Wilderness Ecosystems, Threats, and Management

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The Wilderness Act of 1964 gave wilderness managers a difficult and challenging mandate. Wilderness areas are to be kept in a wild and natural state—relatively free of human influence and human control. Their value is dependent on the degree to which they remain unmodified—a contrast to the highly modified world in which most of us live. However, even the ecosystems in these most protected of public lands are threatened by human activities both internal and external to wilderness (Cole and Landres 1996). Impacts from these activities vary in both intensity and areal extent. Recreation use, often heavy and highly concentrated, has turned many sites into compacted, erosion-prone places, stripped of vegetation and topsoil. Livestock grazing impacts, while absent in a majority of wilderness areas, have been profound where they occur, with impacts from current grazing practices often less pronounced than those of the past (Vankat and Major 1978). The impacts of fire suppression, while less intense, are widespread. Huge acreages of wilderness have already experienced profound changes in vegetation structure as a result of this activity. Air pollution effects may be even more pervasive and problems with exotic invasions are increasing all the time.

As recognition of the prevalence and severity of human impact in wilderness increases, pressure to restore wilderness ecosystems—to compensate for human influence—mounts. Some managers are advocating intentional manipulation of wilderness ecosystems—from thinning of vegetation and management-ignited fire to liming of water bodies and genetic manipulation. This raises the serious dilemma of whether it is best to emphasize naturalness or wildness in wilderness—whether to minimize human influence or human control (Cole 1996).

Science is needed to provide a foundation for appropriate management of wilderness ecosystems. Rich research traditions in the fields of wilderness recreation impact and fire have contributed to relatively firm scientific bases for dealing with these threats. Air quality programs, strengthened by the mandates of the Clean Air Act, are also relatively well developed. Most other threats to wilderness ecosystems have received even less attention. This problem is aggravated, moreover, by the fact that many scientists who work on large undisturbed ecosystems make little attempt to apply their knowledge to wilderness management.

Managers need research on the nature and significance of a wide variety of anthropogenic impacts, as well as an understanding of factors that influence impact characteristics. They need an improved understanding of natural conditions and processes and the extent to which existing conditions deviate from natural conditions. They need practical indicators and techniques for assessing conditions and monitoring deviation from natural or acceptable conditions. Armed with this knowledge, managers should be in an improved position when deciding where and what management is appropriate.

This volume is devoted to research on human activities that threaten the integrity of wilderness ecosystems, impacts of those activities, and management approaches that minimize these impacts. It is organized into seven sections. The first section provides five overview papers, one on each of five major threats. Yu-Fai Leung and Jeff Marion provide a comprehensive overview of the field of recreation ecology and update the synthesis of recreation impact research provided in the proceedings of the first wilderness science conference (Cole 1987). Jim Agee synthesizes the rich research tradition on fire and its management in wilderness, again updating a review developed for the first science conference (Kilgore 1987). Research on air quality issues and their management in wilderness, another topic covered in the first science conference (Schreiber and Newman 1987), is reviewed by Kathy Tonnessen. The final two overview papers provide research syntheses and perspectives on threats that were not addressed at the first science conference. Mitch McClaran examines livestock management in wilderness, while John Randall covers management of alien plants.

The second section consists of research papers on recreation impacts and their management. While some of these papers improve our understanding of the fundamental nature of recreation impacts, many are devoted to assessment and management of impacts. Papers in the third section deal with wilderness restoration. Most of these papers are concerned with restoration of sites damaged by recreation use. Papers on restoration of fire in wilderness are included in the fourth section, along with other research papers on fire regimes, impacts associated with suppression of fires, and appropriate fire management in wilderness. The few research papers presented on air, water, and exotic species issues are collected in the fifth section. Broad papers on wilderness management and planning are collected in the sixth section. The final section consists of the one dialogue session included in this volume, a session devoted to the dilemma of manipulative restoration of wilderness ecosystems.

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