The Future of Silviculture Research—Thoughts from the Yale Forestry Forum

Sharon T. Friedman and James M. Guldin

Authors

Sharon T. Friedman is national program leader for silviculture, Vegetation Management and Protection Research, P.O. Box 96090, Washington, DC 20090; and **James M. Guldin** is a research forest ecologist and project leader, Southern Research Station, University of Arkansas at Monticello, P.O. Box 3516, Monticello, AR 71656.

Abstract

The 1999 Yale Forestry Forum, sponsored by Yale University and the USDA Forest Service, brought together a number of experts in an academic setting to discuss the future of silviculture research in the next century. Four participants in the plenary session outlined three areas that will characterize the future of silviculture research—sustainability, flexibility, and rigor. Sustainability includes two elements—sustainability of practices at different scales of management, and striking the appropriate balance of conditions across the landscape. Flexibility has three elements—feasible 'silvicultural pathways' for species of interest, research within and among a wide scale of intensities of management, and silviculture for a variety of 'at risk' situations. Rigor has two elements—silviculture research as a subset of a larger array of response variables, and maintenance of high standards of statistical design for silvicultural research. The implications of these and other elements raised for future funding of silviculture research remains unclear, but will give the silviculture research community an opportunity for enhanced discussion of priorities in the immediate future.

Introduction

In October 1999, staff from the Office of the Deputy Chief for Research of the USDA Forest Service collaborated with faculty and professional staff from the School of Forestry and Environmental Studies at Yale University to exchange ideas on the future of silviculture research (Wishnie et al. 2000). Organized under the auspices of the Yale Forestry Forum, the program was highlighted by a plenary session in which invited experts from government, industry, academia, and a non-government organization presented views from each perspective on the prospects for silviculture in the next century, and the research that would be needed to support those prospects. Following the plenary session, a roundtable discussion was held that featured the invited experts as well as a number of other active and respected silviculturists from academia, government, and the private sector. Adding to the value of that discussion was the participation of the graduate student body at Yale and the College of Environmental Sciences and Forestry from the State University of New York at Syracuse.

This paper presents highlights and key concepts from the session. It should not be considered to represent the views of the USDA Forest Service, or of the Yale School of Forestry and Environmental Studies. Rather, the ideas brought forward here represent the authors' view of the concepts and priorities for silviculture research based on comments of the forum participants during both the plenary session and the roundtable discussion. Nor should these ideas be considered as the ultimate contribution on the subject. The virtue of hindsight, enabled by a review of transcripts of the session, and the opportunity to consider perspectives and input from other experts not available to those at the meeting, can lead to the introduction of new ideas or the heightened awareness of others raised but not dissected in detail at the Yale Forestry Forum. These will, and should, also contribute to the larger discussion as well.

Thus, rather than the final word, this paper should be viewed as the beginning of a larger discussion among the profession about the future of silviculture research. The authors hope that this work can promote that larger discussion in a number of appropriate venues, including this 2001 National Silviculture Workshop.

Methods

Organizers of the Yale Forestry Forum invited four keynote speakers to kick off the symposium, and arranged for the participation of a dozen other practicing research and academic silviculturists. Most, but not all, in attendance were from institutions—Yale and others, and the Northeastern Research Station of the USDA Forest Service—located in the northeastern part of the country.

The Forestry Forum was organized in two sessions—a plenary session and a roundtable discussion. The Plenary Session was conducted as four half-hour presentations, followed by a general question and answer period. Participants in the Plenary Session were:

1) Dr. Greg Aplet, Research Ecologist, The Wilderness Society, Washington DC;
2) Dr. Chadwick D. Oliver, Professor of Forestry, School of Forest Resources, University of Washington, Seattle WA;
3) Dr. Susan Stout, Research Forester and Project Leader, Warren Forestry Sciences Laboratory, Northeastern Research Station, USDA Forest Service, Warren, PA; and
4) Dr. John Hodges, Woodlands Manager, Anderson-Tully Company, Memphis TN, (former faculty member, Department of Forestry, Mississippi State University, Starkville, MS).

The Roundtable Discussion included these experts and others. Opportunities for extended input were given to a half-dozen other prominent academic and agency research silviculturists, and to several practitioners attending the forum. Finally, a round of opportunities for comments were taken from the floor, and prominent among these were what might literally epitomize the future of silviculture research—members of the Yale graduate student body. Thus, the discussion pool included largely individuals from one region of the country, and largely one philosophical perspective—virtually everyone at the meeting would not hesitate to conduct active interventions in a stand should conditions so warrant. Results from the discussion should be interpreted from this perspective.

Both sessions were taped, but with different formats. The plenary session was videotaped. This offered good opportunities to review speakers' overheads, provided that they were of sufficient clarity and resolution to review on the VHS format. The roundtable discussions were taped by using cassette audio tapes. This provided a few different problems in review. Not all speakers identified themselves or were known to the reviewers of the tape; others spoke too softly, or were seated too far from the microphone to allow their comments to be clearly heard. By and large, however, the authors think that these comments allowed for a reasonably complete capturing of the comments raised by the Forum's many participants.

In such circumstances, the challenge to the authors was not too little material, but too much. The challenge of this review-through-media format is to collect, organize, synthesize, and evaluate the material raised by those attending the Forum. Any shortcomings in interpretation or omission of comments are to be blamed on the authors.

Results

Plenary Session

A number of major comments arose from the comments of the four speakers at the plenary session. These were centered in three key areas: sustainability, flexibility, and rigor. Specific comments can be broken down into eight key areas:

Sustainability

Sustainability of practices at different scales of management. The definition of sustainability at the stand and landscape scale is not clear in existing silvicultural literature. Nor is the contribution that silviculture can make a clear one to understand. Delinking the public's assumption that silviculture is synonymous with timber production is a key element.

Striking the appropriate balance of conditions across the landscape. Several speakers pointed to the need for more thought and research to the dynamic distribution of conditions across the landscape, and the silvicultural contributions to that balance. A strong analysis and discussion of the intensive plantations, reserves, integrated management approaches from the financial, social, and economic perspectives is needed and has yet to occur.

Flexibility

Feasible 'silvicultural pathways' for species of interest—Despite some seven decades of productive research on specific species, many species of interest to land managers are underrepresented in the scientific literature. This is especially the case when considering reproduction cutting methods such as the shelterwood and single-tree selection, or intermediate treatments such as the use of prescribed fire. Learning more about applying a wider variety of silvicultural treatments to a wider variety of situations is a high priority.

Research within, and increasingly among, a wide scale of intensities of management—While plenary session speakers disagreed about the details of this key area, there is support for continued research in intensive management among industry clients and expanded research in natural stand management.

Silviculture for a variety of 'at risk' situations—Enhanced understanding of how silvicultural practices can be used for hazard reduction (acute, such as pestilence, or chronic, such as extensive herbivory or buildup of fuels near areas that require fire protection). Techniques for restoration of plant communities underrepresented on the landscape (such as longleaf-wiregrass restoration, restoration in the lower southeastern Coastal Plain or shortleaf pine-bluestem restoration in the Interior Highlands) would also be of interest. Especially valued would be an understanding and acceptance that silvicultural manipulations can be applied in specific instances to improve habitat of endangered, threatened, and sensitive species. There are instances in the literature where this has been documented.

Rigor

Increasing understanding the context for and variety of responses to silvicultural manipulation—More and more, participants held the view that silviculture of the next century would not remain viable in the absence of experiments that embrace a broader variety of response variables. The professional interactions that result when silvicultural research is conducted in juxtaposition with wildlife, social science, economics, and other disciplines adds not only to the studies themselves but also to the perspective of silviculturists.

Maintenance of high standards of statistical design for silvicultural research—Finally, plenary session participants were of the opinion that rigorous experiments should be the norm rather than the exception. It is critical that new experiments be subject to statistical evaluation before installation. The difficulty in this challenge is to capture appropriate degrees of experimental error by using appropriate statistical designs as spatial and temporal scales increase.

Roundtable Discussions

A number of points were raised in the discussion session that differed from the concepts raised in the plenary session. In some cases, the discussion expanded considerably on the main elements initially raised in the plenary session. In others, new elements were introduced. The main elements follow:

Cohesion across ecogeographic boundaries—Several participants commented on the potential value of a common experimental design and data structure in the context of silvicultural practices research. For example, a new group selection study might be developed using a common study design and similar measurement protocols across a variety of forest types. By comparing and contrasting results across forest types, scientists could develop better conceptual models for group selection that clarify what elements of the prescription apply for a specific forest type, and which elements appear to hold across all forest types.

Enhanced understanding of social needs—Some participants observed that the understanding of silviculturists about society's larger needs from forests was limited at best. Few would disagree that improvements in understanding the values of society and the needs of society for forests in the next century might be good information to have in designing silvicultural experiments.

Technology transfer—Information about accepted sound forest management practices was available in the literature, but was not getting into the hands of private landowners or forest managers. Periodically, foresters find themselves in conflict with their peers not because either is wrong, but because one has had the opportunity to learn something the other one hasn't. This seems to be an especially persistent problem on private non-industrial lands where exchange of information, both researchers to

practitioners and practitioners to practitioners, can be limited. Moreover, some foresters cross the line of accepted ethical application in withholding certain silvicultural recommendations from private landowners if implementing those recommendations might reduce the fee the forester could collect. State extension offices, technology transfer experts within the Forest Service, and professional societies such as SAF should revisit the mechanisms needed to link research with the on-the-ground folks, the consultants, the field foresters for industry and government agencies, and the state service foresters. Research findings are of minimal value unless they can be translated to application in the woods.

Attentions to a broader spectrum of landowners, especially small-parcel NIPF landowners—Landowners with small ownerships on the order of 20-300 acres provide a particular challenge for foresters, given the marginal operability for many silvicultural practices, and the marginal profitability for consulting foresters, on tracts in this size. Many landowners don't have the resources to pay for good silviculture or management practices. To this end, ways should be identified to make a quality job of vegetation management on small parcels affordable to landowners. Understanding the development of these stands and possibilities of a range of benefits and costs from manipulating that development is the key information that needs to be developed and transferred.

Silviculture for values other then timber—An important transition for silviculturists is to increase the breadth of silvicultural research beyond simply timber growth and yield. The great bulk of landowners are not just going to produce timber, but are very interested in what effects the production of timber has on related resources. People's values don't always mesh very well with the information that silviculturists are trying to peddle—especially smaller landowners and, increasingly, the general population with respect to public lands. Moreover, time has shown the weakness of the post-war axiom that 'good forestry for timber is good for everything else.'

Silvicultural implications of the 'range of natural variability' concept—From the research perspective, a focus on silviculture as applied stand behavior and ecology rather than as a tool for production of timber or creation of habitat for a single endangered species may carry greater flexibility to meet uncertain future resource issues. Studies developed broadly in the context of ecological fundamentals rather than the question of the day will have a better chance of producing relevant research over time.

Role of traditional production research— A small but important component of the forest land ownership base—forest industry—will continue to emphasize research on intensive silviculture. This is especially the case in making refinements in development of genetically improved planting stock (such as for enhanced physiological uniformity or resistance to herbicides), improvements in strategy and tactics of chemical silviculture ("weed and feed" mixtures of herbicides and fertilizers, or increased precision in application rates depending on seedling or sapling attributes within a stand), and tailoring of silvicultural practices to anticipated products. Finally, companies are discovering that fewer people in the woods leads to fewer liability issues, but the challenge of maintaining rates of production with fewer workers will lead to continued research on the operations side of silviculture.

Economic interpretations of silvicultural experiments—Many silviculturists lack extensive training in financial analysis, but added value would immediately result from application of economic and financial analyses to silvicultural studies. For example, many long-term, large-scale habitat studies lack this component, and as a result, it can be difficult to convince landowners of the costs and benefits of silvicultural practices. Information on the financial aspects of management is critical when translating research results using language to which landowners, especially NIPF landowners, can relate. And this can, in most instances, be done with very little additional effort, but should be incorporated into the planning of the work.

Discussion

This document represents the first step to capture the thoughts and opinions of scientists and practitioners of silviculture regarding the future of their field. A broader review will be conducted through staff members and field scientists in Forest Service Research and Development to build upon some of these issues, discount others, and raise new issues not brought forth to date.

The panelists and roundtable participants consistently held that silviculture must increasingly encompass a greater diversity of treatments, larger scales, longer timeframes, more disciplines, and more landowners. There is clearly a role for traditional production research, especially in the high-technology arena of tree breeding for resistance to herbicides, insects, and pathogens, but there's a corresponding interest in applying silviculture in the context of restoration of natural systems. And, clearly, more attention must be given to the distribution of research products—through technology transfer and to clients that have not been reached by using the extension tools of the past few decades.

For scientists, the challenge will be in implementing these changes; for research administrators, the challenge will be in development of the support infrastructure to support their implementation. It may be that different organizational pathways and research work unit structures must be developed to implement and fund these changes. But the general tenor of discussion is clear—silviculture is not just for timber management any more, if it ever was.

Reference

Wishnie, M.; Ashton, M.; Friedman, S.T. [and others]. 2000. The future of silviculture and applied ecology research—a summary of a forum exploring the evolving role of silviculture and silviculturists in the United States. Yale Forest Forum Series Volume 3, Number 2. New Haven, CT: Yale School of Forestry and Environmental Studies. 40 p.