

# Multiple-Use Management<sup>1</sup>

## Ecosystem Perspectives of Multiple-Use Management

The following papers are in part a product of a technical session that was conducted at the American Association for the Advancement of Science (AAAS) Annual Meeting in February 1991 in Washington, D.C. Attention to this topic of ecosystem-based multiple-use management is motivated by two major initiatives. First is the United States Department of Agriculture Forest Service strategy of taking a new direction in its research and management program for 191 million acres of national forests and grasslands (8.2% of the area of the United States). Termed "New Perspectives for Managing the National Forest System," this new direction modifies and broadens the multiple-use paradigm to one of ecosystem management as described by Kessler et al. (this volume). Thus, ecologically based concepts, principles, and technology provide the underpinning of this new direction. A second factor that makes this topic timely is the "Sustainable Biosphere Initiative: An Ecological Research Agenda" proposed by the Ecological Society of America. That initiative focuses on the role of ecological science in the wise management of resources and the maintenance of life-support systems. One element of the initiative highlights the need to develop and apply ecological theory to the management of ecological systems.

The goals of these papers are to: (1) share the concept, philosophy, needs, and opportunities related to *New Perspectives*, and (2) illustrate with examples the role that ecosystem research has played **and/or** could play in multiple-use management as viewed from a broader perspective. We approached these goals by selecting diverse and important forest ecosystems across the country. Scientists with an ecosystem orientation in these regions were asked to consider concepts, methods and approaches, or principles that serve as examples of the past, current, or future applications of ecosystem research to resource management. Their assessments range from rather specific examples to conceptual analyses at a broad scale.

The first paper, by Kessler, Salwasser, Cartwright, and Caplan, provides the template for new directions in Forest Service programs that are needed to meet changing views of natural resource management. Labeled "New Perspectives," a central theme is that ecosystem-based science and management on national forest lands are required to meet public needs and expectations. The authors also discuss the changing roles for science, including more emphasis on interdisciplinary research and collaboration between scientists and managers. In the next paper, Sharitz, Boring, Van Lear, and Pinder discuss themes and concepts compatible with the stewardship philosophy of "New Perspectives" as applied to southern forest resources. The themes include maintenance of biological diversity, fragmentation of the landscape, maintenance of environmental quality, **and** balancing economic commodities and ecological values. The authors approach this regional analysis by integrating past and current ecological conditions of southern forests, patterns of land ownership, and examples from ecological research in the region. The third paper, by Hornbeck and Swank, illustrates how watershed ecosystems analysis can be used to evaluate the effects of alternative management practices on natural resources of eastern forests. The authors trace the history of watershed research from the early emphasis on forest hydrology to current trends of using watersheds as a basic tool for interdisciplinary study of ecosystem structure and function. Examples involving forest harvesting demonstrate how assessments of sustainable productivity and quality of stream water can be derived from watershed ecosystem analysis and how results can be incorporated into recommendations for ecosystem management. In the fourth paper, Gosz addresses the important issue of how to extrapolate ecological process-level information, usually taken at small scales, to the broader scales in time and space needed for management planning and applications. He approaches this through analyses

<sup>1</sup> Reprints of this 56-page group of papers on forest management are available for \$6.00 each. Order reprints from the Business Manager, Ecological Society of America, Arizona State University, Tempe, AZ 85287-3211.

over gradients, using conditions in western forests at community and regional scales as examples. The central theme in gradient analysis is that ecological phenomena must be understood in the context of the physical environmental constraints operating in the ecosystem, the biota and interactions of biota that operate within those constraints, and the interactions between the biota and environment. The application of gradient analysis to ecosystem management is an emerging concept; since few examples exist, the author concludes with suggested topics for application. The concluding paper by Swanson and Franklin shows the benefits of using ecosystem analysis to derive management options for Pacific Northwest forests. The authors use results of ecosystem research to examine management practices from perspectives of the recent past, current trends, and future opportunities. A central theme is how an understanding of natural disturbance processes can be used to modify stand management practices, particularly intensive plantation management. They also illustrate how models can be applied to alter cutting patterns at a landscape scale to achieve ecological objectives and the ecosystem basis for alternative

**stream/riparian** zone management strategies. The paper concludes with a discussion of the roles of ecosystem scientists given the future direction of natural resource management.

The melding of ecosystem science with natural resource management is in its infancy. A Forest Service commitment to manage National Forests and Grasslands to achieve environmentally acceptable multiple-use management while simultaneously providing a full array of values to the public presents a unique, challenging opportunity to apply ecological principles. These papers identify and illustrate some of the opportunities. Obviously, other ecosystems and examples could be examined and this is just a beginning effort. We thank AAAS participants for comments and questions and numerous reviewers for technical suggestions that served as a guide for paper structure and context; a special thanks to the authors for addressing such a complex topic.

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