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## **Creating a Scientifically Credible and Socially Relevant Research Agenda for the Elliott State Research Forest**

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**SUMMARY:** The Oregon State University College of Forestry (OSU COF) has an extraordinary opportunity to serve the citizens and forest resources of Oregon at the Elliott State Research Forest (ESRF). It can do that by creating new knowledge about forest ecosystems and demonstrating the application of that science in managing forests for the multiple environmental, economic, and cultural benefits desired by Oregon's citizens. However, the current OSU COF proposal for management and research on the Elliott Forest needs significant revision if it is to succeed in achieving those benefits.

Activities on the ESRF should begin with development of a problem analysis to identify what research and experiments are needed to address problems of importance to Oregonians. The current document "puts the cart before the horse" by proposing a major experiment before conducting such an analysis and without developing on-the-ground familiarity with the property. In addition, the experiment OSU has proposed is badly flawed, compromises development of the long-term research potential of the forest, and lacks significant relevance to management of Oregon's forests. The proposed experiment violates basic principles essential to production of statistically valid and socially convincing outcomes. Furthermore, the focus on Triad, an academic concept related to land allocations at regional scales, has no relevance to pressing forestry issues facing Oregonians.

The citizens of Oregon are effectively giving OSU COF a \$121 million gift in creating the ESRF – arguably the largest single investment that the State of Oregon has ever made in forest research. The state deserves a research program that will contribute to creation of forest ecosystems that can better meet current challenges, such as wildfire, climate change, and recovery of threatened salmon populations. The program also needs to have great flexibility to meet the ever-changing needs and preferences of society.

The State Land Board should direct OSU COF to make a fresh start at designing a research program that includes scientifically rigorous experiments directed at sustaining the productivity and other functions of managed forest landscapes. This process of selecting the research foci and initial experiments for OSU's program should be undertaken systematically and transparently. It is important that stakeholders understand how the topics for research were selected and how they relate to proposed experiments. Independent outside peer review would be appropriate for both the problem analysis and for all major research projects and experiments.

The State Land Board should also insure that there is a process by which OSU COF's program of research and management at the ESRF will undergo periodic outside review by

**an independent panel of scientists and citizens, who will report to the State Land Board on its findings.**

I appreciate this opportunity to comment on Oregon State University College of Forestry's (OSU COF) proposal to undertake management of the Elliott State Forest for research and education. My credentials for commenting on this proposal include my involvement in forest research in the Pacific Northwest for over 60 years, much at Oregon State University and most recently as a professor in the University of Washington's School of Environmental and Forest Science. My entire career has been involved with development and management of experimental forests and long-term research projects. I helped lead the development of the globally recognized H. J. Andrews Experimental Forest and managed Andrews, Cascade Head Experimental Forest, and the Wind River Canopy Crane facility for significant periods. I also participated in conceptualization and implementation of the National Science Foundation's Long Term Ecological Research Program (LTER), successfully competed for one of the initial grants (at Andrews), and coordinated activities of the LTER network for the National Science Foundation. I was involved in obtaining congressional funding for and the design of the only statistically designed regeneration harvest experiment in the Douglas-fir region (DEMO). I am coauthor with Norm and Debora Johnson, of the foundational textbook for ecological forestry, "Ecological Forest Management".

OSU COF has made significant progress in developing a vision statement, but some further changes are required, most profoundly a problem analysis to identify priorities for research and experiments on the Elliott State Research Forest (ESRF). A critical missing element in the existing document is provision for independent oversight of OSU COF's research and management of the property. It is fair to say that OSU COF's record in management of its own lands and in support of long-term research is checkered. Providing independent oversight is necessary to establish and sustain the trust necessary if OSU COF is to manage this important property. This group should include both scientists and distinguished citizens that represent the spectrum of stakeholder interests. They would be charged with reporting regularly and publicly to the State Land Board. Funding to sustain and make credible their oversight activities would be needed. Conservation easements could also provide some additional legal teeth in the oversight function.

The problem analysis is critical to identify the important issues relevant to managing Oregon's forest that OSU COF can address on the Elliott Forest. Such a document would provide a systematic approach to identification, review, and prioritization of potential research topics for the OSU program. It would be the basis for identifying the research, including experiments, necessary to address those issues. Examples of the scientific issues that need consideration are development and demonstration of approaches to creating managed forests that are more resilient in the face of disturbances, such as wildfire, and climate change, and techniques to better integrate forest management with restoration of salmon populations.

Development of a problem analysis will have several important benefits. First, it can make the process of identifying OSU COF's research priorities a much more transparent process. It would put on record the various topics/issues that were considered and the processes used by OSU COF in making its selection. While some stakeholders have relatively little interest in what research is

done on the Elliott, many stakeholders do want to know more about OSU COF's research plans as well as to have input into these plans. It could allow for much broader participation by individuals both within and outside of the institution. The problem analysis should also undergo a scientific peer review process before it is finalized.

The State Land Board needs to provide OSU COF with time to develop such a problem analysis and to familiarize themselves with the property, so that the proposed activities are based on on-the-ground familiarity and not simply on maps and remote imaging. Detailed information on stand ages and structural and compositional characteristics is necessary to identify comparable areas for research. Attention to the geomorphic and hydrologic features of drainages is also needed, so that credible experiments examining the interactions of forest management on aquatic systems and fish, can be developed. ***The development of specific studies and experiments needs to follow, not precede, development of such familiarity. Initiating activities on a property that is intended to be managed in perpetuity for research, demonstration, and education should never begin with by committing essentially all of it to a single experiment.*** OSU COF's current proposal for a major experiment is very much "putting the cart before the horse"!

The deficiencies in the massive experiment currently proposed by OSU COF further emphasizes the need for a systematic assessment of research priorities and the potential of the ESRF before activities are undertaken. The experiment lacks a relevant focus (a supposed test of TRIAD) and has multiple significant flaws in its design and proposed implementation. The potentials for statistically credible scientific or socially convincing outcomes from the current design are near zero. Some of my concerns with this specific proposal are as follows.

The purported purpose of the experiment is to test the TRIAD concept. TRIAD is a concept that envisions forests in a region being managed using three general approaches (Hunter and Calhoun 1996): (1) Areas for intensive commodity production, (2) Areas with little or no resource use by people; and (3) Areas in which resource use is integrated with protection of ecological values. Here in Oregon, such a partitioning of forest lands has already occurred – an approximation of the Triad approach. The industrial forest lands are currently managed intensively for commodity production (Triad category 1); and the national parks, wilderness areas, and Late Successional Reserves represent Triad category 2. The remaining managed forestlands (e.g., federal, state, tribal, most non-industrial private lands, conservation trust lands, etc.) represent Triad category 3. All owners and managers of lands in this latter category (Triad category 3) seek to integrate economic and environmental goals in the management of their properties by choice and/or law. A further important aspect of Triad is the geographic scale to which the Triad model applies and at which it needs to be tested. This scale is where the "Issues of economic distribution and balance can usually be evaluated [and is] at the scale of an individual state or county" (Hunter and Calhoun 1996). ***Triad is not intended to be applied to nor can it be tested at the scale of a single property.***

Hence, Triad is inappropriate as either an intellectual or experimental focus for OSU COF's research program on the ESRF. A Triad-like division has already occurred in Oregon by policy decisions made regarding management of the various forest ownerships. Practically speaking, the proposed experiment can provide no meaningful insights into the merit of the concept. Indeed, what Oregonians need most is research that will assist managers of the Triad category 3 lands in

achieving their goals of managing forests simultaneously for economic, environmental and cultural values.

In addition to its focus, the failures of the proposed experiment are numerous. The whole idea of committing most of what is intended to become a long-term research property to one massive experiment at the outset, is an outstandingly bad idea, since it greatly limits the potential for future research projects, notwithstanding arguments by proponents that you could nest other experiments within its design. We know from experience that our current ideas about the most pressing research questions, scientifically and socially, are going to undergo dramatic change with time. If most of the unreserved portions of a property have already been compromised by an experiment, the opportunities will be limited for other major research programs to be undertaken as new knowledge emerges and societal goals change.

The proposed experiment would be immensely expensive and take many years to implement; hence, it would take decades before any useful knowledge could emerge. It bases its treatments on watersheds and yet has no credible plan or intellectual engagement in measuring impacts of management on hydrology and aquatic ecosystems. Such research must be an important part of the Elliott Forest research program. However, the cost and institutional commitment for such research generally allows for relatively few gaged watersheds and the calibration of such watersheds requires 10 to 20 years before any treatments can begin. So, why are whole watersheds being proposed as the treatment units in the proposed experiment?

The experiment lacks a rigorous statistical design. The first and most basic principle in designing field experiments is random assignment of treatments to the experimental units – the specific land areas that are going to be part of the experiment. Treatments are not randomly assigned to the experimental units in OSU COF's proposed experiment – rather the characteristics of the experimental units (such as how much older forest is present) are the basis for assigning the treatment that they will receive! A second principle is that the treatments must include controls, which would be experimental areas that do not receive any treatment. The experiment does not include control treatments. The presence of a large semi-reserved area elsewhere on the Elliott does not fulfill the requirement for experimental controls. A third principle is that, if you want clear tests of variables – for example, how ecological responses are affected by the number of trees retained or the spatial pattern of the retention or the effects of different retention patch sizes – you must avoid confounding your treatments. Treatments are confounded when you change more than one variable at a time. Confounding of treatment variables is implicit in the current design.

There are many potential research topics highly relevant to the management of Oregon's forestlands, which could be addressed in OSU COF's research program. This summer has made obvious the importance of developing management regimes that would reduce the vulnerability of managed forests in western Oregon to wildfire and other large-scale disturbances. A related and critical research need is to conceive and test multiple approaches to adapting managed westside forests to climate change. Experiments of this type are underway in many forest regions of North America – but notably not in the Douglas-fir region! Silvicultural approaches to integrating ecological and economic goals is a major challenge in management of a broad array of forest ownerships in Oregon, from small, non-industrial private forest lands to tribal and

federal forests. Extensive experimentation is needed to better quantify the tradeoffs between various forest values, such as the economic costs and ecological benefits associated with various levels of live tree and dead wood retention during harvests. Similarly, research, including experimentation, is needed to compare economic returns and ecological benefits of mixed-age forests compared with even-aged forests. Any and all of these could be the foci of rigorous, statistically credible experiments that would directly benefit the citizens and forest ecosystems of Oregon.

OSU COF's research at the Elliott Research Forest needs to include significant, credible attention to the relationships between forests and streams. The streams and rivers are the very best and most sensitive indicators of the health (or, I would substitute the word, functionality) of our forest landscapes. We need much better knowledge of the impacts of management on water quality and quantity and on health of the biota. The salmon are arguably the most significant of the endangered biota of the Elliott. There has been no meaningful consideration of streams and stream biota in the current research plan – for example, no consideration of how geophysical processes line up with the expected treatment units. There are multiple ways to configure riparian networks to achieve desired outcomes but this is not a part of the current experimental design. Credible experiments are needed but these will be expensive and significant time will elapse before treatments can begin. The potential for stream-based experiments should not be compromised as they will be by the current research design. These concerns with the research related to aquatic systems and salmon need to be dealt with “up front”, not some time after other experimental manipulations have already been planned, let alone implemented.

In conclusion, the OSU COF should drop the current proposed experiment and undertake a comprehensive and transparent problem analysis to identify the research priorities and experiments that will provide the greatest benefit for Oregon citizens and forest ecosystems. Any research projects, including experiments, should be developed after the COF has an opportunity to become more familiar with the property and reassess how research can benefit the citizens and forests of Oregon in the short- and long-term.

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Hunter, Malcolm L., Jr. and Aram Calhoun. 1996. A triad approach to land-use allocation. Pages 477-491 in “*Biodiversity in Managed Landscapes*”, edited by R. C. Szaro and D. W. Johnston. Oxford University Press: New York.