management policies provide direction regarding responses to wildfire, including such basic issues as whether or not to suppress wildfires. A generalized policy regarding fire suppression is inappropriate as evidenced by the negative ecological (and other) impacts of a universal fire-suppression policy during the 20th century. Decisions regarding appropriate response to fire need to consider many ecological and social factors, beginning with the nature of the forest type and societal goals.

Key Findings:

- From an ecological perspective, allowing fires to serve their natural role may be most beneficial ecologically. Certainly, fire must be managed when close to human settlements and infrastructure and in some cases where economic resource values are high. Away from these areas—such as in many wilderness areas, national parks, and large areas of contiguous public lands—there is opportunity to increase the use of wildland fire, thus benefiting the range of species that require a diversity of natural fire regimes.
- Fire suppression may be beneficial to ecological values in some forest landscapes, particularly where special values are at risk. For example, fire suppression may be appropriate where rare or unique ecological values (including imperiled species habitat) could be lost, where uncharacteristic fuel accumulations have created the potential for a fire that is outside the historic range of variability, or where infrequent high-severity fires are characteristic but where such fires are not currently viewed as ecologically desirable (e.g., old-growth forests in Pacific Northwest).

Forest Management After Wildfire

Forest landscapes that have been affected by a major natural disturbance—such as a severe wildfire or windstorm event—are commonly viewed as devastated and biologically impoverished. Such perspectives are usually far from ecological reality. Overall species diversity measured as number of species—at least of higher plants and vertebrates—is often highest following a natural stand-replacement disturbance and before re-development of closed-canopy forest. Important reasons for this include an abundance of biological legacies, such as living organisms and dead tree structures, the migration and establishment of additional organisms adapted to the disturbed, early-successional environment, and temporary release of other plants on the site from dominance by trees.

Currently, natural, early-successional forest habitat—naturally disturbed areas with a full array of legacies (i.e., not subject to post-fire logging) and experiencing natural recovery processes (i.e., not seeded or planted)—are among the scarcest habitat condition in some regions, such as the Pacific Northwest.

Key Findings:

- Research by both ecologists and foresters provides evidence that areas affected by large-scale natural disturbances often recover naturally. Post-burn landscapes have substantial capacity for natural recovery. Reestablishment of closed

forest following stand-replacement fire characteristically occurs at widely varying rates, providing temporary, but ecologically important and now rare early-successional habitat for a variety of native species and key ecological processes.

- Post-fire logging does not contribute to ecological recovery; rather it negatively impacts recovery processes, with the intensity of such impacts depending upon the nature of the logging activity. Post-fire logging in naturally-disturbed forest landscapes generally has no direct ecological benefits and many potential negative impacts from an ecological standpoint. Trees that survive the fire for even a short period of time are critical as seed sources and as habitat that will sustain many elements of biodiversity both above and below ground. The dead wood, including large snags and logs, is second only to live trees in overall ecological importance. Removal of these structural legacies—living and dead—is inconsistent with our scientific understanding of natural disturbance regimes and short- and long-term recovery processes.
- Post-fire logging destroys much of whatever natural tree regeneration is occurring on a burned site. This is a fundamental concern since these tree seedlings are derived from local seed sources, which are most likely the best adapted to the site. Furthermore, environmental variables, such as moisture and temperature conditions, are major selective factors in determining which natural tree seedlings survive, which favors genotypes more tolerant of environmental stresses than are nursery- or greenhouse-grown seedlings.
- Evidence from empirical studies is that post-fire logging typically generates significant short- to mid-term increases in fine and medium fuels. In some cases this may result in increased reburn potential rather than a decreased reburn potential, as is often claimed. In any case, from an ecological perspective large wood is of demonstrated importance in ecological recovery; removing this wood in an attempt to influence the behavior of a potential reburn event has little scientific support.
- In forests subjected to severe fire and post-fire logging, streams and other aquatic ecosystems will take longer to return to historic conditions or may switch to a different (and often less desirable) state altogether. Following a severe fire the biggest impacts on aquatic ecosystems are often increased sedimentation caused by runoff from roads. High sediment loads from roads may continue for years, greatly increasing the time for recovery.
- Post-fire seeding of non-native plants generally damages natural ecological values, such as reducing the recovery of native plant cover and biodiversity, including tree regeneration. Non-native plants typically compete with native species, reducing both native plant diversity and cover. Reductions in natural tree regeneration as a result of seeding of non-native plants have also been reported in numerous studies.
- Post-fire seeding of non-native plants is often ineffective at reducing soil erosion. Aerial seeding of grasses (primarily non-native) is common on federal lands following moderate- to high-severity fire to reduce postfire erosion. The effectiveness of seeding in reducing erosion is mixed. Grass seeding generally does not mitigate erosion during the first winter following fire, when seeded grasses are not yet well established. Seeding may slow erosion during the second year following fire but is rarely effective during intense storms.
- There is no scientific or operational linkage between reforestation and post-fire logging; potential ecological impacts of reforestation are varied and may be either positive or negative depending upon the specifics of activity, site conditions, and management objectives. On the other hand, ecological impacts of post-fire logging appear to be consistently negative. Salvage and reforestation are often presented as though they are interdependent activities, which they are not from either a scientific or operational perspective. From a scientific perspective, policy and practice should consider each activity separately. As noted above, post-fire logging is a consistently negative practice from the standpoint of ecological recovery. Natural tree regeneration is ecologically most appropriate, but intentional reforestation could also be designed to provide significant ecological benefits in some cases.
- Accelerated reestablishment of extensive closed forest conditions after fire is usually not an appropriate objective on sites managed with a major ecological focus. Wildfires have been viewed historically as events that destroy valuable standing forest and create undesirable expanses of deforested (i.e., unproductive) landscape. Re-establishment of fully stocked stands of commercially important tree species on burned sites has been a fundamental forest management objective on most private and public forestlands; hence the historic commitment to intensive reforestation. However, timber production is no longer the primary objective on many federal lands, where the focus on provision of biodiversity

and ecosystem services equals or exceeds wood production objectives. The ecological importance of biological legacies and of uncommon, structurally complex early-successional stands argues against actions to achieve rapid and complete reforestation except where the primary goal is wood production. In addition, it is also inappropriate to re-establish fully stocked stands on sites characterized by low-severity fire—the same sites where managers are trying to restore fuel loadings to their historical range of variability.

- Where timber production, other societal management goals, or special ecological needs are the focus, planting or seeding some native trees and other plants using local seed sources may be appropriate. Ecological assessments of the post-burn area and considerations of management objectives should be used to determine appropriate activity. Special ecological circumstances might include a need to restore an uncommon plant species or habitat for a threatened or endangered species. Innovative practices, such as low or variable density planting, will likely be more appropriate ecologically than traditional practices that involve dense tree plantations of one or a few commercial species. Dense uniform conifer plantations are always inappropriate on sites characterized by low-severity fire unless the intent is intensive management of such sites for wood production.

MORE ECOLOGICAL SCIENCE IS NEEDED IN FIRE MANAGEMENT

Despite the complexity of fire ecology in western forests and uncertainty over the effects of particular management actions, the scientific basis for rational decision-making about fire has improved dramatically in recent years. Some of this improvement is evident in law and policy. For example, there is explicit attention to old-growth and characteristic forest structure in the Healthy Forests Restoration Act (HFRA) of 2003:

> "In carrying out a covered project, the Secretary shall fully maintain, or contribute toward the restoration of, the structure and composition of old growth stands according to the pre-fire suppression old growth conditions characteristic of the forest type, taking into account the contribution of the stand to landscape fire adaptation and watershed health, and retaining the large trees contributing to old growth structure."

Nevertheless, current approaches to implementation of HFRA may be flawed; while attempts are being made to incorporate the variability of fire regimes and vegetation dynamics among forest types, there is heavy reliance on expert opinion and unvalidated, over-specified models. Critical review of the scientific basis for HFRA, FRCC (Fire Regime Condition Classes), and LANDFIRE from a credible independent source, such as the National Academy of Sciences, is needed.

More generally, principles of ecological science and the detailed existing knowledge of individual forest ecosystems need to be incorporated more systematically into the development of forest fire and fuel policies. A current example is the need to incorporate ecological principles into proposed legislation dealing with post-fire (salvage) logging and reforestation.

One barrier to better use of ecological science is that scientists involved in developing fire policies and practices have tended to be specialists in fire and fuel management, not ecologists, conservation biologists, or other broadly trained scientists. It is not surprising, then, that current forest law and policy, such as HFRA, does not adequately incorporate ecological science in its implementation and tends to promote a narrow definition of restoration that focuses almost exclusively on fuels.

True ecological restoration requires the maintenance of ecological processes, native species composition, and forest structure at both stand and landscape scales. Because ecological variability is great, few universal principles exist for integrating insights from ecology and conservation biology into fire management and conservation policies. Nevertheless, one principle that does seem to hold is that as forests are managed or restored, they should not only support the desired fire regime but also viable populations of native species in functional networks of habitat.

Mr. WALDEN. Thank you, Dr. Franklin.

Dr. Perry, thank you. Welcome for being here. We look forward to your testimony. Have at it, sir.

STATEMENT OF DAVE PERRY, PROFESSOR EMERITUS, OREGON STATE UNIVERSITY

Mr. PERRY. Thank you, Chairman Walden.

Mr. WALDEN. Make sure your mike's on. And if you could bend it over your way, then everybody can hear a little better. Thank you, sir.

Mr. PERRY. Light means on now.

Mr. WALDEN. Light means off. Don't ask me. I don't get it.

Mr. PERRY. Where am I?

Mr. WALDEN. Medford. And this appears to be an old growth table we're around.

Mr. PERRY. Chairman Walden, Members of the Committee, Members of the Staff, thank you for the opportunity to testify.

I want to talk today about being conservative and being careful about tiptoeing along the edges of cliffs, which if we go over we're going to compromise our objectives. I don't care whether timber management or biodiversity or what.

If you go up elevation from Cave Junction, Oregon and you—around the vicinity of Oregon Caves National Monument and you look south into California, you'll see what in Hawaii they call a puka, a hole, a lot of holes in the forest. And those holes in the forest are clearcuts that were put in in the '60s and were planted three, four times each, and it's difficult to find a living stick on. This is a problem at high elevations and other areas of the West as well.

I spent a lot of my research career myself and my students trying to understand what goes on there. Why is it that you can cut what was a productive, healthy forest, established by fire, and all of the sudden you can't get trees to grow back.

Now, I want to stress these are different situations than Steve Hobbs talked about with the forest study. But they may have some similarities as well.

Well, to make a long story short, we concluded that a big part of the problem was the removal of the shelter, of big old trees. It's an old, old silvicultural technique called shelter wood, which is very important on these kinds of harsh sites and which wasn't done up there. And the second thing was herbiciding the sprouting hardwoods and shrubs.

We spent a great deal of time and research and intensive study figuring out what went on in the soils in these areas. These shrubs will protect soils. They protect streams. They maintain organisms that are important for conifers. They cleanse the soil of organisms that are detrimental to conifers. They also compete for resources. These services don't come free. And the balance between their benefits and their costs are multidimensional and not generalizable, depending on a number of factors.

Adjacent to each one of these clearcuts was a forest that was established by wildfire. And the retrospective studies that have been done for the last ten years around western Oregon and southwestern Oregon, and Tom Sensenig, whose name came up earlier, did a number of these in southwestern Oregon, all show the same, pretty much the same thing. These forests recover by themselves very well.

Now, we're at a different point in history now. Maybe the situation is different, and we can't assume that that will happen again. But neither can we assume that we have to get in there and help them. And, if fact, the evidence is that if we do the wrong thing

on the wrong place—in the wrong place, we can tip these systems into something that we wish we hadn't, and it's going to compromise all our objectives.

The second cliff to stay away from, and this one was going to be impossible to, but maybe we can help it, is the threat of wildfire. And we hear a lot of talk about the threat of snags and wildfires. And actually it turns out the studies that are being done on the Biscuit show that the fire laid down when it came to the unsalvaged areas of the Little Silver.

I have some hypotheses about that. I think—I think the standing dead timber disrupts the air flow into the fire, just like closing down the damper on your stove. That's a hypothesis to be tested.

But let me go back to the old Silver complex. I was out on the ground with Forest Service people shortly after that. And Yogi Berra's name came up a little earlier, and I'll invoke him again. You can learn a lot from looking. And I'll tell you in my career I've learned a lot from looking.

We came upon an example of something that just absolutely blew me away. It was a plantation which had been the site of a brush control study. And like virtually all plantations in the fire area—the plantations, by the way, are the most fire susceptible thing we put out there. Like virtually all plantations in the study area, the trees outside of—or the trees where the brush had been controlled were totally consumed. The trees where the brush was not controlled were green and healthy, and they didn't look like they had been touched by the fire. I couldn't believe what I was seeing.

And then I got to looking around and I got to talking to people, and I discovered that this was—some of the plant species we have out there are fire resistant. This is something foresters 100 years ago knew and somewhere along the line got forgotten. But those things are out there doing stuff for us.

And I think our job here is to find balance. We need to find the balance. And that's where research can really contribute to helping us find the balance between extracting and between preserving and long-term health of these systems.

I think science has traditional things to contribute in terms of research. I think we also have to be taking a hard look at risk analysis, how much do we risk when we start modifying the biodiversity of these systems. And I can tell you we do risk something. And this needs to be looked at.

And, finally, I'll close by saying that another role for science that I would like to see is the formation of rapid response collaborations between scientists and managers on individual fires, so we bring the expertise of both groups together. And this is a lot easier said than done, but I think that would be an important way to begin to make intelligent decisions on what we do out here.

Thank you very much.

[The prepared statement of Mr. Perry follows:]

Statement of David A. Perry, Professor (emeritus) of Ecosystem Studies and Ecosystem Management, Department of Forest Science, Oregon State University

Chairman Walden, members of the Committee, staff members, thank you for the opportunity to testify.

My name is Dave Perry. I'm a Professor (emeritus) of Ecosystem Studies and Ecosystem Management in the Department of Forest Science, Oregon State University. I currently live in the Illinois River Valley near Selma, Oregon.

I'll begin with a comment on the study by Donato and colleagues. In my opinion, it is a fine piece of work. That it has stirred up such a controversy calls to mind a plaque that forest service scientist, Jim Lotan, had on his office wall. The plaque had a single stirrup on it, and beneath the stirrup the inscription—He who tells the truth better have one foot in the stirrup".

Since the critics of Donato's work chose not to follow accepted scientific procedure and air their objections in the open literature, I can only guess what they are. I imagine a major criticism is that the study focused on short-term responses and did not account for long-term dynamics (something Donato et al acknowledged). This is a valid criticism, and it can be applied to virtually every study we have on forest ecology and forest management. Studies that span as much as two decades are rare, whereas the dynamics of these forests play out over many decades and centuries. The few long-term studies we have teach us that what you see today is not necessarily what you get tomorrow, which means that most of what we know must be considered provisional. If I could summarize 35 years of ecological research in a single phrase, it would be that nature loves to throw curveballs.

The Sessions Report stressed the environmental benefits of active post-fire management, particularly with regard to reducing fire risk from standing snags and ameliorating the impact of brush on conifer seedlings. I want to discuss some of the environmental benefits of leaving fire-killed trees and the so-called brush species, both of which represent critically important biological legacies. I will briefly discuss three aspects: habitat, conifer regeneration, and susceptibility to future fires. I will conclude with comments on science's role in helping society find a proper balance between levels of utilization and maintenance of ecosystem health.

Habitat. It's beyond the scope of my testimony (not to mention my expertise) to go into all the habitat implications of post-fire management, suffice it to say that big dead wood and noncommercial plant species are critically important habitat for a number of animal species. For example, a comparison of bird communities in salvaged and unsalvaged areas in Alberta found that "resident species, canopy and cavity nesters, and insectivores were the least likely to be detected in salvaged areas" (Morrisette et al 2002). In their review of the scientific literature, McIver and Starr (2001) found that

> "Most cavity-nesters showed consistent patterns of decrease after (post-fire) logging, including the mountain bluebird and the black-backed, hairy, and three-toed woodpeckers; abundance of the Lewis' woodpecker increased after logging...In general, postfire logging enhances habitat for some wildlife species and diminishes it for others".

At least one bird, the black-backed woodpecker (more common in the northern Rockies and the eastern Cascades than in the Klamath region), is critically dependent on fire killed trees. Montana has listed the black-backed as a species of high concern.

Mast produced by oaks and tanoaks is an important food resource for many animals, as are madrone berries.

Prominent hydrologists and fisheries biologists have raised concerns about the impacts of post-fire management on streams (Karr et al. 2004).

Aids to conifer regeneration. In some cases standing trees (living or dead) and early successional hardwood trees and shrubs help rather than hinder conifer regeneration. I'll illustrate that with a story from my own research in SW Oregon. My students and I were trying to understand the factors underlying the inability to reforest high elevation clearcuts, which is a widespread problem in the portions of the west. One of our prime study sites was a degraded clearcut at high elevation not far from Oregon Caves National Monument. Like a number of other clearcuts in similar environments, this one had been cut in the early "60's and despite several planting attempts had virtually no living conifer seedlings. Adjacent to this clearcut was a fully stocked 80 year old conifer stand that was obviously established by fire. The fire would have occurred long before roads were put into that area, so the site presumably received no post-fire management of any kind. Yet it was a thriving forest, in sharp contrast to the neighboring unreforested clearcut. It seems nature knew something we didn't. Perhaps the climate had changed, but I doubt that's the explanation. To make a long story short, we concluded that it was the biological legacies represented by fire-killed snags and early successional sprouting shrubs that enabled trees to successfully reestablish on the burn (Perry et al. 1989). Standing boles, living or dead, provide what is essentially a greenhouse effect that reflects radiant heat loss back to the surface and thereby ameliorates temperature extremes (which is the basis for the old silvicultural technique called shelterwood). At high

elevations in the west, where the window of establishment for a tree seedling may be very short, the extension of the growing season that results from a sheltering overstory—living or dead—can be a critical factor enabling seedlings to establish and survive.

A number of studies have demonstrated the beneficial role of sprouting shrubs and hardwood trees. They protect soils and therefore streams, stabilize soil organisms that are important to conifer survival, induce conifer seedlings to form roots faster, and cleanse the soil of organisms harmful to conifers. Research following a recent wildfire on the San Dimas Experimental Forest, funded by the National Commission on the Science of Sustainable Forestry (NCSSF), used modern molecular techniques to study recovery of the soil biota (Egerton-Warburton et al. 2005). Speaking of ectomycorrhizal fungi (EM), which form a critically important symbiosis with trees, the researchers concluded that

The root zone of re-sprouting plants and possibly senescing roots, along with soil spore banks are—important sources of EM inoculum. Halting activities that impede the recovery of the EM, such as salvage logging, stump removal, site clearing or ripping, should be considered because these activities remove sources of inoculum. In addition, any mechanical disruption of the soils will limit plant access to resources transferred by common mycorrhizal networks.

Planting conifers promptly (within one year) also stabilizes soils (if the seedlings survive). However, even if planted at high densities, seedlings will influence less than 10% of a site during their first few years. The more widespread cover provided by the naturally recovering vegetation is necessary for protecting soils and streams (seeded grasses can stabilize soil physical properties, but not the ectomycorrhizal fungi required by conifers). The San Dimas researchers went on to conclude that

> "Adequate mycorrhizal inoculum exists within the soils of natural communities for post-fire plant regeneration. Plantation forests, however, contain lower fungal abundance and species diversity, with the result that plant regeneration may be slower due to limited mycorrhizal benefits (e.g., aggregation, resource uptake)".

Fire Susceptibility. It's well known that fine fuels rather than standing dead boles carry fire, however snags can send up flaming brands and contribute to spotting. But the story is turning out to be more complex. Analysis by Thompson and Spies (2006) shows that areas salvaged and planted following the Silver Fire tended to burn with higher severity than comparable areas that burned in Silver but were not salvaged and planted. Initial results indicate a sudden change in weather was not a factor in the difference.

Though not studied, standing dead timber seems likely to disrupt patterns of air movement that influence the behavior of subsequent fires. In later years, unsalvaged timber would become a source of soil organic matter and large down wood, both of which hold large amounts of water that would also influence the flammability of stands. To date, I am not aware of any models that take these factors into account. Our understanding of the full range of effects of unsalvaged timber on subsequent fires is poor.

Studies and observations both show that certain hardwood species retard the spread of fire and protect intermixed conifers (something foresters of 100 years ago knew and used). In one natural experiment, the Longwood fire (part of the Silver complex) burned through a plantation that was the site of a brush control study. All conifers in the area where the brush had been removed were killed. All conifers intermixed with the brush were alive, and appeared to be completely unaffected by the fire. This example calls to mind Aldo Leopold's first rule of intelligent tinkering, to keep all the pieces. It also cautions about premature judgments and the need to incorporate risk into our decisions. Measurements of the effects of brush on conifer growth would have reached quite different conclusions depending on whether they were made before or after the fire.

Finding balance. The weight of scientific knowledge cautions against significant modification of ecosystems recovering from severe disturbance. Vital systems could easily be disrupted and ecosystem health jeopardized. This is not to say, however, that all post-fire management is inappropriate. The "brush", for example, performs important ecological functions but it also competes for resources. There is no reason that competition can't be managed on a spot basis while preserving the overall functioning of the noncommercial plants. Similarly, I believe some economic value can be captured in salvage without compromising the ecological values of fire-killed trees, however that is a hypothesis to be tested. There is precedent. Following the Silver fire, the USFS worked salvaged 50% and left 50%. Salvage was done with helicopters to minimize site impacts.

As recognized in the Walden Bill, science has a crucial role to play in helping policy makers find balance. We cannot maintain healthy and productive ecosystems

unless we know how they work, and there is still much to be learned. Other testimony goes into research needs in some detail and I will be brief. Two general types of research will be needed: (a) rapid response to study natural patterns of recovery, and (b) manipulative experiments.

In a recent issue of the Proceedings of the National Academy of Science, Robert Holt wrote,

> "Ecologists increasingly recognize that the structure of natural communities reflects the interplay of processes acting over a wide range of temporal and spatial scales that are well beyond the scope of manipulative experiments".

The ability to respond quickly with post-disturbance research aimed at understanding the processes of natural recovery (in other words letting nature teach us) is critically important. The National Fire Program and the NCSSF have funded such research on several recent wildfires (NCSSF is sponsoring a symposium in Denver in April to review some of the findings). It is important that continued funding be made available for such studies.

Manipulative experiments still have an important role to play. Finding balance involves exploring options that can only be achieved by manipulation, such as different levels of salvage or brush control.

Finally, it would be highly desirable for scientists and managers to form rapid-response collaborations, which would develop options for management response to each large disturbance on public lands,. Each group has a critical role to play: managers know their objectives and their ground better than scientists do; scientists bring knowledge of relevant, cutting edge science (e.g., landscape ecology, modern disturbance ecology, ecosystem management, risk analysis). Following the model established by the Northwest Plan, the objective should be to produce a set of options for policy makers to choose from, not a single approach. Unlike the Northwest Plan, these options would have to be developed within a short time-frame. A general strategy will be necessary to guide the tactical approaches to individual situations. Lindenmayer et al (2004) made that point clearly:

Large-scale salvage harvesting is often commenced when resource managers are in "crisis" mode following wildfires. Major decisions are made rapidly, often with long-lasting ecological consequences. A better approach would be to formulate salvage harvesting policies before major disturbances occur again. Such policies should make provision for the exemption of large areas from salvaging such as national parks, nature reserves, and watersheds closed to human access to maximize water quality. Furthermore, wherever salvage harvesting continues, carefully formulated prescriptions are needed to guide the timing and intensity of such operations. This is essential to both maintain the regenerative potential of recovering stands (15) and ensure the retention of biological legacies such as dead trees, live trees, logs, and islands of undisturbed or partially disturbed vegetation.

Similarly, Karr et al (2004) offered 10 recommendations for minimizing impacts on streams by post-fire management.

The formation of rapid response collaboration teams is more easily said than done, and the general framework will require planning. I suggest that a first step would be to bring together a blue-ribbon panel of scientists and managers to work out a strategy for forming such teams and to develop general guidelines for protecting the resource base along the lines of those published by Lindenmayer et al (2004) and Karr et al (2004).

In conclusion, I would like to thank the committee members and staffers for the opportunity to testify.

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Mr. WALDEN. Thank you, Dr. Perry. We appreciate this. It's most helpful.

Mr. Drehobl, you're our wrap-up witness. Thank you for being here today. We look forward to hearing your testimony as well.

Please go ahead, sir.

STATEMENT OF RICH DREHOBL,
RETIRED BLM FIELD MANAGER

Mr. DREHOBL. Thank you for inviting me, I think.

I'm sorry that Yogi left because I was looking forward to a lively debate over how forests evolved and how you could regrow forests. And I think it's unfair that Mr. Inslee started this news media blitz and he walked out in the middle of the testimony. I wish he were here.

I retired from the BLM just the first of this year. I've been a manager—well, I was a resource specialist, planner for the Bureau for seven years and a manager for 26, the last 18 here in south—Southern Oregon, the Ashland Resource Area.

I received a number of awards while I was here in Oregon, and I'm going to tell you about these not to brag, but rather to let you know that I—I don't have the credentials of Dave Perry and Jerry Franklin and Hal Salwasser, but I've been a practitioner of applied science for those 26 years. I received award from the Public Lands Foundation, which is a group of retired BLM employees, headquartered in Washington, D.C., from directors on down to resource specialists. So the award was very special to me. It was for outstanding public land professionalism of the year—public—outstanding public land manager of the year, for developing the agency's, BLM's first new forestry project while working under extreme, heavy and diverse public opinion, and for bringing industry and environmental groups together on contentious issues. And I see a lot of folks on both sides of this issue in the audience here today.

I also received an award from Oregon/Washington State office of BLM, also recognized me for being on the leading edge of implementation of all facets of the Northwest Forest Plan through innovated approaches to ecosystem based management on a landscape scale and in a collaborative manner.

Dr. Dave Perry was very instrumental in helping me do this paradigm shift, a very important paradigm shift on how we manage the public lands/forests, as was Dr. Franklin, although I didn't have direct interaction with Dr. Franklin. I attended many of his presentations and read his work. So these folks had an influence on me. I appreciated good science. I implemented good science, even under adverse conditions. A couple of my former bosses are sitting in the audience, and they can attest to the fact that it was no picnic at that time.

Dave Perry said in his 1994 book, titled Forest Ecosystems, in the preface he was talking about the need to explain the complexities and the intricacies of ecosystem functioning in his book to—college students are going to have one course in ecosystem. And he further said that it has to be a reservoir of science, not only for

students, but for practicing land managers, for scientists, and increasingly for public land policy folks, as yourselves, and for the private citizen who has a very vested interest in how our public lands are managed.

So that one's gonna—yeah, you can just click them all up there at one time. Thank you.

As a manager and a practitioner of applied science, I was responsible for implementing science-based projects on an ongoing basis. And we reviewed these—this science on every project that we did, nearly every project. We reviewed—we made a determination of its applicability. And I can tell you, after 26 years of doing this—actually 33 years—there is a lot of science out there purported to be science, which upon a closer look is nothing more than an advocacy statement. And we call that junk science.

I had criteria for separating out sound science from the junk science, and it's pretty simple and you apply the following test. And if I could read it, I'd read it to you, if I could see. So maybe—I don't know if everybody in here can see that far. Does the report provide any new information? Is there any information that is previously unknown that may influence my decision as a manager? Are the conclusions supported by the data? Is there sufficient data to cover the area of inference? Are the conclusions independent and agenda free? Is it intended to influence a point of view? Are there relevant and important factors that were not disclosed that would change the conclusion?

After the 2001 Quartz Fire I had asked Dr. Sensenig, who was a forest ecologist on my staff at the time, because we were trying to do a salvage and we had a lot of—a lot of discussion going on, even some within my interdisciplinary team, my own scientists, on not knowing what to do. Dr. Sensenig came back and said there's not a lot of information available on post-fire in southwestern Oregon, and a lot of the work that was done was on industrial land, so it wasn't really applicable to how we were managing on the public lands. So I asked for and I wholeheartedly supported the research project that's the subject here today.

And I've been following the news media blitz with all this controversy that's going on and BLM being accused by one media person that I really respect, which is Russell Sadler, and I worked with Russell when he was living in Ashland. I'm really disappointed that he has made this dance without finding out the facts. But I couldn't—in light of all this frenzy, I could no longer sit in retirement. I came out of retirement, and for hopefully maybe one last time, but maybe never say never. But the notion in the media that the BLM is stifling academic freedom is absolutely false.

Academic freedom does not apply to intentionally misleading or publishing disingenuous or politically motivated science that's funded by taxpayers. That is not sound science. And I can understand the temptation of scientists to maybe want to sway the data a little bit to influence a decision for or against. But that's not ethical. If you're a scientist, you got to be a scientist. Otherwise, you're an advocate.

So let's look at the test. Does the report provide any new information? Is there any information that is previously unknown that may influence the decision?

And I'm going to have to get—does that microphone work up here, do you think? If I may, I'm going to stand up here because I can't see that far. OK. That's good. It must be my aged eyes.

In the report seedlings and debris were measured two years after the fire of '04 and once after the felling of the trees in the salvage logging of '05. This is insignificant in terms of effects of salvage.

Seedling mortality is expected to occur in any operation. This could have been a green timber sale. It could have been a salvage sale. It doesn't matter. If you have seedlings present and you're doing any kind of salvage and you take that into account, or any kind of logging, you take that into account prior to dropping the trees. There's no new science there. We know you're going to disturb seedlings.

There's lots of information on expected seedling mortality and seedling damage during harvesting. Nursery seedling orders reflect the fact that we're going to need more seedlings. If they're present, we're going to damage them.

Go ahead on that please. OK. Next line.

So, again, there's no new information.

Another test. Are the conclusions supported by the data? Is there sufficient data to cover the area of inference?

Post-fire natural regeneration varies greatly in Southern Oregon, and that's why I had asked Doug if I could go after these renowned ecologists because that was—there was no mention in his report, anything about the site. What was the elevation? What was the aspect? What was the plant association? What was the precipitation and what was the available soil moisture? The natural soil moisture is probably a critical factor in this dry climate on seedling survival. He could have 1,500 seedlings per acre as he said in the report, and maybe 71 percent of them were damaged in the harvesting. So what? Twenty-nine percent is more than adequate probably for that particular—the carrying capacity of that particular site. And also what kind of seedlings were they? I don't know that.

There's no mention either in the report of a land use allocation for this area. There's four possibilities in the Biscuit Fire. It could have been Kalmiopsis Wilderness, which it was not. It could have been the Brewer's First Natural area, which it was not. It could have been a late seral reserve, which it was not. Or it could have been the matrix lands, which by the Northwest Forest Plan are for timber production. That's where it was at.

So it's only—by law, the agencies should have aggressively pursued stabilization and rehabilitation, whether they were going to log or not. The agencies, in their defense, are kind of—have two hands tied behind them, they're shackled and they got a blindfold over one eye, because they're short on staff and, quite frankly, the paper monkey-wrenching and the judicial obstructionism that is occurring is very, very effective, and it was not possible to get that out.

Had the—had the salvage occurred when it should have, been aggressively pursued, there wouldn't have been any seedlings

destroyed. There would have been the seed bed prepared and you would have had probably more seedlings than you got in this case.

So to typify salvage from data that is infinitesimal relative to the area of inference is improper and a gross misuse of the data.

One back, please. That's OK. I can tell you.

The Biscuit Fire was 500,000 acres. It was 700 square miles. That's a large area to make—to draw these inferences from one—from one study.

Are the conclusions independent and agenda free? Is it intended to influence a point of view?

In the paper submitted to Science, the journal Science, the authors stated that their intentions were to inform the dialogue on pending House Bill 4200. This statement was incriminating, and they requested that Science—to Science that it be removed.

The Hatch Act.

Recipients shall not use any part of the Government's funds for any activity or the publication or distribution of the literature that in any way tends to promote public support or opposition to any legislative proposal on which Congressional action is not complete. However, the use of Federal funds to mislead the dialogue on pending legislation is precisely what the Hatch Act was enacted to prevent.

These are the wordings. And I put these on slides because I want you to read them for yourself. Legislation currently—this was submitted January 5th, the original publication.

Legislation currently pending in U.S. Congress, H.R. 4200, would expedite post-fire logging projects, citing reforestation and fuel reduction among its goals. To help inform the dialogue—or more correctly to help sway the dialogue perhaps—to help inform the dialogue, we present data from a study of early conifer regeneration and fuel loads following the 2002 Biscuit Fire, Oregon, U.S.A., and with and without post-fire logging. Natural conifer regeneration was abundant with high severity fire.

Post-fire logging reduced median regeneration density by 71 percent and significantly increased downed woody fuel loads and thus short-term fire risk. Post-fire logging can be counterproductive to stated goals of ecosystem restoration.

The underlying words now on January 20th were changed, and you can see that that was dropped out and the addition to, reduction of fuels as necessary for effective mitigation. They failed to mention that mitigation of fuels was programmed. It was already planned. But there's no mention of that.

Mr. WALDEN. Mr. Drehobl, if I could get you to kind of wrap. We've got about ten minutes and——

Mr. DREHOBL. I'm going to pick on everybody, so I should have more time. I'm not just going to pick on Mr. Donato.

Mr. WALDEN. Well, we've got to wrap the whole hearing up in about 15 minutes and so——

Mr. DREHOBL. Go ahead then. Go ahead.

There's specifically requirements. This has been discussed already, about the specific requirements. Mr. Donato said he didn't know they were there.

Let's keep going. I do want to pick on some other people.

OK. No, let's keep going.

Conclusions were out of context. I talked about that already. If salvage had been done when it should have been, you wouldn't have destroyed any seedlings. Probably have more.

Of course wood debris was another thing. That was already prescribed. They failed to mention that. They just criticized the fact that they're going to be removing it.

So in wrapping up, management perspective. From a—from a person that applied science, tried to apply it, did not provide any new or useful information, compromised the trust between the agencies and the university and the public, compromised a potentially worthwhile study, got it detailed and somehow politicized it, cost the taxpayers $308,000, made no contribution whatsoever to science, damaged the image of university researchers, and intentionally misled the dialogue of post-fire management in pending legislation.

It's obvious a violation of the Hatch Act.

If I could have a few more minutes, I would like to pick on you folks. All right.

Mr. WALDEN. You wouldn't be the first. Or the last.

Mr. DREHOBL. Yeah.

I was doing pretty well until this morning's Mail Tribune article came out, and my anxiety rose. And I'm glad we had the hearing this afternoon. Otherwise, I'd have some medical emergency because if I didn't get it off my chest.

In the Mail Tribune this morning Yogi was quoted as saying he wants to publicly burn the fingers of an administration he believes tries to prevent scientists from speaking out if it's contrary to administrative policy. Further, he states it needs to have the whistle blown on it.

Well, hey, hey, hey, bring it on. I'm ready. It should be investigated. I welcome an investigation to get the truth out of this.

Mr. DeFazio is quoted as saying, to pull the funding was simply stupid. And he's referring to the Director of BLM, Kathleen Clarke.

Further, Mr. DeFazio said that there's nothing wrong with policymakers having a wide range of facts. I agree 100 percent, Congressman. But please don't select in what facts you gather. Get all the facts and look at them before you call it stupid.

I also agree with the Representative Inslee, Yogi. This does need to have the whistle blown.

So as a taxpayer, an official originally responsible for this study initiating, I'd like to go on record as requesting an investigation, that to house something so unethical and illegal could not only have occurred, but is authorized to continue.

This paper contained absolutely no new information, and what it did report was taken so far out of context it is meaningless. There is no useful information for a manager whatsoever.

Although what these authors managed to pull off is obvious, and every level, including the media and Russell Sadler, Oregon State University, the Bureau of Land Management, and the journal Science, had access to the truth, none could find it within their system to face the truth. Apparently, all had their reasons. I don't know what those would be. But I would like to know and I'd like the public to know the truth.

Mr. WALDEN. All right.

Mr. DREHOBL. So I'm saying let the scientific researchers practice honest, unbiased, nonpartisan forest science and let the politicians practice honest political science. That may have been an oxymoron. I don't know.

Thank you.

[The prepared statement of Mr. Drehobl follows:]

Statement of Richard John Drehobl, Retired Bureau of Land Management Manager of 33 years, Representing Self, Medford, Oregon

My name is Richard Drehobl and I recently retired as a field manager for the Bureau of Land Management. Over my 32-year career I managed hundreds of thousands of acres involving nearly every social and ecological issue conceivable. I graduated from the University of Arizona in 1972 with majors in Forestry, Range Ecology, and Natural Resource Planning. My career covered the. Public Domain lands of California to the O&C lands of Oregon, both as a resource specialist and manager in both states. Over the last 18 years I have been the Area Manager of the Ashland Resource Area the most complex single organizational unit in the Bureau of Land Management. I received the Department of the Interior's second highest reward, the Superior Service Award for "outstanding contributions to the natural resource programs in the Bureau of Land Management. I also received an award from the Public Lands Foundation as "Outstanding Public Land Professional" for "developing the Agency's first 'new forestry' project while working under extremely heavy and diverse public opinion"—and for bringing "industry, environmental groups together on contentious issues." The Oregon/Washington BLM State Office also recognized me for being on the leading edge in implementing all facets of the Northwest Forest Plan through innovative approaches to ecosystem based management on a landscape scale and in a collaborative manner.

Although I had some rough times, I owe my success to my perseverance and insistence and pursuit of quality and honest work. Upon retirement I thought that I could finally put my career behind me and move on to the things that I enjoy doing that weren't possible while working. . However one of the issues before us tonight is quite serious, serious enough to bring me out of retirement at least one more time.

As a manager, I was responsible for implementing science based projects on an on-going basis. Nearly every project involved a science review, evaluation and a determination of its applicability. And I can tell you that there are a lot of papers out there that purport to be science that upon closer look are nothing more than advocacy statements. Mangers have a name for these papers, we call it junk science. I had a stack of junk science paper this deep. My criteria for separating out sound science from junk science is simple and the following list provides the tests;

1. Does the report provide any new information? Is there any information that is previously unknown that may influence my decision.
2. Are the conclusions supported by the data? Is there sufficient data to cover the area of inference?
3. Are the conclusions independent and agenda free? Is it intended to influence a point of view?
4. Are there relevant and important factors that were not disclosed that would change the conclusion?

First of all I would like to make it clear that I'm not here to talk about the pro or cons of salvage logging, that's why the renowned scientist are here, frankly I don't care. What I do care about is what happened to what was otherwise a good study under my watch, one that I wholeheartedly supported, but was commandeered to promote a political agenda.

I'm referring to the Science paper "Post-Wildfire Logging Hinders Regeneration and Increases Fire Risk D. C. Donato, J. B. Fontaine, J. L. Campbell, W. D. Robinson, J. B. Kauffman, B. E. Law "

In 2002, after the Quartz fire in southern Oregon, I requested a review of the options relative to post fire management of the Quartz fire, because little information was available on southern Oregon post fire management, and to address the controversy over post fire management. I requested and supported the study proposals presented to the joint Fire Science Program by Doctors Boone Kauffman, Tom Sensenig and Douglas Robinson in 2003. Because I was the BLM manager at the time, I had, and still have, a vested interest in this project. I've been following the media fury which they have made a global issue

I could no longer sit back and watch the frenzy of misinformation continue. The notion that censorship or suppression of academic freedom is what is going on is

absolutely false. Academic freedom does not apply to intentionally misleading or publishing disingenuous or politically motivated science funded by the taxpayers. I can understand the temptation for scientist to over state there data to further something that they do or don't support. However I believe this is unethical, especially when federal money is involved.

Lets talk facts:

I believe that this research started out as a sound study having the potential to make important contributions to our knowledge relative to post-fire management. However, at some point it became derailed for political purposes. The authors made an "end run" to Science avoiding all of the required PSW, BLM and OSU protocols that would have revealed their objective. The authors intentionally prepared, submitted and published this Science without informing the agency or Dr. Sensenig the co-Principle investigator and Project Inspector responsible for overseeing the implantation of the agreement.

They portray this as miscommunication. I believe that characterizing "no communication" as "miscommunication" is wrong. The agreement clearly states:

> "Recipients must obtain prior Government approval for any public information releases concerning this award, which refers to the Department of Interior or any employee"
>
> "The specific text, layout, photographs, etc. of the proposed release must be submitted with the request for approval"

The agreement further states:

Government Requirement.

> "Provide timely review and comments on the document produced by this study and work in partnership on the project".

The test:

Does the report provide any new information? Is there any information that is previously unknown that may influence my decision?

There is no new or useful information in this study. Seedlings and debris were measured before and after felling of trees at one point in time. Seedling mortality is expected to occur in any operation. There is lots of information on expected seedling mortality and seedling damage during harvesting. Nursery seedling orders reflect unanticipated lose of seedlings during logging. Seedling loses as a result of logging occurs regardless of what type of operation is being conducted. It could have been a green tree project or even a thinning had seedlings been in the under story. The authors misleadingly portrayed this as being unique to salvage.

Are the conclusions independent and agenda free? Is it intended to influence a point of view?

In the paper submitted to science on November 21, 2002, the authors stated that their intention was to "inform the dialogue on pending House Bill 4200, apparently realizing that this statement was incriminating, they requested that it be removed. Because this report contains no new information, and the results are reported out of context it is essentially useless to science, thus there is no other possible purpose than to influence legislation. The use of Federal funds to "mislead the dialogue" on pending legislation is precisely what the Hatch Act was enacted to prevent. By the authors simply stating that this paper had no political purpose, does not make it true. All circumstantial and physical evidence indicate otherwise. Their actions clearly speak for themselves. The agreement clearly states

Opposition to any Legislation

Recipients shall not use any part of the Government's funds for any activity or the publication or distribution of the literature that in any way tends to promote public support or opposition to any legislative proposal on which Congressional action is not complete.

Are the conclusions supported by the data? Is there sufficient data to cover the area of inference?

The data were collected on limited number of sites using 75m transects 1/2 meters wide. The diversity of the southern Oregon landscapes which varies greatly by slope, elevation, precipitation, plant association, tree species, and stand structure. To typify salvage from data that is infinitesimal, relative to the area of inference is improper and a gross misuse of the data. The Biscuit fire alone covered over 700,00 square miles and some 700,000 acres.

Are there relevant and important factors that were not disclosed that would change the conclusion?

There were many important factors that were not disclosed in the report: 1. had the salvage operation been conducted immediately and not delayed because of the required administrative processes, seedling recruitment would have occurred post disturbance and seedling numbers would have remained unaffected. 2. seedling recruitment is likely to continue over time and thus the disturbed areas will possibly have more seedlings than the undisturbed areas in subsequent years. 3. The number of residual seedlings surviving after logging is, in many cases above adequate levels, and represent tree densities observed in old-growth stands.

The report concluded that salvage logging increased fire hazard. Of course logging creates debris. This is also to be expected and is not new information. What we were not told is that where necessary, fuel reduction treatments were planed. In addition course wood was prescribed to be retained on site by the contractor during the operation to enhance long-term site productivity. To report that a fire hazard was created was to use the data out of context and intentionally misleading.

Although what these authors managed to pull-off is obvious, and every level including the media, OSU, BLM, and Science had access to the truth, none could find it within their system to face the truth. Apparently they had their reasons. However, the truth is what compels me to be here today.

When I first read the paper I could not believe what I was reading. This work is an insult to me. The paper contained absolutely no new information and what it did report was taken so far out of context it is meaningless. There is no useful information for a manager in this paper, none. It's obvious this paper was about influencing pending House bill 4200, pure and simple. This is unethical, in violation of the BLM agreement and is precisely what the Hatch Act was intended too prevent.

I've been asked why the so-called "Session" report is any less unethical. Although I am not going to speak to that report, and really don't care what it says, however there are at least three distinctive differences. The "Session" report; did not involve Federal money, was not research and did not have the expectations of independence, clearly reveled the objectives of the paper up front and clearly defined the purpose of the report.

In my 33-year career, I have not observed anything as unethical as this.

A management perspective on the Donato et al. paper,

1. Cost over $300,000.00 dollars of taxpayer money.
2. Did not provide any new or useful information.
3. Intentionally mislead the dialogue on post fir management and pending legislation
4. Made no contribution to science.
5. Compromised a potentially worthwhile study.
6. Damaged the image of university researchers.
7. Compromised the trust between the agencies, the University and the public.
8. Blatant violation of the Hatch Act.

I would like to go on record as requesting an investigation as to how something so unethical and illegal could, not only have occurred, but is authorized to continue.

Exhibit 1. Dr, Sensenig's response to questions

As co-PI, these are my questions and concerns, concerning the publication Donato et al.

The research projects being conducted by OSU graduate students Mr. Dan Donato and Mr. Joe Fontaine are part of a cooperative effort between the USFS, BLM and OSU and are being funded by the Interagency Joint Fire Science program. However, the many anomalies in the process leading up to and the publishing of preliminary information raise questions as to the objectives of OSU and other authors. It should be noted that the types of data collected on the plots was more comprehensive that reported. It included information on shrub and forbs height and cover, live and dead biomass, root mass etc., yet only the information on regeneration and fuel hazard were selectivity presented. The title derived from regeneration and fire hazard is misleading. Why was pending House bill 4200, referenced in the report but later withdrawn? Note: requirement -Stipulation N, page 10.

Also, why did all six authors withhold the fact that this publication was being prepared for, and submitted to Science for publication from the Bureau of Land Management (administrator of the project), U.S. Forest Service (co-operators), and violate required PSW research publication requirements.? Could it be that had any of the processes been conducted it is clear that the publication would not have gone

forward in its present form. Why was publication so urgent, given the simplicity of the data used?

In addition, the data did not support the conclusions displayed in the title. For example, damage to seedlings from logging is expected regardless if the trees are felled dead or alive. If protecting seedlings was the objective then perhaps a different plan may have been utilized. To imply that salvage is uniquely responsible was disingenuous. The report overlooks the fact that had the salvage operations been conducted immediately and not delayed, seedling recruitment would have occurred post disturbance and seedling numbers would have remained unaffected. Also, to report that residual debris from harvesting elevated the fuel hazard when it was clearly understood that subsequent fuel reductions treatments where planed was, at minimum, deceiving. In addition, coarse wood was prescribed and required to be retained by the logger. Therefore, I believe that this paper unfairly served to feed one side of the ongoing political debate over salvaging logging

Shortcomings like these are usually identified during the Journal peer review process, however, as indicated by many OSU and other distinguished scientists, in this case, the peer review process failed to identify these shortcomings.

The way in which this publication was prepared, used the data, reviewed, released, and the misleading conclusions, give the appearance, and raise the possibility that it was intended to influence public policy on this contentious issue

Exhibit 2. Dan Donato's first reveling of their publication

"Donato, Dan" <Dan.Donato@oregonstate.edu>
01/04/2006 07:17 PM Tom-

Here's that paper. Do read it with an open mind. It is a simple presentation of numbers, with a few implication statements relative to some of our common post-fire management goals. There is no good-or-bad, for-or-against verbiage in there. But people will run with it anyway. Best, D

Dan Donato, Department of Forest Science, Oregon State University
321 Richardson Hall, Corvallis, OR 97331
ph: 541.231.7273 fax: 541.737.1393

Exhibit 3.

The publication was kept secret and not revealed to the project inspector until January, 4th 2006. The paper was submitted to Science November 21st, 2005 Memo sent to the authors by Dr. Sensenig, a Principle Investigator and the Project Inspector upon seeing the publication for the first time on January 9, 2006.

Dan and others:

> "I feel compelled to briefly respond to your recent report. Dan, as you know, this project was conceived by Boone Kauffman and I during the development of the Quartz fire salvage plan, because of the uncertainty and lack of creditable science on several issues. Doug Robinson added the wildlife part later. After considerable work, our proposal was funded and I received the funding when I was the ecologist for the BLM, which I transferred to OSU. Also, as you know, I spent a great deal of time defending the credibility of these OSU studies this past summer during your troubles, when It was perceived by some to possibly have an underlying agenda. I am a principle investigator on these studies, yet I was not provided even a draft report. The timing and handling of the events that led to this situation gives the perception of a political stunt. That fact that preliminary data was intentionally used for political proposes seriously undermines my and your scientific credibility regardless of the quality of the science. Being tasked with explaining and responding to this puts me in a very precarious situation, which I don't particularly appreciate.

I don't think that I'm the one that needs to be reminded to keep an open mind. As I have explained on several occasions, I am not for or against salvage logging or anything else for that matter. Every action has consequences (effects) and good and bad are human imposed values. Effects are only good or bad when evaluated against the objectives. Good science, explains the observation in context, including size, scope, limitations and variability. That being said, the title of this report is misleading and feeds one side of the debate without sufficient information to understand the limitation of the observations. Your title makes assertions from the numbers, it does not constitute facts. Title "Post-Wildfire Logging Hinders Regeneration" does it? Maybe. For example, the remaining trees may well be sufficient to constitute a fully occupied stand? What about timing, had the salvage operation been conducted immediately and not delayed because of the required administrative processes, seedling recruitment would have occurred post disturbance and seedling numbers would have remained unaffected, yet it was salvaged logged. Will seedlings

continue to recruit into the stand over time creating ecological complexity or even result in more seedlings? on and on.

Title "Post-Wildfire Logging Increases Fire Risk,"—does it? Maybe. The data showed an increase in fuel one/two years following the operation and before fuel treatment. This does not equate to fire risk. Fire risk is much more complex. It involves landscape scale analysis of current conditions, fuel continuity, vegetation structure and probability if ignition. Etc. Also, what about longer-term conditions when fine fuels decompose? etc. This assertion is quite the leap from the data.

Despite my harsh criticism of how this has been handled, I still feel your work is good and will prove valuable in future management. We just need to be more careful and not read more from the numbers than just good science."

Thomas Sensenig
Southwest Oregon Zone Ecologist
Rogue River-Siskiyou, Umpqua National Forests
333 West 8th Street
Medford, Oregon 97501
(541) 858-2319
Fax (541) 858-2330

Exhibit 4 Dr. Sensenig response to the contracting officer over OSU reference to miscommunication.

To: Contracting Officer, Steve Shapiro
From: Tom Sensenig, Principle Investigator, and Project Inspector
Subject: Communication Regarding Donato et al. Publication
Date: 02-10-2006
Identification of Authors:

Dan Donato and Joe Fontaine: Our study plan included an objective for supporting several student degrees including PhD and Masters program. Dan Donato and Joe Fontaine are the graduate students selected per study plan. Dan is a Masters student in the Department of Forest Science and Joe is a PhD. student in Department of Fish and Wildlife.

Douglas Robinson and Boone Kauffman were original OSU co-principle investigators along with myself. Boone now works for the Forest Service, Institute for Pacific Island Forestry in Hawaii. Douglas Robinson works in OSU's Department of Fisheries and Wildlife.

Bev Law: Although not part of the original study, it's my understanding that Boone recruited Dr. Law to join the project upon his leaving OSU to work for the Forest Service.

John Campbell: I have no knowledge of John Camble's participation or role in this project. He was not identified in the study plan, any of the agreements nor had the other PIs or students mentioned that others were involved. I did not authorize his involvement and I don't know if he received any of the BLM's funds. His contribution, if any, is unknown.

Science publication background and/or lack of background

The publication Post-Wildfire Logging Hinders Regeneration and Increases Fire Risk by D. C. Donato, J. B. Fontaine, J. L. Campbell, W. D. Robinson, J. B. Kauffman, and B. E. Law was submitted by these authors to the Journal of Science on November 21, 2005. Because information on the preparation and draft reviews among the authors has not been divulged it is not known when the process of development for this publication actually began. Typically several months or more is common. Therefore, preparation of this publication presumably began in October or before.

The Rogue River-Siskiyou and Umpqua National Forests conduct their annual business and science conference in Gold Beach, Oregon during the second week of February. I was informed in late November that the science portion of the 2006 conference was going to focus on the research currently being conducted on the Biscuit fire, and that the Joint Fire Science project, on which I'm a principle investigator and project inspector, is in the program. Science coordinator Robyn Darbyshire, had requested that both Dan Donato and Joe Fontaine prepared presentations for this conference. I called Dan Donato in early December to schedule a meeting where we could prepare for this conference. I said that I would like to discuss their progress and go over any presentational material in preparation for the February conference. I scheduled a meeting for Thursday, December 15, 2005, in Corvallis Oregon. Despite having already prepared and submitted their paper to Science Dan did not offer any information regarding the other authors' involvement or the fact that they had submitted a paper for publication.

As scheduled, I met with Joe Fontaine and Dan Donato on December 15, 2005 in Corvallis Oregon to prepare for this conference. Contrary to what the OSU letter indicated, I scheduled this meeting, not them, and it had nothing to do with their publication. Both Dan and Joe showed me some PowerPoint slides that they had prepared. Joe discussed the wildlife aspects of the projects, mostly on deer mice. Although the study is comprehensive and involves many types of data, Dan only prepared slides on seedling counts and fine and coarse wood transects. He did not discuss any other aspects of the study. Curious about this, I asked about the other parts of the study. He indicated that he did not have time to look at these data yet, and that regeneration and fuel hazard are the two factors on which pending House Bill 4200 is based. Because, I was not familiar with House Bill 4200 at that time, I asked him to explain what he was talking about. Because these projects were not complete, was preliminary and because they had kept their publication from me; I had no reason to suspect any wrongdoing at his time. In closing, I asked them to send me any information. I did not receive any information until January 4th when Dan e-mailed their paper to my office.

Had I not scheduled this meeting, there would not have been any communication between any of the authors with me prior to publication. None of the authors had, at any time, contacted me, nor was I provided any of the draft or final documents. It was only a matter of happenstance for Joe and Dan to have had this meeting prior to the release of their paper. To imply that at this meeting I, in any way, condoned, approved, or authorized their publication, which I had no knowledge of, is wrong. In fact, to the contrary, for it was this very meeting that made me instantly realize, when I first read their headlines on January 9th, 2006, what these authors had done.

On the afternoon of January 4, 2006, although I was on leave that week, I was in my office taking care of business. I received a call from the Rogue River-Siskiyou Forest officer Robert Shull and Illinois Valley District ranger Bam Bode. They asked me if I knew anything about a news release on the Biscuit fire salvage creating a fire hazard. I had no idea what they were talking about. I explained that our project is still underway and that there is still another year of data collection, so it's not our Joint Fire Science project. However, when they said that the author was Donato et al., I immediately became suspect and called Dan in Corvallis, and explained that I was asked about a "Salvage" publication news release with his name on it, and that I need to know what was going on. He explained that he and others had published a paper on salvage in Science. I asked who else was involved and then ask him to send a copy of the paper to me immediately. My computer received the following message from Dan Donato at 7:17 pm January 4, 1006. The timeline speaks for itself.

Mr. WALDEN. All right. Thank you, I think.

I also want the record to show I think you had the longest time to testify of anybody. So we didn't cut anybody off today. I appreciate you also had to wait the longest to give your testimony.

So let me move right into questions. We're each going to get about five minutes, no more than that, and literally I have to be out of here no later than 4:35.

And I want to go to Dr. Franklin, because you talked about the old growth ponderosa pines in eastern Oregon, which I'm probably more familiar with in terms of where I've grown up, in the Dalles and Hood River and out in that country over the years. And I was out in the Ochoco National Forest, and there had been a fire up in a wilderness area in part and outside of a wilderness area in part. And the Forest Service had tried to do some salvage logging, if you will, in the piece outside. And then across the basin and up the other side there was an old growth forest they were managing for old growth characteristics with all the usual things you've identified in eastern Oregon of the understory that's grown up.

And that opportunity to do precisely what you said needs to be done, to thin out the small diameter that's growing up as ladder fuels and competing for moisture and everything else, was the plan

they had in place, to remove that stuff so that we can preserve the big old beautiful ponderosa pines.

That got challenged, appealed and litigated. In the meantime, the bugs came out of the forest where the fire had occurred—this is what the Forest Service tells me, their scientists—came down across the valley, up the other side, into this area that they had set aside to do thinning to strengthen these old growth pine, and guess what was attacked. The old growth ponderosa pine. And they're now dying.

Somewhere in here we're not able to accomplish, even if we have the money, what you have told us we need to. What else do we need to do?

Mr. FRANKLIN. Well—wow. In one minute.

Mr. WALDEN. Actually, I have another question, so 30 seconds will work. No, I'm kidding.

You know, I want to say you have told us repeatedly and thankfully you've come before our Committee and said you guys got to do this stuff, we got to manage better. And I'm just—I guess I'm not asking you that specific example to tell me what your prescription is. But I hope you—I think we share our frustration here.

Mr. FRANKLIN. Yes. So I think, you know, we do see a consensus coming together in these fire-prone—uncharacteristically fire-prone—landscapes. And we need to fan the fire, the development of that consensus, so that we can move forward.

I learned a lot about those areas working with Norm Johnson and his wife Deborah on that Klamath Restoration Plan. And I hope you have a chance to—to visit with us about it.

Mr. WALDEN. I'd enjoy doing that.

Dr. Salwasser, you can't come here and not comment something about what happened in your school of forestry. If you had to do it over again, what would you do differently?

You've heard criticisms raised today about specific questions. I've raised them based on information I've only received in the last two days. Does any of that affect your view now? What would you do differently? What should we do? Do you feel that your school of forestry was somehow attacked by having the BLM—tell us what—how you folks reacted when it came to the BLM's decision to hold funding, which even Brian Baird and I wrote a letter and said, wait a minute, let's not get into academic freedom here.

But what about this issue of following protocols. Mr. Donato said he was unclear that those protocols were even there. Can you shed some light on that.

Mr. SALWASSER. Yeah. First, we took the letter from BLM quite seriously about their points about not being in compliance with a couple of the stipulations with the contract. And our legal office people immediately started talking with the authors of the article and—to find out just exactly what went on. And in their judgment this was not an issue of science, so we weren't even involved, but the legal people were. In their judgment, it was very much as Dan Donato said. There was a misunderstanding of what the expectation was for consultation.

They—it was also clear that Science had not followed through on the request of the authors to remove the language from the draft of the article that said something about H.R. 4200, and Science

had not done that. And Science wrote a letter back saying it was our fault, not the authors' fault.

And so we put that information together and sent it back up to the BLM contracting people. This is contract officer to contract officer and legal people, and they were sufficiently satisfied that they put the funding back on line.

Mr. WALDEN. Did you feel or do your researchers feel like academic research was being suppressed as a result of that communication.

Mr. SALWASSER. Not at all. It wasn't a matter of the research. It was a matter of performance on the contract, on the specifics on the contract and——

Mr. WALDEN. Because it's been characterized that way.

Mr. SALWASSER. I know, but that's an unfair characterization. The BLM's points had nothing to do with the substance of the science. It had to do with following the contract language. And once that was resolved, they were back on line. And our objective was to—was to find out what actually occurred and then—and I think everybody understands a little bit better. In fact, the project—the investigator for BLM, a new person has been down on campus, and we're working out the details about making sure we all understand what's expected.

Mr. WALDEN. All right. Thank you, Doctor.

And, again, to all our panelists, from my perspective, thank you for your testimony.

Peter.

Mr. DEFAZIO. Thank you, Mr. Chairman.

And in response to that, Dr. Salwasser, and to Mr. Drehobl, I guess perhaps rather than being my usual blunt self, I should have said it was a precipitous decision made hastily which had to later be reversed which was stupid. And that was—so, you know, in any case, I mean, you know, but that's really not relevant here. And I understand there's some varied opinions.

Let me—I want to get back to the bill because the two of you were there, in a hearing there, and there's unresolved issues, as you can understand, here. And a key element of the bill, and you both referenced this, is—and you in particularly, Dr. Salwasser—preapproved management practices. I'm going to give you a list of things, and you tell me which of these things would be disqualified in a generic sense from being a preapproved management practice for post-catastrophic event recovery. OK. Here's the list.

Clearcut, reforest monoculture; clearcut, reforest diverse; remove small medium trees, leave large trees, reforest; remove small trees, medium trees, leave large trees, natural regeneration; selective logging at different levels of retention, reforest; no logging, restock; no logging, no restocking.

Now, what of those would be rejected out of hand? What of those would never be acceptable as a prior approved management practice?

Mr. SALWASSER. Well, actually, I've been trying to think about what these preapproved management practices might be because I've not seen what one looks like yet. So my answer to your question is: All of the above would be rejected, because to me a preapproved management strategy would have to deal with the

kind of—the management direction for the place, the forest plan association group, how intense the fire was, and what kind of conditions were left on the site in the forest. And only after I would know some of those kind of things would I have a clue, you know.

So to me the preapproved practices might be something more like a dichotomous key, you know, what forest type you in, what's the land management direction, what actually happened on the site. And then it would say—and then it would fall out.

Mr. DEFAZIO. And I agree with everything you're saying. So it needs to be specific to the forest classification, forest type, the event that occurred.

Mr. SALWASSER. Right.

Mr. DEFAZIO. And so how could we have like gone through a public review, set up a bunch of generic practices, and then say, OK, now the secretary has total discretion to apply anything on that list to this fire. How does that get to be site specific.

I personally believe that, you know, we maybe want to do something in the short term, but in the long term we're going to have to go back and amend forest plans and anticipate these things at the forest level where you have a much more, you know, and better idea of all those things, and you can say what might be appropriate on which parts of the forest.

Dr. Franklin, can you help me with this, because when I read this we're going to publish this list, they're going to be peer reviewed, which is going to be obviously generic because we are not going to say on the Siskiyou, you know, on a south facing slope in an area that hasn't been previously harvested, here's a preapproved management practice. If that's going to be what they're going to develop for all the forests in the United States of America, this is going to be one hell of a big, long list and it's going to take a long time.

So my question becomes what—you know, and then the secretary has total discretion to apply, which again I am disturbed by because as I said previously the Clinton administration would probably say let's do nothing; this administration would say, hey, let's use number one, which is what I listed, which is, well, we're going to go in and clear cut and reforest in a monoculture.

Dr. Franklin, can you help me with this.

Mr. FRANKLIN. Well, I—you know, the response to the question the way you put it to me, it's the same as Hal's. You know, there isn't anything on that list that you could preapprove for an undefined situation.

Now, I can——

Mr. DEFAZIO. So then how do you get from having a preapproved list to secretarial discretion and applying something.

Mr. FRANKLIN. Let me suggest a way, all though I think that Norm Johnson, who is my mentor in forest policies, persuaded me the best way to do it, exactly what you're talking about, make the disturbance-based response a part of the forest plan for each of the land allocations.

OK. Now, if I want to do legislation and preapproved practices, then you're going to have to at an absolute minimum talk about the management allocation. For example, if we're talking about a land allocation which is predominantly timber production, you

might as a matter of policy say salvage and reforestation with a dense plantation of conifers is appropriate to that.

OK. Similarly, late successional reserve, that land allocation is not appropriate for salvage logging. It's not preapproved. It doesn't mean you wouldn't do an analysis maybe and decide, but no streamlining basically. You leave—you don't salvage that. You probably don't even mandate reforestation on that.

So, you know, the only way I could see you doing it is going back to land allocations. I think otherwise you try to do anything else, you're going to end up with a really incredible bollixed up system.

Mr. DEFAZIO. So perhaps a little more prescription or direction from Congress on how these plans would be developed and how they would be applied to different forest classifications and types of management regimes.

Mr. FRANKLIN. That's right. You know, I've had some correspondence with Representative Baird about using that kind of approach, using the management direction as a basis for policy direction.

Mr. DEFAZIO. OK. Great. Thank you. I appreciate that.

Mr. WALDEN. Thank you, Peter.

Brian.

Mr. BAIRD. A few quick things.

Peter, I admire and enjoy your bluntness, but in referring to the actions of the BLM, it may have appeared stupid. It may have appeared to Mr. Inslee as it was politically motivated. But the fact is they were obeying the law. And if obeying the law is stupid or politically motivated, we've got a problem.

Mr. DEFAZIO. They could reinstate the money if they were obeying the law before the money was——

Mr. BAIRD. Because the law suggested there were legitimate questions of process and there were legitimate questions of the Hatch Act as were raised earlier. They inquired about—with the university about an explanation. The university provided the explanation and they proceeded forward. The law provides for that.

And it is shameful that this has been portrayed as a political witch hunt. There I believe this administration is biased against certain scientific findings. I agree with that. I've testified to that. I participated in hearings. I do not think this was the case, point one.

Point two. Dr. Franklin, as we've done this, I've got to tell you, you've been quoted only second to God on some of these things. You other folks are demigods, sorry. So apparently I want to hear what God has to say about this notion that we're going to protect our old growth trees, big old ponderosa pines that you so dearly love. There was a radical anti-environmental piece of legislation a while back written by someone I've never heard of, called Greg Walden, called Healthy Forests Restoration Act. It was vehemently opposed by the environmental community.

Do you think the Healthy Forests Restoration Act has the potential to help us save old growth timber or not?

Mr. FRANKLIN. Certainly it has some potential to help us save old growth timber.

Mr. BAIRD. And would it be better to spend more money in the wildlands to do that or in the urban interface.

Mr. FRANKLIN. Well, my position on that is that we have as much need for treating fuel-loaded forests outside of the urban interface as we do within it. And I'm on record on that, but—well, published on that, that, you know——

Mr. BAIRD. Well, it's just nice to hear God say it once again.

Mr. FRANKLIN. And, incidentally, I miss Jack Thomas because when Jack Thomas was involved in this stuff, he was God and I was only the Pope.

Mr. WALDEN. Jerry, are you saying we still have to kiss your ring.

Mr. BAIRD. Let me conclude with this. I want to put these preapproved concepts into context.

It is not as if we have not anywhere else in human existence said let's take the broad base of information that we know on a number of variables and use those variables in advance to make decisions about what is best, given our desired outcomes.

There is no absolute right or wrong about what end desired outcome is. And one is not necessarily evil or good in being able to say in this area this is our desired outcome and this is how best to achieve it, and in this area this is our desired outcome. Neither is one corrupt or venal. That is what society does. That's part of our responsibility. It's part of this entire community's responsibility.

What Greg and I are saying is rather than have every single one of these fought out in the courts so we spend millions and millions of dollars of the taxpayers' money and depending on the judge you get determines the outcome, let's look in advance and say what do we want to do with the land, and recognize that some land might be for production and others might be preserved for environmental qualities. And our legislation allows for that. And then say what information do we have and can we agree on the best practices, given the goal of the land.

Now, people may not like that, but there will be in our legislation a public process for input under NEPA as we develop these plans. We will turn to you folks, and there may be areas where by golly you say we've got to leave something or we're going to screw things up big time. There may be other areas where you say if you don't do something you're going to have a brush field for the next 40 years and that may not be good for forests.

This is not such a dangerous, such a radical or such a destructive notion. I think it's common sense, and we hope common sense can be guided by science. And that's why I appreciate your input today.

And I'll yield back, as we say. I had time to yield, by golly.

Mr. WALDEN. I appreciate that because we're right on schedule.

I want to thank our witnesses on this panel for their insights and the Members for their questions. Members of our full Subcommittee who couldn't be with us at this field hearing may have questions they'd like to submit to you and the other panel. We hope you'll respond quickly, like in ten days, to those question.

Members of the public, you can submit testimony if you have comments. We welcome them. There are some sheets here that are stacked there that you can use as a guide, and you can submit them. And the address—in theory we have an e-mail address too, but I don't have it handy. It is the House Resources Committee, the Longworth House Office Building, 1337 Washington, D.C., 20515.

My staff will, though, at some point here have an e-mail address for you. I assume we have one they can use.

And for our audience, thank you for the way you've conducted yourselves in a most contentious issue.

To our people who testified, thank you. I know we grilled people hard in some cases. It is so we get better knowledge about these issues so we can make better decisions.

If there is no further business before the Subcommittee, I again thank the members of the Subcommittee and our witnesses.

And this Subcommittee stands adjourned.

[Whereupon, at 4:35 p.m., the Subcommittee was adjourned.

[Additional material submitted for the record follows:]

[A statement submitted for the record by Manuela M.P. Huso, Consulting Statistician, Department of Forest Science, Oregon State University, Corvallis, Oregon, follows:]

Statement submitted for the record by Manuela M. P. Huso, Consulting Statistician, Department of Forest Science, Oregon State University, Corvallis, Oregon: March 9, 2006

Honorable Members of Congress,

I am respectfully submitting my comments concerning the Congressional Oversight Hearing entitled Scientific Research and the Knowledge-base concerning Forest Management Following Wildfires and Other Major Disturbances, held February 24, 2006 in Medford, Oregon. I am a consulting statistician with the Department of Forest Science at Oregon State University. Although two of the authors (Messrs. Donato and Fontaine) on the publication in the journal Science that precipitated this hearing consulted with me regarding study design prior to data collection, I was not consulted regarding data analysis or interpretation of the data after collection.

On March 3, Mr. Donato asked me to provide an independent analysis of his data in order to assess the validity of his approach from a statistical point of view. I did so using a slightly different approach than he and his co-authors used. I had two primary objectives: to analyze the data from a different, yet statistically sound and ecologically relevant perspective in order to compare my results with theirs for consistency; and to investigate the potential influence of measurements made on any single plot to assess the robustness of the results. I have described my methods in detail below. As with all statistical analyses, statistical significance of results may or may not represent biologically meaningful differences in the context of the study. That interpretation is left up to the authors and is not an issue I am qualified to address.

Even though my analysis addressed a slightly different question than Donato et al (2006) asked, my results regarding seedling density and fine fuels are consistent with the conclusions they draw and their analysis appears to be quite robust. My results concerning coarse fuels were consistent with Donato et al's but I found that some individual plots had slight influence on the magnitude of the results.

In my analysis, I focused on the salient question of the research for each of the three measures: seedling density, fine fuels and coarse fuels. I asked **"Is there statistical evidence that, on average, stands that were logged between 2004 and 2005 changed more than stands that were not logged over the same interval?"** As annual variation can lead to changes in these three measures between these two years, regardless of the human intervention, I felt it was important to frame the research question in a way that incorporates the potential inherent change in these measures from year to year. Donato et al also addressed this issue but in a slightly different way. They asked two sequential questions "Is there statistical evidence of significant differences between logged and unlogged stands in 2004, before logging was implemented?" Once they established that the two groups (logged and unlogged) had no initial differences, they then asked "Is there evidence of significant differences after logging, in 2005?" Both approaches are valid, but are estimating slightly different things. I deliberately approached this analysis from a different perspective in order to assess the consistency of their results. **My independent analysis of the data indicates the answer to my question above to**

be clearly "Yes" for seedling density and fine fuels and a "qualified yes" for coarse fuels.

Methods. I used a parametric approach with these data, using log -transformed values. This transformation is very common in natural resources and is often used when effects are multiplicative rather than additive. If a factor acts additively, as opposed to multiplicatively, it would cause a change of a fixed number of units, no matter how many were there to start with. For example, a certain factor may induce an average change of 10 units, so that a plot starting with 200 units or a plot starting with 50 units are both expected to change by 10 units after this factor has acted. A factor that acts multiplicatively would cause a change of a fixed percent, no matter how many there were to start with. For example, if a factor induces a 10% decrease, a plot starting out with 200 units would be expected to decrease by 20 units, whereas a plot starting out with 50 units would be expected to decrease by only 5 units. When factors act multiplicatively, the distribution of the data is often skewed with some few, very large numbers. In this case, the median is often a better measure of central tendency than the mean. The median represents the half way point in the distribution of the data, i.e., half the values can be expected to be above the mean, half below. It is much more stable than the mean and is not influenced by few large values. The mean in a skewed distribution, on the other hand, is highly influenced by a few large values and will be pulled toward them. It will not be representative of the half-way point in the distribution. In the Donato et al. study, seedling density, fine fuels and coarse fuels appeared to be acting on a multiplicative scale, so the log transformation was applied to all three measures and median values (and 95% confidence limits) are reported.

In statistical analyses, we can never make such precise estimates as those just stated (e.g., 10 unit decrease or 10% decrease). We place 95% confidence limits or bounds on these estimates of change or difference that can be interpreted as having a 95% chance that the true change or difference is somewhere within the bounds, so rather than a 10% decrease we would estimate somewhere between a 7% and 14% decrease, for example.

In addition to answering the above research question, I explored the possibility that results were based on an unusual sample of data, and that perhaps only one plot with an extreme measured value was actually responsible for the results. So, I reanalyzed the data, leaving out one plot at a time (16 separate analyses) to see if the results would change. If taking out a single point causes the conclusions to change, then the results of this study would not be considered to be robust. It would be extremely tenuous to interpret as general effects, those that are unduly influenced by measurements at only one point. However, if the conclusions were qualitatively unchanged by removal of any plot, then the results would be interpreted as robust and the effects measured would be considered representative of a general pattern in the data. Visual representations of the results of this analysis are presented in Figures 3, 6 and 9. In each of the these, if the plotted interval includes 1, then there is no statistical evidence of difference between logged and unlogged stands. If all intervals exclude 1, then the conclusions are robust and there is statistical evidence of a difference between logged and unlogged stands.

I found that the results derived from Donato's sample were robust for seedling density and fine fuels and even leaving any one plot out did not change the essential interpretation of the results. Coarse fuel measures were extremely variable and there was some evidence that the coarse fuels estimates would change slightly if only one point were removed.

Analysis Results Based on All Data

Seedling density

Seedling densities in 2004 ranged from about 300 to 2400 in 2004, with (to be) logged plots having about the same range as (to be) unlogged plots (Figure 1). Seedling density of most stands declined between 2004 and 2005 (9 out of 9 logged, 5 out of 7 unlogged). However, **the magnitude of the decline was, on average, greater in logged stands than in stands that were not logged** (Figure 2). While seedling density in unlogged plots was estimated to decline 20% from 2004 to 2005, seedling density in logged plots was estimated to decline by 61% over this same time period. The 95% confidence limits for the estimated percent change in seedling density in unlogged stands extend from a decline of 48% to an increase of 23%, indicating that the evidence is equivocal as to whether the average density decreased, increased or remained unchanged in these stands. The 95% confidence limits for the estimated percent change in logged stands, however, extend from a decline of 43% to a decline of 74%, indicating that there is strong evidence of a decline over that period, with uncertainty only in the magnitude of the decline. **Logged**

stands were estimated to have, in 2005, between 27% and 86% of the proportion of seedling density remaining in unlogged stands in 2005.

Fine Fuels

Fine fuels ranged from 0.5 to 2.9 Megagrams per hectare in 2004, with (yet to be) logged plots having about the same range as (to be) unlogged plots, and well interspersed (Figure 4). In 2005, after logging, the fine fuel load of every logged plot was greater than that of every unlogged plot (Figures 4 and 5). Fine fuels in unlogged plots were estimated to increase by 8% from 2004 to 2005, whereas fine fuels in logged plots were estimated to increase by 370% over this same time period. The 95% confidence limits for the estimated percent change in fine fuels in unlogged stands extend from a decline of 31% to an increase of 68%, indicating that the evidence is equivocal as to whether the average fine fuel load decreased, increased or remained unchanged in these stands. The 95% confidence limits for the estimated percent change in logged stands, however, extend from an increase of 222% to an increase of 607%, indicating that there is strong evidence of an increase in fine fuels over that period, with uncertainty only in the magnitude of the increase. The change in fine fuels in logged stands from 2004 to 2005 was estimated to be between 2.4 to 8 times the change in fine fuels in unlogged stands over this same period.

Coarse Fuels

Coarse fuels ranged from 1 to 81 Megagrams per hectare in 2004, with (yet to be) logged plots having a bit larger range as the (to be) unlogged plots (Figure 7). The two largest values and the two smallest values were measured in plots that were later logged. In 2005, after logging the coarse fuel load of every logged plot was greater than that of every unlogged plot (Figures 7 and 8). The two plots with the smallest coarse fuel load in 2004 each had dramatic increases in coarse fuel load after logging. Coarse fuels in unlogged plots were estimated to decrease by 34% from 2004 to 2005, whereas coarse fuels in logged plots were estimated to increase by 240% over this same time period. The 95% confidence limits for the estimated percent change in coarse fuels in unlogged stands extend from a decline of 63% to an increase of 19%, indicating that the evidence is equivocal as to whether the average coarse fuel load decreased, increased or remained unchanged in unlogged stands. The 95% confidence limits for the estimated percent change in logged stands, however, extend from an increase of 7% to an increase of more than 1000%, indicating that the data are highly variable but there is fairly strong evidence of an increase in coarse fuels over that period, with a lot of uncertainty in the magnitude of the increase. The change in coarse fuels in logged stands from 2004 to 2005 was estimated to be between 1.4 and 19.2 times the change in coarse fuels in unlogged stands over this same period.

Analysis Results Based on Subset of the Data

I examined the potential influence of each point on these results by removing one point at a time (16 possible) and rerunning each analysis. I evaluated the effect on inference by plotting the 95% confidence intervals around the estimate of the change in logged stands relative to the change in unlogged stands from 2004 to 2005.

Seedling density

Figure 3 represents the 95% confidence intervals around the ratio of percent seedlings remaining in logged stands relative to percent seedlings remaining in unlogged stands in 2005. For example, if density in logged stands in 2005 was 60% of what it was in 2004, but in unlogged stands it was 80% of what it was in 2004, the ratio of the percent remaining in logged to unlogged stands would be .6/.8=0.75=75%. This ratio takes into account the possibility that densities in all stands decreased between the two years. **When the seedling density data were reanalyzed after having removed one of the plots, none of the 95% confidence limits of this ratio included 1, indicating that the results were robust and the measured effect was representative of a general pattern in the data (Figure 3).**

Fine fuels

When the fine fuels data were reanalyzed after having removed one of the plots, none of the 95% confidence limits of this ratio included 1, indicating that the results were robust and the measured effect was representative of a general pattern in the data (Figure 6). In fact, this ratio was never less than 2, indicating at least a doubling of fine fuels in logged plots relative to unlogged.

Coarse fuels

When the coarse fuels data were reanalyzed after having removed one of the plots, 4 out of 16 of the 95% confidence limits of this ratio included 1,

indicating that the results were not very robust and the measured effect might not be representative of a general pattern in the data (Figure 9). Although in all cases the estimate itself indicated an increase in coarse fuels, removal of some of the plots caused the 95% confidence interval around the estimate to include 1, providing equivocal evidence of a general change. In addition, all the 95% confidence intervals were extremely large, reflecting the high variability in this measure.

Literature Cited

Donato, D.C., J.B. Fontaine, J.L. Campbell, W.D. Robinson, J.B. Kauffman, B.E. Law, 2006. Post-wildfire logging hinders regeneration and increases fire risk. Science 311: 352.

Figures

Figures

Figure 1. Seedlings per hectare in each plot in 2004 and in 2005. Logged plots are indicated with an asterisk and solid line connecting the two measurement dates, unlogged plots are indicated with a square and a dashed line connecting the two measurement dates.

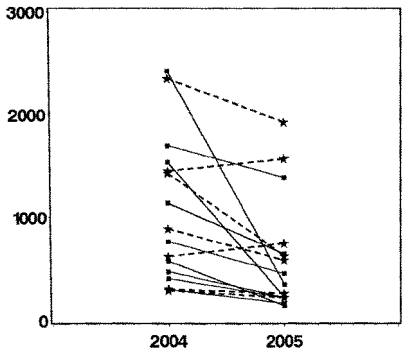


Figure 2. Estimated median seedlings per hectare in each plot in 2004 and in 2005 with 95% confidence limits. Logged plots are indicated with an asterisk, unlogged plots are indicated with a square.

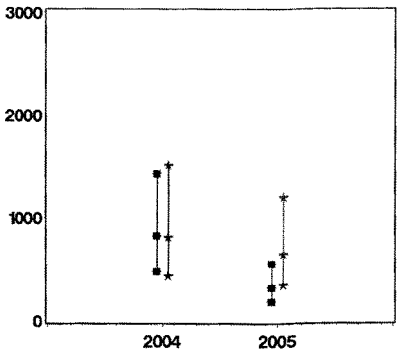


Figure 3. Ratio of percent seedlings remaining (and 95% confidence limits) in logged plots relative to unlogged plots in 2005, after having removed one point at a time from the data. None of the confidence limits include 1.

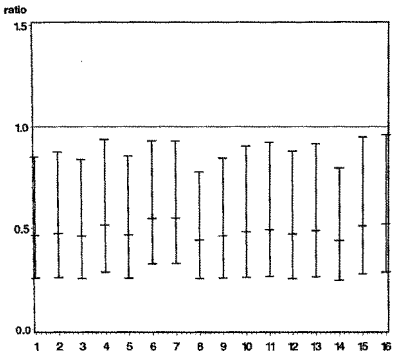


Figure 4. Fine fuel (Megagrams) per hectare in each plot in 2004 and in 2005. Logged plots are indicated with an asterisk and solid line connecting the two measurement dates, unlogged plots are indicated with a square and a dashed line connecting the two measurement dates.

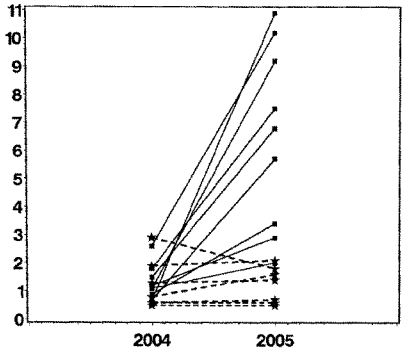


Figure 5. Estimated median fine fuel (Megagrams) per hectare in each plot in 2004 and in 2005 with 95% confidence limits. Logged plots are indicated with an asterisk, unlogged plots are indicated with a square.

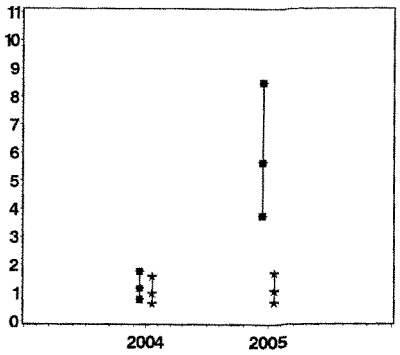


Figure 6. Ratio of percent fine fuels remaining in 2005 (and 95% confidence limits) in logged plots relative to unlogged plots, after having removed one point at a time from the data. None of the confidence limits include 1.

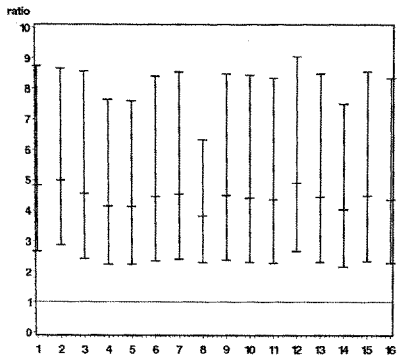


Figure 7. Coarse fuel (Megagrams) per hectare in each plot in 2004 and in 2005. Logged plots are indicated with an asterisk and solid line connecting the two measurement dates, unlogged plots are indicated with a square and a dashed line connecting the two measurement dates.

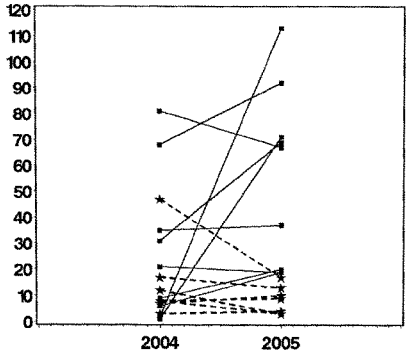


Figure 8. Estimated median coarse fuel (Megagrams) per hectare in each plot in 2004 and in 2005 with 95% confidence limits. Logged plots are indicated with an asterisk, unlogged plots are indicated with a square.

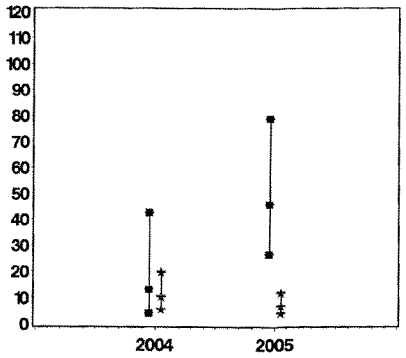
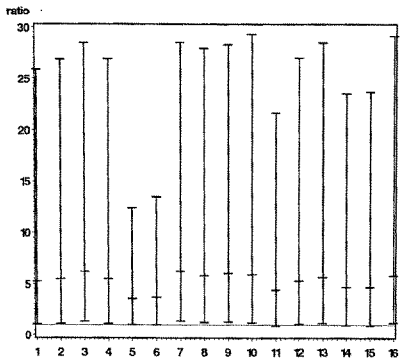


Figure 9. Ratio of percent coarse fuels remaining in 2005 (and 95% confidence limits) in logged plots relative to unlogged plots, after having removed one point at a time from the data. Some of the confidence limits include 1.



[A report prepared by the USDA Forest Service Research & Development submitted for the record by Chairman Walden follows:]

Research & Development, USDA Forest Service—November 2004

POSTFIRE LOGGING: THE CONTROVERSY AND THE CURRENT STATE OF KNOWLEDGE

Debate over the effects and appropriate use of postfire logging has intensified in recent years. While many managers and scientists consider it as part of a suite of possible restoration techniques after wildfire, others argue that it causes damage to burned sites sufficient to outweigh potential benefits. These discussions, whether in the courts or in the literature, have often been carried on with a notable absence of balanced evaluation of the available science. Managers and policy makers need the soundest possible information in developing recommendations for postfire management activities.

What do we know?

A recent review (Mclver and Starr 2000, 2001) summarized available scientific information on this topic. This paper looked at some 21 studies that addressed effects of postfire logging on erosion, wildlife, vegetation recovery and other factors. Since that review, a few additional field studies have been completed, and several others have been initiated to help address some of the gaps in scientific knowledge identified in the review. None of these new studies changes the major conclusions:

- The environmental effects of postfire logging depend on the severity of the burn, slope, soil type, vegetation composition and condition, the presence or building of roads, type of logging system, and postfire weather conditions. Logging over snow and aerial logging or other low-impact systems help to reduce erosion and soil compaction. Road building is likely to cause the greatest increase in sediment transport off-site.
- Wildfire, postfire logging, or other management treatments alter vegetation structure, food sources, and other aspects of animal habitat. These changes will favor some species and reduce the occurrence of others; the end result is change in species composition but not necessarily in species richness.
  - Both wildfire and postfire logging can cause significant changes in the abundance and nest density of cavity-nesting birds, particularly those attracted to high insect populations or structural changes in recently burned forests.
  - Mammal species composition is changed by wildfire and postfire treatments; everything from deer and elk to small forest-floor mammals respond to the habitat changes that result from fire and postfire logging.
- The probability that insect pest populations will build up and infest adjacent healthy tree stands may be reduced through removal of vulnerable trees after fire.
- Fine fuels are reduced by fire, and then increase as trees or other vegetation die and new growth occurs. Fuel mass increases on logged sites as a result of slash left over from harvest and on burned but unlogged control sites as the result of dead branch litter and falling dead trees. Control of logging slash can minimize accumulation after harvest. There are few data on fuel changes with time after fire, or on how these changes affect and are affected by future fires.
- Maintaining a maximum diversity of habitats and plant and animal species across the landscape depends on a shifting mosaic of landscape conditions. Fire and other disturbances can be important contributors to maintaining a healthy and desired level of spatial and temporal diversity over the landscape.
- There is considerable variation in burned forests, in logging methods, and in site-specific effects. A coordinated approach to addressing key science questions, such as the ecological consequences of alternative postfire logging practices in an operational context, and could improve our understanding of general principles for mitigating ecological damage in the postfire environment as well as important site-specific information for adaptive management.

Several recent papers have discussed postfire logging from various perspectives (Beschta et al. 2004, Lindenmayer et al. 2004, Sessions et al. 2004). The assumptions that these papers make about desirable societal or ecological goals influence their conclusions. Sessions et al. (2004) focused on postfire options in areas being managed either for old-growth characteristics or for fiber production following the 2002 Biscuit fire in Southwestern Oregon. They concluded that postfire logging and artificial regeneration can help accelerate return to old growth characteristics. They also concluded that rapid loss in economic value of timber over the first two years after a fire, and the potential for rapid growth of shrubs or other species that would compete with conifers could make it much more difficult to use postfire logging to help meet reforestation or old-growth restoration objectives if action was not taken rapidly.

Beschta et al (2004) started with the assumption that 'nature knows best', and that under most circumstances it is desirable to take a custodial approach to management in the postfire environment. They did little to address the social and economic context within which forest lands are managed. They concluded that beneficial postfire management activities can include soil protection, road restoration, large-tree retention, and support of natural recovery, while most postfire logging, seeding of non-native species, disturbance of riparian areas, road construction, and in-stream erosion control structures are "not likely to be consistent with ecosystem restoration". Unfortunately, a selective review of the literature, and reliance on indirect evidence for many of their arguments detract from the value of this paper as a balanced analysis.

In a policy forum published recently in Science, Lindemayer et al. (2004) discussed examples of negative ecological effects of postfire logging from around the world. However, they recognized that, depending on management objective, there may be situations where postfire logging is appropriate. They made the excellent point that post fire or post disturbance restoration and recovery activities are best considered during the planning cycle, analyzed in a landscape context, and incorporated into planning documents as anticipated responses to severe fires or other disturbances.

Conclusions:

Effects of postfire logging and other restoration treatments are site specific and strongly dependent on the way in which treatments are conducted, the extent and severity of wildfires, and what parts (and how much)of the burned area are treated. Both fire and postfire treatments affect soils, hydrology, and the structure and composition of plant and animal communities. While most research has been conducted at the stand level, planning for such treatments should occur in a landscape context, and with a clear set of ecological and social objectives. Such planning is best done in advance of disturbance events and with a full balancing of the potential impacts and benefits of treatments, or of decisions not to treat, on recovery and restoration of desired landscape condition. Adaptive management is a useful tool that could help build understanding of logging effects in the postfire environment.

Research is ongoing

Several studies have been started recently, with support from the Joint Fire Science Program and National Fire Plan Research, to help enhance our understanding of the effects of postfire logging.

- A study established by the Pacific Northwest Research Station following the 1996 Summit fire in eastern Oregon is evaluating the effects of postfire logging on fuel structures, fire hazard, soils and sediment movement. Treatments include: no postfire logging, harvest of one-third of the viable timber, and harvest of all of the viable timber. Logging was removed between 43 and 46 percent of timber basal area. Logging disturbed between 15 and 30 percent of the soil area in the study units. Sediment transport out of the area was minimal, probably because the slopes were low, logging was over snow, no new roads were constructed, and there were no severe rainfall events in the year following logging. Logging added more small-diameter woody fuel in the short term, but reduced the amount of standing fuel, in the form of dead trees, which will contribute to future fuel loads as they fall down. Model projections suggest that logged units might have less fuel in the long run and may burn less intensely. This study suggests that logging can be done with acceptable effects on soils and minimal sediment transport off-site, provided the right equipment and approach are used.
- Rocky Mountain Research Station has installed several sets of paired watersheds to measure the impact of salvage logging on erosion and hydrologic processes. The sites are at the Hayman Fire (Pike and San Isabel National Forest, Colorado), the Kraft Springs Fire (Custer National Forest, Montana), and on simulated wildfires at Priest River and Boise Basin Experimental Forests. Researchers are monitoring runoff and sediment yields from these small watersheds (10 ac) on a storm by storm basis over three years. Preliminary results indicate only small rainfall intensity events for these sites, thus little erosion for either the salvage logged or control watersheds. Additional sites following wildfires and simulated wildfires will be installed over the next several years. FS scientists also continue to improve and develop hillslope and watershed-scale models and analysis tools for that estimating postfire erosion with and without postfire treatments. These tools are widely used by the NFS and other agencies throughout the western U.S., and scientists are incorporating available information on effects of postfire logging.

- Pacific Northwest Research Station and several collaborators are investigating effects of salvaging burned trees following the 2002 Cone Fire in northern California. Scientists established 2 hectare (5 acre) plots that to evaluate effects of 5 levels of postfire logging - 0%, 25%, 50% 75%, and 100% of basal area removed, with each level replicated 3 times. The historic fire regime of this ecosystem was of the frequent/low-moderate severity type of interior ponderosa pine in the southern Cascade Range of northern California. The study team is assessing effects of levels of postfire logging on: 1) the succession of the fuel profile (e.g., How rapidly does the fire hazard return; what happens when dead trees fall down; how does regrowing vegetation affect fuel hazard?); 2) levels of insect infestation and the use over time of the dead trees by woodpeckers; and 3) the influence of various levels of postfire logging on soil compaction.

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