

# EFFECTS OF TOXICITY ON ECOSYSTEMS

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## 1. Definition of ecosystem

The purpose of this paper is to put the proposed epidemiological study of pollution effects into an ecological perspective. Before discussing effects of toxicity on ecosystems, I need to define a few terms. The term *ecosystem* was introduced by Tansley in 1935 [25] and its applicability to general ecological study was argued by Evans in 1956 [8]. An ecosystem is the sum of the organisms and the nonliving environment in a given area. A particular ecosystem can be as large as the whole earth or as small as the protozoa living in the gut of a termite; its actual size depends on the ecological questions being asked. In the study of an ecosystem as in the study of any other system, the functional pathways linking components and the interactions among the components are stressed. To a greater and greater extent, the methods and generalizations of systems analysis that have been developed in other fields are being brought to bear on the study of ecosystems [27], [28], [29].

A critical aspect of the description of an ecosystem is the delineation and study of its boundaries. All natural ecosystems are more or less permeable, that is, various substances cross the defined limits of the system and may have significant effects on its components. For example, a stream ecosystem receives water, dissolved substances, dead plant material, and numerous organisms from the land and radiant sunlight from above. Many organisms spend from a few moments to most of a life cycle within the stream, returning later to the land. There is extensive output from the system as it flows into the sea or some other body of water. Man removes water from the system for drinking and for various agricultural and industrial purposes and may return the water in a greatly altered form. He dumps various additional materials into the system at innumerable points. Thus, the study of what is going into and coming out of the system is almost as complicated as determining what is going on within the system itself.

## 2. Toxicity effects on the ecosystem

Toxicity effects on an ecosystem are chemical or radiation effects on a species or group of species that result in the reduction or elimination of these compo-