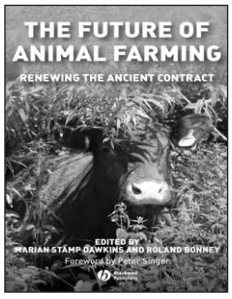
production systems—and these choices must be based upon dialogue and information.

In a perhaps surprising foreword, Peter Singer (renowned for his pivotal book *Animal Liberation*) acknowledges that while vegetarianism is on the rise in the developed world, the numbers of animals raised and killed for food are increasing. This raises a dilemma for the animal rights movement, which, he argues, can no longer confine itself to promoting veganism but also must engage in the debate about production systems that promote good welfare.



If there is such an enlightened animal rights movement, *The Future of Animal Farming* will give hope to it. But in a wider and more important sense, this book will encourage others who are directly involved in the production of animals for food, and those in the chain between producers and consumers, to think more critically about their practices and to explore options for better welfare within commercially viable systems. Finally, the book may persuade consumers to be more vocal in expressing their choices, and in demanding information to ensure that those choices are informed ones.

JUDY MACARTHUR CLARK
Judy MacArthur Clark (judy@solomon-foundation.org) is affiliated with the Solomon Foundation, a nonprofit organization that works to promote the welfare of animals used in science and technology. She is past-president of the UK Royal College of Veterinary Surgeons and the International Association of Colleges of Laboratory Animal Medicine, and was chair of the Farm Animal Welfare Council from 1999 to 2004, advising the UK government on welfare issues in food production.

ACCELERATING A SILVICULTURAL METAMORPHOSIS?

A Critique of Silviculture: Managing for Complexity. Klaus J. Puettmann, Christian Messier, and K. David Coates. Island Press, 2008. 206 pp., illus. $30.00 (ISBN 9781597261463 paper).

Hooray for *A Critique of Silviculture: Managing for Complexity!* This short, readable, affordable book, by Klaus Puettmann, David Coates, and Christian Messier, attempts to push along a nascent yet growing transformation—in fact, a paradigm shift—of the art, science, and practice of silviculture. Given that forests cover one-third of the terrestrial globe and play critical roles in the earth system, terrestrial biomes, and human economy, it is imperative that we constantly improve our approach to the science and practice of forest management (one simple definition of silviculture). By dint of its many excellent features—historical overview, sturdy and straightforward architecture, conceptual synthesis, and cultural challenge—this book should become an important contribution to the literature in applied ecology.

The authors are eminently qualified to tell this story. All three work at the nexus of forestry and ecology, and bring considerable experience and expertise to their discussion of silviculture. Puettman is a professor at Oregon State University, Coates is a research silviculturalist with the Ministry of Forests and Range in British Columbia, and Messier is a professor at the University of Québec at Montréal. All three are acknowledged international leaders in the field.

The book offers a critical examination of the limits of basic silvicultural assumptions and practices of yesterday and today, in light of changing societal expectations for forests and of evolving thinking about systems ecology. It then lays out a proposal for a new framework. The authors provide a synopsis of how silviculture focuses on commercially important tree species, using an agriculturally based conceptual model and spatial framework—the stand—that emphasizes managing for uniformity. The authors contend that such an approach is no longer the best way forward, if it ever was. They argue that the uniformity promoted by traditional silviculture does not effectively deliver the broader ranges of outputs desired (and perhaps necessary) today, nor does it enhance the resilience of forests to the broader array of tomorrow's challenges. The desired outputs go well beyond timber production to include the diversity of structure, function, and composition of all biotic elements of forest ecosystems, and the provisioning of ecosystem services (including climate regulation). Climate change, fragmentation, invasive and invigorated native pests and diseases, and altered disturbance regimes are among the broad range of challenges (against which enhanced resilience will be a key). The authors posit that forests are "perfect examples of complex adaptive systems," and as a result, forestry—specifically silviculture—will be more effective if it adopts key concepts of complexity science, a notion almost 180 degrees from the goal of traditional silviculture, which is to eliminate complexity in order to maximize economic production.

The story begins with an illuminating and entertaining history of the need for and the development, politics, and culture of silviculture from its origins until the 20th century. To my thinking, this is not just boilerplate background but a key piece—it shows that forests have for centuries been managed for an evolving galaxy of social and economic needs that shift in time and space with the evolution of human social, political, and economic systems. The book then focuses on the assumptions, approach, goals, and practice of silviculture, laying out what it does well, what it does poorly, and what is outside its scope. The authors identify what they view as

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key shortcomings of silviculture: its limited goals (primarily wood production); its use of a conceptual framework that is somewhat unrealistic, given heterogeneity in time and space; and its reliance on design considerations and statistical tools that may be mismatched to the heterogeneity and unpredictability we may see in our forest stands in the future.

The authors then provide a brief primer on the evolution of the science of ecology, cogently hitting upon the big ideas as they arose, were debated, and morphed with time, and showing their direct relevance to silviculture. At the end of this part of the book, they introduce the idea of complexity science, effectively arguing that forest ecology is "the poster child for complexity," and that as silviculture is (and must be) built directly on an ecological foundation, it needs to recognize this key reality and reform itself to more effectively and comprehensively meet the various goals society has assigned to it.

The strength of *A Critique of Silviculture* lies in its holistic vision and synthesis. Very little in the book, if anything, is new—in addition to many others, the authors themselves have already said much of what is here, albeit in pieces until now—but that is immaterial. By synthesizing the rationale, history, evolution, and possibilities of silviculture, they do a great service. Is the book perfect? Of course not. Here are a few minor quibbles.

Although my hunch is that most of what the authors claim to be true is true, I also think that the basis for some aspects of their critique of silviculture lies more in theory than in empirical evidence—yet they present their story as if there were satisfactory evidence that "new adaptive forestry management" does in fact lead to more desired outcomes under the range of challenges that face us now and will do so in the future. Such evidence is most likely quite limited because it is very difficult to establish and conduct the necessary long-term, large-scale manipulations and management experiments required to develop such data. Nonetheless, I would have been more comfortable if they had couched their argument largely on theoretical grounds and had been more circumspect about the actual evidence in favor of some of the claims for the benefits of alternative management strategies (whether they be corridors, spatial heterogeneity, or others).

I was also surprised by the limited focus on landscape and regional coordination, although the authors noted early on that the book focuses on stand-scale management. Why the surprise then? Two linked reasons: First, for reasons laid out in the book, landscape and regional heterogeneity influence both the appropriateness and merits of specific goals for any given stand, as well as the probability of such goals being met; second, the authors gave only limited attention to landscape management, yet these researchers are proponents of and active in pioneering attempts at this

exact type of landscape and regional forest management. To my mind, it is unfortunate that this issue did not receive more emphasis, because the question of whether and how a mix of different forest objectives on a landscape—even if some of them were homogeneous at a stand scale—might increase heterogeneity and adaptability is very important.

One could play devil's advocate and argue that a dynamic mix at the landscape scale of stands managed in the static, old-school style of silviculture might do almost as much to strengthen resilience as managing individual stands with an eye to enhancing within-stand complexity, but without landscape-scale coordination. However, as the book does not address such issues in much detail, we do not enjoy the benefits of the authors' vision on these points. The authors may have strategically chosen to largely ignore this issue to keep the book to a reasonable scope, but I feel they lost an opportunity in not exploring the matter more than they did.

In all, I heartily recommend *A Critique of Silviculture* to anyone engaged or interested in forestry and how it shapes our forests and landscapes. The book will very likely inspire much debate—and more important, collective synthesis and development of a new silviculture for the 21st century.

PETER B. REICH
Peter B. Reich (preich@umn.edu) is Regents Professor and Distinguished McKnight University Professor in the Department of Forest Resources at the University of Minnesota in St. Paul.

NEW TITLES

Air: Our Planet's Ailing Atmosphere. Hans Tammemagi. Oxford University Press, 2009. 256 pp., illus. $27.95 (ISBN 9780195430073 cloth).

The Biology of Coastal Sand Dunes. M. Anwar Maun. Oxford University Press, 2009. 288 pp., illus. $75.00 (ISBN 9780198570363 paper).

Cold-water Corals: The Biology and Geology of Deep-Sea Coral Habitats. J. Murray Roberts, Andrew J. Wheeler, André Freiwald, and Stephen D. Cairns. Cambridge University Press, 2009. 352 pp., illus. $125.00 (ISBN 9780521884853 cloth).

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doi:10.1525/bio.2009.59.9.15

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The Princeton Guide to Ecology. Simon A. Levin, ed. Princeton University Press, 2009. 842 pp., illus. $95.00 (ISBN 9780691128399 cloth).

The Religion and Science Debate: Why Does It Continue? Harold W. Attridge, ed. Yale University Press, 2009. 240 pp., illus. $16.00 (ISBN 9780300152999 paper).

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Restoring Wildlife: Ecological Concepts and Practical Applications. Michael L. Morrison. Island Press, 2009. 368 pp., illus. $45.00 (ISBN 9781597264938 paper).

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The Tangled Bank: An Introduction to Evolution. Carl Zimmer. Roberts and Company, 2009. 394 pp., illus. $59.95 (ISBN 9780981519470 cloth).

ENVIRONMENT

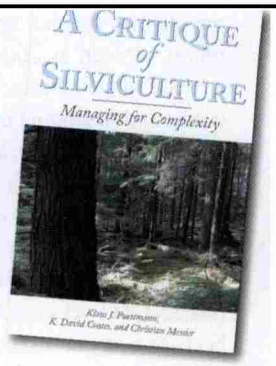
Date: Thursday, October 01, 2009
Location: WASHINGTON, DC
Circulation (DMA): 4,295 (N/A)
Type (Frequency): Magazine (6Y)
Page: 40,41
Keyword: Island Press

A CRITIQUE OF SILVICULTURE: MANAGING FOR COMPLEXITY

by Klaus J. Puettmann, K. David Coates, and Christian Messier; Island Press, Washington, DC, 2008; 206 pp., $60.00 hardcover (978-1-597-26145-6), $30.00 paperback (978-1-597-26146-3)

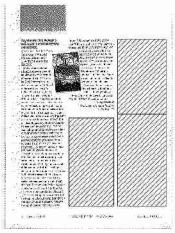
A Critique of Silviculture is a groundbreaking analysis of how the two disciplines concerned with forests, silviculture and ecology, move on parallel paths with little interaction between scientists. Authors Klaus Puettmann, a professor of silviculture and forest ecology at Oregon State University; K. David Coates, a research silviculturist at the Ministry of Forests and Range in British Columbia; and Christian Messier, a professor of forest ecology and director of the Center for Forest Studies at the University of Quebec, successfully argue for greatly expanding interdisciplinary work—especially to assure that, as we continue to manage forests for society, we improve efforts to maintain forest ecosystem complexity. With forest harvesting coming under increasing public scrutiny and forests expected to provide an increasing array of products (including, for example, carbon sequestration and biofuels), this book is timely and insightful.

The first three chapters cover the history and development of the fields of silviculture and ecology. The more than 200-year history of silviculture is a fascinating study of local foresters in Europe as they met changing demands for a variety of products via a trial-and-error approach to harvesting techniques. For example, "thinning"—the modern practice of aiding the growth, health, and development of preferred trees—actually began as a method to provide small trees for local markets with no concern for the growth or health of remaining trees. A key turning point for silviculture came in the nineteenth century as the Industrial Revolution created distant markets for wood products. The traditional, local use of wood had been governed by a model of sustained yield; the new model focused more on maximizing rates of returns, which meant a transition to shorter rotations favoring faster-growing species.



By contrast, ecology is a much younger science, one that began with Charles Darwin and other early scientists examining the relationships between organisms and their environment in the late nineteenth century. It evolved to examine concepts such as natural community structure, competition, succession, and population dynamics in its early years. While silviculture is based on an agricultural model with studies comparing various treatments to improve tree growth and productivity, ecology examines nonlinear relationships among complex parts of a natural community and often uses complicated mathematical models.

The final two chapters contrast the two disciplines and propose steps to incorporate emerging ecological theories into modern forestry. The challenge in melding the two disciplines is to produce a continuing supply of products for society while maintaining ecosystem biodiversity, resilience, productivity, and complexity. In the process, the study of ecology can benefit from the more management-oriented discipline of silviculture by using the long history of comparative studies and tested techniques for producing products for society. The authors lay out principles necessary for forestry to make the leap to more complex forests, including the concepts of managing the forest, not just the trees; accepting more variabil-



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ity in managed forests; and measuring forest structural targets on a landscape basis. Ultimately, to attain the benefits that complex, adaptive forests can provide, such as resilience to climate change and invasive species, society and forest landowners need to realize the value of these benefits. The authors successfully lay out a justification and roadmap to continue this necessary transition.

Bob O'Connor
Executive Office of Energy and Environmental Affairs
Boston, MA

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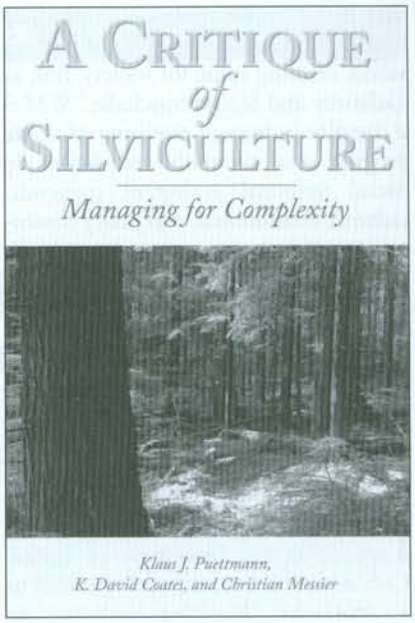
A Critique of Silviculture
Managing for Complexity

Klaus J. Puettmann, K. David Coates and Christian Messier. 2008. ISBN 978-1-59726-146-3Island Press, Chicago. $ US 30.00 (cloth) + shipping. Contact: orders@islandpress.org



According to the authors of this new volume, silviculture currently "stands at a crossroads." The discipline is bound by tradition and is no longer served well by concepts and practices that have evolved little since the 18th and 19th centuries. They feel that silviculture has focused on timber yield and production throughout most of its history, while the need to sustain the full function and dynamics of forested ecosystems has been largely ignored until recent times. A significant shift in both research and practice is now required to ensure the discipline maintains public trust and satisfies demands for higher standards in environmental conservation.

In advancing their thesis, the authors compare the development of silviculture with the closely related discipline of ecology. In line with 19th century philosophical and scientific understanding of nature, silviculture emerges as an extension of agriculture, with its emphasis on uniformity, efficiency, simplification of ecosystems and predictability of outcomes (Chapter 2). In contrast, ecology has evolved along a rather different trajectory, resulting in a set of theories that can be used to explain ecosystem processes and interactions (Chapter 3). Contrasting scientific methods are seen to underscore the differences between each discipline. Where silviculture has traditionally been concerned with minimizing variation within ecosystems, ecology has embraced complexity.

For silviculture to "regain its *lettres de noblesse*," the authors contend that a greater interchange of ideas with ecology is required (Chapter 4) and that forests should be viewed as "complex adaptive systems" (Chapter 5). The traditional "command and control" approach, where forests are managed as wood fibre farms, must be abandoned in favour of strategies that incorporate wider ecological information. To achieve this end, they argue for a conceptual framework that includes: applying a diversity of silvicultural treatments at various spatial and temporal scales; monitoring a wider variety of ecosystem components and moving beyond the stand concept; incorporating more risk and uncertainty into management; and, developing more gradient- and process-based silvicultural research. Among the important implications of these proposals are the need to understand more fully the processes that drive productivity and ecological resilience, and acceptance of greater heterogeneity in future forest conditions.

In setting out an agenda for action, *A Critique of Silviculture* provides a historical review that complements many current texts in the discipline. It builds a case for looking at forests as highly complex systems and for incorporating elements of complexity theory in silvicultural science. Many readers will agree that a fresh approach is necessary and will welcome this carefully prepared and scholarly treatment of the subject. However, some will not be easily convinced by the dichotomy between silviculture and ecology. There has long been a close interplay between both disciplines, to the extent that many silviculturists have also been highly regarded ecologists. Professor M. L. Anderson FRSE (1895–1961) is one eminent silviculturist who actively promoted experiments in what the authors might term complex adaptive systems in the early 1950s. Furthermore, the challenge in silviculture is not always one of maintaining ecosystem integrity but the need to balance many other competing interests that impact forest management.

Throughout Europe and North America there is wide interest in managing woodlands according to close-to-nature principles. The ProSilva Europe organization and the Continuous Cover Forestry Group (UK) have been active since the late 1980s in promoting silvicultural practices that equate with many of the ideas contained in *A Critique of Silviculture*. A current preoccupation for many silviculturists is the process of transformation of forests from relatively simple to more complex structures. The community forest at Freudenstadt, in the Black Forest, (venue for the 2008 ProSilva Congress, attracting >300 silviculturists) is just one example where a variety of silvicultural treatments are being applied in response to a new ecological understanding and to maintain ecological resilience. As a result, I found myself looking for more detailed case studies of woodlands and discussion of transformation. Nevertheless, ideas about the role of process-based ecosystem models and the need to step back from strictly defined yield predictions are important contributions that many foresters will want to explore further.

In short, *A Critique of Silviculture* should stimulate discussion about new approaches to silviculture research and practice. It will provide a useful reference for advanced students in both silviculture and forest ecology, and will be of interest to many forest resource professionals. Whether one believes in evolution or revolution, this book projects a powerful case for change and deserves to be widely read.

Reviewed by
Edward Wilson
Medical School,
University of Sheffield,
Sheffield, United Kingdom

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5.0 out of 5 stars **Excellent treatment of subject with surprisingly wide applicability**, December 30, 2008
By **maxwells daemon** (in the aether) - See all my reviews
For at least two thousand years, forests have been managed in some fashion to maintain productive harvest for fuels, building materials, paper and other products. Started as a local part of the economy, forest management has morphed into a intensive cropping system that places millions of hectares across the world into production each year. The goal of the system is maximal return on investment, with a view that this is best accomplished with factory methods.

The result is that a tunnel-vision view of trees as simply industrial product has blotted out the importance of ecosystem functions of natural forests. Natural forests are replaced by evenly grown, homogeneous blocks of trees with limited diversity. Not only is the composition of the natural forest profoundly changed at the level of the tree species, the rich community of the natural forest is destroyed. The loss of biodiversity has profound implications for the planet as a whole.

The authors do an extraordinary job building multiple contexts in a few very readable chapters. The chapters are well organized. Complex issues presented in ways that make them very understandable. Jargon is minimal and, where needed, clearly defined.

The book traces the evolution of silviculture through history from ad hoc methods to formalized modern methods (the modern methods are presented as including science, but the system is taken to task for being more learned-based than thought-based).

Silviculture gives way to a discussion on theoretical ecology. The discussion is a tight and excellent review the science of ecology and its evolution from Darwin to present thoughts on the dynamics of ecosystems and the organisms they contain.

The two major threads of silviculture and ecology are woven together, culminating in the final chapter on managing industrial

forests as complex adaptive systems rather than factory floors.

The size of land covered by industrial tree farming is huge and growing each year. Modifying the goals of the industrial forest has great potential for creating forests that yield both industrial wood product and rich ecosystems. This book transcends the niche of silviculture and has broad importance. It is also an excellent read.
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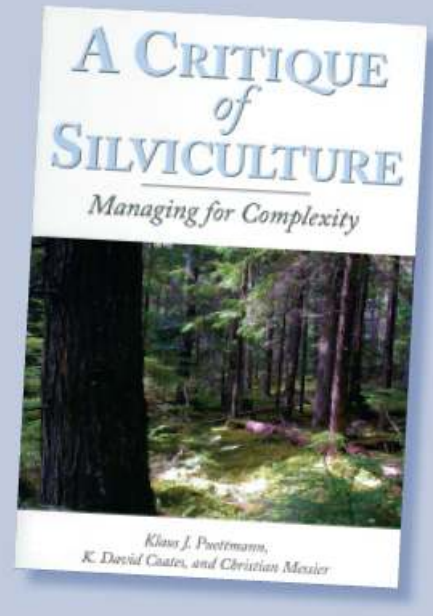
Book Review

A Critique of Silviculture: Managing for Complexity

By Klaus J. Puettmann, K. David Coates and Christian Messier
Island Press 2008. xvi and 188p.
Hard and soft cover versions available



If I were asked to recommend a single book to BC forest professionals to read this year, **A Critique of Silviculture** would be the one. The writing is accessible, engaging in places, challenging in others and packed full of insights. The authors have lofty goals. They set out to convince the reader that forests should be managed as complex adaptive systems, and that to do this, forest professionals need a new conceptual framework to organize their thinking about how to practise silviculture and manage forests.

They begin their critique by taking us on a tour of the history of silviculture, and in particular, German silviculture, the birthplace of many forestry ideas and ideals. In doing so, they focus the reader's attention on the key concepts of silviculture in unique fashion. They then take us on a quick and relatively painless tour of ecological thinking and the central ideas of that branch of knowledge. Building a bridge between silviculture and ecology is one of their purposes and they are most successful when they cleverly contrast the way in way a forest professional and an ecologist might view an old growth forest. The final chapter on forests as complex adaptive systems contains the core of their argument and is the most difficult, but ends with relatively simple key points for forest professionals to consider.

Whether this book irritates you or sets you to nodding with agreement, the authors will have succeeded. Change will be slow but as the aging French general said when asked why he was planting a tree on his estate that would take decades to mature, "we have no time to lose."

Reviewed by Alan Vyse, RPF

Ranking: 5 out of 5 cones