Relations Between Ecology and Economics

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IT IS A PRIVILEGE and a pleasure for an economist to serve as co-chairman of this meeting of distinguished ecologists.

For some time, I have regarded ecology as a kind of sister discipline. Ecologists and economists have in common that the name of their discipline is derived from the same word, namely, the Greek term for habitat—*oikos*. This similarity is more than semantic. Both disciplines are interested in the relations between complex sets of variables, and both try to understand these relations as a meaningful whole. In other words, ecology and economics are both concerned with the analysis of "systems."

The ecosystems which are of interest to ecologists often contain variables that are influenced by man; that is, most ecosystems, implicitly at least, include socioeconomic variables. Often, these variables need explicit consideration, for example, if the productivity of ecosystems is considered.

On the other hand, the analysis of many economic systems requires understanding of ecological relations. This holds especially for the field of natural resource economics (Ciriacy-Wantrup, 1963). Within this field, economic analysis of fire as a tool of land management would be impossible without an understanding of fire ecology.

The economics and the ecology of fire converge when inputs and outputs of ecosystems are compared with a view to decision making by private individuals and public bodies. Inputs are then costs and

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outputs returns. They must be evaluated in order to be compared with alternative inputs and outputs. Otherwise, land management decisions to improve private incomes and social welfare cannot be sound.

Evaluation of costs and returns is undertaken through various formal and informal techniques known in economics as "benefit-cost analysis." Application of such analysis to the use of fire can benefit from the experience gained in the economic analysis of water development (Ciriacy-Wantrup, 1955).

Benefits and costs of the use of fire in forestry and grazing of domestic livestock can be evaluated fairly easily on the basis of market prices. Other benefits and costs, for example, those connected with wildlife and recreation, can be evaluated in pecuniary terms only with difficulty. This calls for improvements and operational simplifications of existing evaluation procedures. Sometimes difficulties of monetary evaluation can be avoided by appropriate reformulation of the economic questions which benefit-cost analysis is to answer. There is a pressing need for cooperative research in this area by ecologists and economists thoroughly familiar with the potentialities and limitations of benefit-cost analysis.

The area of benefit-cost analysis is not the only one where fire ecology and fire economics meet. Equally important is the understanding of the many socioeconomic institutions which influence the use of fire as a tool of land management. Such institutions may be either obstacles or aids. An understanding of their *structure*, their *functioning*, and their *performance* is the first step toward their modification with the objective of facilitating the use of fire as a tool (Ciriacy-Wantrup, 1961).

Among these institutions, there are, first, the many laws and regulations that define the responsibilities and rights of landowners, tenants, and the several "publics"—local, state, federal—that are involved. In some parts of the West, these laws and regulations prohibit the use of fire as a tool and in others make its use too expensive or too risky.

Second, there are the laws and regulations relating to various forms of taxation and to creditor-debtor relations. Tax and credit institutions can be either obstacles or aids in the use of fire in land management.

Third, there are the laws and regulations relating to the type of insurance which is available to individual land managers and to groups of land managers. The economics of insurance is of particular significance in fire economics.

Fourth, there is public landownership and similar forms of public control over land use, for example, public easements. Here again, such ownership and controls can be either obstacles or aids in the use of fire.

It is apparent from this sketch of institutional relations that natural resource economics in general and fire economics in particular are largely concerned with the study and the modification of institutional systems. Natural resource economics is analytically oriented institutional economics.

I have already taken more time than is customarily allotted to the chairman. The main purpose of my remarks was to suggest that there are two broad research areas in which ecologists and economists concerned with fire may fruitfully cooperate: The first is the area of benefit-cost analysis of fire use and the other is the study of institutional systems that hinder or facilitate the use of fire as an important tool of land management.

LITERATURE CITED

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