ECOSYSTEM MANAGEMENT AND WILDLIFE MANAGEMENT: COMPATIBLE OR CONFLICTING?

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Abstract: Examples of wildlife-human conflicts include deer-automobile collisions, disease transmission concerns, and damage to various commodities (e.g. agricultural crops, timber production). The extent of these problems is increasing at a time when American's attitudes are shifting emphasis from commodity production to concern for the environment. Ecosystem management has been proposed as a strategy to balance concerns for commodity production and the environment. Ecosystem management, unlike traditional natural resource management, will require management over large areas for long periods of time. This new philosophy of land management requires that the natural resource base be viewed in its entirety, and not as separate and independent parts. Ecosystem management will require cooperative decision making by all stakeholders. The public wants to be involved in the definition of a healthy ecosystem as well as determining management strategies that maintain and enhance the integrity of ecosystems. Social, economic and ecological factors must be considered if ecosystem management is to be embraced by the public. Ecosystem function over the landscape has been altered by many factors including habitat modification, elimination of large predators, and introduction of exotic species. Examination of these factors suggests that wildlife damage management will need to be an integral part of practical ecosystem management.

Proc. East. Wildl. Mgmt. Conf. 7:7-11. 1997

The last decade has brought changes in American's attitudes regarding natural resources and the environment. Emphasis is being shifted from production of commodities to concern for the ecological condition of the land, restoration of the natural landscape and preservation of ecological processes. Scientists, land managers, and others are proposing an ecosystem approach as the best way to balance concerns for commodity production and sustaining ecosystems.

During the same period, wildlife damage management efforts have increased across the nation, receiving close scrutiny from groups advocating "hands off" policies and animal welfare and animal rights concerns. These happenings beg the question, "Are ecosystem management and wildlife damage management compatible or conflicting?" Before attempting to answer this question we should first examine the current state of wildlife damage management problems in the eastern United States and the policy implications of ecosystem management.

WILDLIFE DAMAGE PROBLEMS

Wildlife cause a myriad of problems that include deer-automobile collisions, disease and reduced agriculture and forest productivity. The extent of the problems, especially regarding white-tailed deer (*Odocoileus virginianus*) have been increasing (Conover and Decker 1991). Conover et al. (1995) estimated 726,000 deer-automobile collisions nationwide in 1991 causing $1.1 billion in vehicle damage; 29,000 human injuries; and 211 human fatalities (Conover et al. 1995). In 1991 there were 11, 639 reported cases of wildlife-related diseases in the U.S. resulting in 192 deaths (U.S. Center for Disease Control and Prevention 1992). Lyme disease accounted for 81% of these cases. Using the information collected by Conover (1994) and Wywialowski (1994), Conover et al. (1995) estimated annual wildlife damage to U.S. agricultural production of $498 million.

In the eastern U.S. beaver (*Castor canadensis*) and white-tailed deer cause significant damage to timber production. In the southeastern U.S., beaver

have flooded more than 288,000 ha of forestland in 6 of 13 southern states (Arner and Hepp 1989) causing an annual loss of $22 million (Conover et al. 1995). Beaver also damage non-impounded timber by felling and gnawing trees.

White-tailed deer cause most of the timber damage in the Northeast. Experiments using exclosures have demonstrated that deer browsing can reduce height growth of regenerating forest stands resulting in longer rotations before trees are ready for harvest (Richards and Farnsworth 1971, Marquis and Brenneman 1981). Furthermore, deer browsing can alter forest species composition (Marquis and Gorsey 1978). In many situations, tree species that are desirable for timber production are also species deer prefer to browse (Marquis and Brenneman 1981). Conover et al. (1995) estimated that annual deer-induced damage to timber in the Northeast may approach $400 million.

The cumulative effect of wildlife-related damage losses is staggering. Conover et al. (1995) conservatively estimated annual economic losses in the U.S. approaching $3 billion. The ecological impacts of wildlife-related damage to ecosystems and the environment are less known.

POLICY IMPLICATIONS OF ECOSYSTEM MANAGEMENT

Many definitions of ecosystem management have been offered, but no widely accepted definition yet exists (Grumbine 1994). However, there are four major considerations that have policy implications that are common to most definitions (Wallace et al. 1994).

First, ecosystem management will require management for longer periods of time over larger land areas than has been practiced in the past. Ecosystems function in cycles that may span centuries. To ensure that ecosystems can function and renew themselves will require planning for many generations into the future. Species like black bear (*Ursus americanus*) may utilize 40 km^2 or more habitat in a year's time (Pelton 1982). It has been estimated that a black bear population needs an area of at least 200 km^2 to remain viable over a long period of time (Harris 1988). With current land ownership patterns, and an economic system based on enhancing short-term gains, society will need to consider longer time periods and cooperative management over large tracts of land that include many ownerships to accommodate species like the black bear.

Second, ecosystem management rejects the traditional idea that the world can be analyzed as separate, independent parts. The natural resource base needs to be viewed in its entirety. This consideration is difficult for many of us to understand. Farmers tend to focus on plant varieties, soil and water. Foresters are concerned with tree species that grow fast or have desirable properties for producing products. Wildlife biologists think more about animals, particularly those that are hunted, endangered, or preferred for their aesthetic value. Natural resource users and managers tend to be specialists. Ecosystem management will require that we consider all parts as they function together.

Third, ecosystem management will require open communication and cooperative decision-making. The need to integrate the knowledge and values of a broad array of individuals and organizations will require community and regional planning. All parties must be determined to reach a consensus rather than protect their individual interests. Natural resource agencies, user groups, and commodity-based industries must be flexible enough to embrace both the dynamic nature of ecosystems and the adaptive nature of ecosystem management.

The fourth consideration is perhaps the most important. The public wants to be involved in the process of defining desired ecological conditions and the means to achieve them. Definitions of ecosystem boundaries will be based more on social rather than scientific considerations. The public is suspicious of information put forth by scientists and managers whose interests are narrow and reflect the history of a discipline. We need to develop a firm consensus of how to approach ecosystem management that unites organizations, agencies, and

people. This can establish a base of trust and credibility from which we can move forward.

Collectively, these four considerations suggest that social, economic, and ecological factors must be integrated with ecological concepts if ecosystem management strategies are to be embraced by the public, particularly those who own land. In the eastern U.S., about 90% of forested lands are in private ownership (Powell et al. 1992). Public lands are often fragmented and managed to exclude natural disturbances such as fire, reducing landscape function. Legislation and regulation offer an approach to inject ecological considerations into land use policy, but the current debates concerning the reauthorization of the Endangered Species Act, the Clean Water Act and the 1995 Farm Bill clearly reflect the public's concern for private property rights and commodity values. Time and space scales appropriate to meaningful ecosystem management strategies in the eastern U.S. will require inclusion of large areas of private lands. Practical strategies will need to be developed with input from local stakeholders to consider the economic welfare of landowners and communities and to allow flexibility in dealing with specific situations such as wildlife damage problems.

ENHANCING ECOSYSTEM FUNCTION

Examination of ecosystems at the landscape level reveals that in most situations natural functions have been altered due to one or more of the following occurrences: 1) reduction and extinction of large predators, 2) habitat modification, and 3) introduction of exotic species.

The disappearance of large predators allows populations of ungulates, such as white-tailed deer, to occur at high densities that can alter habitat structure and composition to the detriment of other species such as nesting birds (Terborgh 1989). Reintroduction of large predators to regulate ungulate populations also has an aesthetic and emotional appeal for many people. Establishment of red wolf (*Canis rufus*) populations on the Great Smoky Mountain National Park and the Alligator River Refuge, and reintroduction of the gray wolf (*Canis lupus*) on the Yellowstone National Park have received national attention and created controversy between those favoring ecosystem function and those concerned with commodity production. Wolves are wide-ranging animals. If viable populations are established, individuals will eventually leave public property which will create concerns over wolf-human interactions and potential conflicts. Removing problem animals in these situations may be a necessary damage management option if the public is to support, or in some cases, tolerate reintroduction of predators.

Agriculture operations, forestry and other land management practices that modify habitat can also create conditions that favor early successional or edge species such as white-tailed deer, beaver, raccoon (*Procyon lotor*) and brown-headed cowbird (*Molothrus ater*). In time these species can become pests that create damage problems and negatively impact biodiversity. Early successional habitat along streams in the mountains of South Carolina has allowed extensive inundation by beaver which has altered water temperature and stream flow to the detriment of some aquatic species (Barnes 1993). Nest predation by raccoons and parasitism by brown-headed cowbirds have contributed to declines in neotropical migratory birds (Terborgh 1989). Restoration of ecosystem function, and maintenance of biodiversity, can be enhanced by controlling depredating wildlife numbers until habitat restoration can be established.

Control of exotic species such as feral hogs (*Sus scrofa*) on public lands like the Great Smoky Mountains National Park and the Congaree National Monument, should be an integral part of ecosystem management strategies in the Southeast. Katahira et al. (1993) demonstrated that feral hogs can be eliminated from large areas in Hawaii, if areas are fenced to prevent recolonization from adjoining properties. Pigs on the Hawaii Volcanoes National Park trample and root-up understory plants degrading native bird habitat, altering forest succession and drastically reducing the diversity and abundance of endemic plants on the island. The authors point out that the pig-induced alterations of natural processes conflicted with the refuge's

mandate to protect and manage native ecosystems. Similar problems exist on several barrier islands along the southeastern gulf coast where feral hogs are destroying sand dunes and native island plants. Across the Southeast, wild pigs have also caused problems with timber reforestation, damaged agricultural crops, and created the potential to spread diseases to other species (Sweeney and Sweeney 1982).

COMPATIBLE OR CONFLICTING?

Philosophically, appealing arguments could be made that ecosystem management and wildlife damage management are mutually exclusive. However, the abstract and reality seldom resonate in perfect harmony. Such is the case with ecosystem management and wildlife damage management. With societies extensive use and dependence on natural resources, and with 90% of the natural resource base occurring on private lands, wildlife damage management must be an integral part of viable ecosystem management strategies in the eastern U.S. Those strategies that involve public input will have a good chance for success. Open communication and cooperative decision making will be paramount if those who own the land and whose welfare depends on use of these lands are to support wildlife damage control efforts and ecosystem management. If we fail to allow flexibility to address specific problems like wildlife damage on private property, ecosystem management has little chance of success, regardless of legislation and regulation.

Wildlife damage management needs to broaden its scope to address ecological function. For example, species interactions like those between white-tailed deer and nongame animals, need to be understood. Animal damage management can enhance ecosystem function, biodiversity, and the long-term integrity of landscapes, particularly concerning exotic and invasive species. Wildlife damage management should focus on an integrated approach that maintains an ecological balance through preventive measures that control depredating animal numbers and regulate negative interactions before significant damage occurs. New techniques, like immunocontraceptives, are not likely to solve problems over large areas, but may find application on a limit basis with some species in certain situations (Guynn 1993). Adaptive wildlife damage management will be an important component of ecosystem management in the eastern U.S.

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