A Critique of Silviculture: Managing for Complexity

Author: Reich, Peter B.

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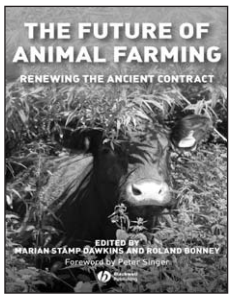
production systems—and these choices must be based upon dialogue and information.

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.

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