Synthesis

Ecology-Based Landscape Planning and Management

Thomas R. Crow

1 The Three Faces of Sustainability

The words "sustain" or "sustainable" are commonly found in the mission statements of resource management agencies. The mission of the USDA Forest Service, for example, is to "sustain the health, diversity, and productivity of the Nation's forests and grasslands to meet the needs of present and future generations." Sustaining the health, diversity, and productivity of a resource has certain fundamental requirements (Thayer 1989; Fedkiw et al. 2004). They start with a commitment to manage land and the water resources for the long term. It requires connecting the people living in the landscape with the natural resources that support their lives. It has to be inclusive of all sectors and functions of society by embracing meaningful civic involvement. And finally, sustaining the health, diversity and productivity of natural resources must create opportunities and preserve choices for people. These requirements necessitate a comprehensive approach in which economic, environmental, and social sustainability are given equal weight and are considered concurrently. Landscape ecology provides a conceptual as well as an operational framework for considering the three faces of sustainability.

2 Moving from Concept to Practice

The five chapters in this section support moving from concept to practice. Practicing sustainability within the context of landscapes is the unifying theme among the chapters. Each chapter illustrates the utility of a landscape perspective for considering sustainability in a variety of social and environmental settings. In Chapter 14, Azevedo et al. evaluated the changes in landscape structure and function that occur due to the application of a forest certification program, the Sustainable Forestry Initiative (SFI), in Texas, USA. They address the question: how is the widely applied SFI changing the

T.R. Crow
Research and Development, Environmental Sciences Staff, USDA Forest Service, Stop Code 1113
1400 Independence Avenue, SW Washington DC 20250-1113 USA
e-mail: tcrow@fs.fed.us

R. Lafortezza et al. (eds.), *Patterns and Processes in Forest Landscapes*,

landscape patterns in the intensively managed forests of East Texas? As always, there are trade-offs. There are winners and losers, but in general, the application of SFI at the landscape level improves hydrologic function and habitat suitability.

Authors for several of the chapters in this section of the book present landscape-level strategies for conserving biological diversity. The first of these, Pfund et al. (Chapter 15), explored the shift in paradigm from emphasizing reserves for conserving biodiversity to considering multifunctional landscapes with a spectrum of land uses ranging from protection to intensive utilization. The value of this new paradigm is the ability to integrate the livelihood of the people living in the landscape with biodiversity conservation. Pfund et al. provide valuable guidelines for connecting people with their natural resource – starting with creating the institutional partnerships and ending with regular monitoring. In contrast to the tropical setting presented in Pfund et al. where preventing forest fragmentation is a likely goal, in Chapter 18 Watts et al. had as their goal restoring connectivity among existing woodlands in the UK that are highly fragmented. As others have done (e.g., Gustafson 1996; Finney 2000), Watts and his co-authors stress the need to evaluate the effectiveness of spatially targeted treatments on the landscape. A challenge in doing so is the lack of information about species responses to change in landscape structure.

Turner (1989) defines landscape ecology as the study of the effect of pattern on process where "pattern" refers specifically to landscape structure. Two chapters in this section, Li et al. (Chapter 16) and North and Keeton (Chapter 17), dealt with the relation between landscape pattern and ecological processes. Li et al. compared and contrasted the patterns created by forest fire and timber harvesting on carbon stocks in two locations, boreal forests in central Saskatchewan, Canada, and sub-alpine forests in Miyaluo, Sichuan Province, P.R. China. Their study focused on carbon dynamics in living biomass and the ability to increase carbon pools through management. The strategy, while depending somewhat on the biotic and physical characteristics of the ecosystem, is basically the same – managing the age-class structure of the forest on the landscape.

Emulating natural disturbance regimes in management has been presented as a basis for practicing sustainable resource management (e.g., Palik et al. 2002; Crow and Perera 2004). North and Keeton used case studies from three U.S. forest types to explore the utility of this concept. A common approach is to compare managed forests to their "historic range of variability" (HRV), assuming that management is sustainable if the boundary conditions defined by HRV are not exceeded. The concept, however, as North and Keeton suggest, is difficult to implement. One problem is that the trade-offs among the three faces of sustainability – economic, environmental, and social – are rarely evaluated in a comprehensive way.

3 Finis

Landscape ecology has much to offer for developing sustainable social institutions and environmental practices. But as the authors of these chapters suggest, much remains to be learned about applying the concepts, theories, and methods from

landscape ecology to the practice of sustainability. We do know, however, that a piecemeal approach in which one species, a forest stand, or a single ownership is considered in isolation is neither desirable nor tenable. Instead, a comprehensive, integrated approach needs to be applied at large scales – and this is exactly the strength of landscape ecology.

References

Crow TR, Perera AH (2004) Emulating natural landscape disturbance in forest management – an introduction. Landscape Ecol 19:231–233

Fedkiw J, MacCleery DW, Sample VA (2004) Pathways to sustainability, defining the bounds on forest management. Forest History Soc, Durham, NC

Finney MA (2000) Design of regular landscape fuel treatment patterns for modifying fire growth and behavior. Forest Sci 47:219–228

Gustafson EJ (1996) Expanding the scale of forest management: allocating timber harvests in time and space. Forest Ecol Manag 87:27–39

Palik BJ, Mitchell RJ, Hiers JK (2002) Modeling silviculture after natural disturbance to sustain biodiversity in the longleaf pine (*Pinus palustris*) ecosystem: balancing complexity and implementation. Forest Ecol Manag 155:347–356

Thayer RL Jr (1989) The experience of sustainable landscapes. Landscape J 8:101–110

Turner MG (1989) Landscape ecology: the effect of pattern on process. Annu Rev Ecol Syst 20:171–197