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Commentary

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GERARDO CEBALLOS*

Commentary

The use of ecological principles in designing management programs for the sustainable use of natural resources is a new and exciting field. The need to incorporate the ecological scenario in natural resources management has been promoted by the tremendous economic, social, and political problems that have arisen as an undesired outcome of projects lacking an ecological perspective.

It has been greatly influenced by the general awareness of the massive changes that are occurring in the physical and biological characteristics of our planet as a result of human activities. For example, recent estimates of the rates of extinction of plants and animals indicate that approximately 50,000 species may become extinct each year. The impacts of such tremendous losses of biological diversity on the ecology and the evolution of the earth's biota are unknown, but could be catastrophic. Additionally, the economic and social impacts of these extinctions will be extremely high.

Unfortunately, we have reached a state where our activities are not only affecting individual species, but are changing the structural and functional characteristics of the environment, and large scale problems such as global warming, acid rain, and ozone layer depletion are becoming increasingly common. It is rather clear that such changes are going to impose additional constraints on the use of natural resources. Therefore, any natural resources management plan has to take into account the local ecological conditions and the unexpected consequences of the predicted large scale global changes.

Dr. Francis' paper provides us with an impressive review of the philosophical development of the concept of "ecosystem management." This concept has its roots in ecosystem and political ecology, and it is based on the principles of sustainability; i.e., the "development that meets the needs of the present without compromising the ability of future generations to meet their own needs." He reviews several schools of thought in ecologism, including those of the academics and environmentalists. A basic distinction between these two groups and their positions is that academics have the scientific knowledge and environmentalists are the political activists; in many cases, the position of these groups towards an ecological problem are quite contrasting.

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Dr. Francis describes some general developments about the incorporation of ecological theory into the management of natural resources. He describes in detail the ecological conceptual framework that may be useful for ecosystem management, and points out that ecosystem managers may turn for guidance to several ecological theories such as Trophic Dynamics, Conservation Biology, Stress Response, and Catastrophic Theory. However, the complexity of the subject clearly points to the incorporation of ecologists into the teams of ecosystem managers. Indeed, ecology is a new science and many of its concepts are extremely difficult to apply in the decisionmaking process. Perhaps one of the most pervasive problems is the degree of compromise between ecologists and managers, which is strongly linked to economics.

The International Joint Commission: Dr. Francis' paper gives us a very complete account of the emergence of an ecosystem approach in the development of United States/Canada binational cooperation plans for the management of the Great Lakes. It is very encouraging to realize that Great Lakes management is incorporating an ecosystem approach. The ecosystem notions in the United States/Canada transboundary context emerged during the mid-1970s, especially because of the discussions held by a group of university seminars addressing the remedial measures for water use, pollution and fisheries management. A key point in such development was cooperation of universities, the IJC, and the Great Lakes Fisheries Commission. Additional meetings incorporated broader issues such as recreation, urbanization, and conservation of biodiversity. Several problems that have to be faced in designing an appropriate ecological management for the Great Lakes were the tremendous complexity of the issue, the lack of both holistic and preventive approaches, and the predominance of a self-serving attitude.

The International Boundary and Water Commission: Unfortunately, there is a complete lack of a coordinated regional and ecological approach to dealing with water use and management in the United States/Mexico border. The arid and semiarid lands of southwestern United States and northern Mexico are among the most fragile ecosystems on the continent. A key climatic feature defining the seasonal rhythms of these ecosystems is the limited availability of water. Yet these are biologically very rich ecosystems, harboring an immense array of plants and animals including many endemic species. Species of flora and fauna have evolved unique adaptations and specializations to cope with a very unpredictable and water-limited environment. Any development without a solid ecological perspective will jeopardize the long-term conservation of many species and the maintenance of the structural and functional attributes of these fragile arid ecosystems.

The lack of a general understanding of the ecological conditions in the Mexico/United States border has led to the implementation of

development policies that are, at least, wrong; in most cases, such as in the Ambos Nogales, are only magnifying the ecological, economic, and social problems. Indeed, ecological water related problems in the Mexico/United States border have become a textbook example. Dozens of plants, fishes, and other aquatic vertebrates and invertebrates are becoming extinct because of water depletion, channelization, siltation, and salinization of lakes, rivers, streams, and groundwater reservoirs.

Presumably, conditions will worsen in the future even without advocating the effects of massive global changes such as global warming and acid rain. Notwithstanding, an explicit policy of the United States and Mexican governments is to develop what are considered under-populated regions. Maquiladoras, agriculture, and human settlement are directly or indirectly promoted by governmental policies. Aside from the ecological damage that such developments may cause, it is clear that the future water supply of towns and cities will be a tremendous problem.

The only real solution to such overwhelming problems will be to integrate an ecosystem approach (i.e., an ecological and regional perspective) into the management plans for the Mexico/United States border, similar to the one implemented in the United States/Canada border. This will not only benefit the local human populations, but will contribute to the maintenance of the regional ecological balance, contributing to the long term wealth of humans and the preservation of native plants and animals. After all, it is our responsibility to protect and preserve the unique biological heritage of those fragile region for future generations.