

A TROPICAL RAIN FOREST

A Study of Irradiation and Ecology at El Verde, Puerto Rico

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An intensive ecological study of several hectares of montane rain forest was made during the 1960s in the Luquillo National Forest in eastern Puerto Rico. The operation of the normal forest was studied and compared with a zone that for three months received gamma-radiation stress from a 10,000-curie cesium source that had been airlifted into the forest. The book reports the scientific results of the project, which used many techniques of systems ecology in the quest of understanding one of the most complex ecosystems on earth. Included in nine main divisions (111 chapters) are maps, tables of tree numbers, and taxonomic keys to facilitate new efforts at the El Verde site toward finding the best designs for man and nature in broad tropic lands.

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CONTENTS

The Rain Forest Project: Issues of scientific and management concern in rain forest lands and concepts of energetics and systems ecology around which the project was organized. (2 chapters)

The Rain Forest at El Verde: The normal Luquillo Forest, including plant and ecological populations and structure, comparisons of El Verde with other tropical forests, including one receiving herbicide, a review of extensive previous studies by the Institute of Tropical Forestry, a study of remote sensing, pollen analysis, and a 100-page report on the forest climatology during the project. (22 chapters)

The Radiation Experiment: The radiation experiment, the cesium source; the dosimetry; the field of irradiation, hypotheses related to the experimental design; and the project chronology. (5 chapters)

Plants and the Effects of Radiation: The effects of radiation on plants and on the succession of plant associations, including trees, herbs, seedlings, mosses, lichens, algae, and bromeliads, and on germination. (20 chapters)

Animals and the Effects of Radiation: The effects of radiation on animals, including snails, lizards, frogs, birds, microzoa, termites, mosquitoes, bats, and rats. (14 chapters)

Microorganisms and the Effects of Radiation: The effects of radiation on microorganisms, including surveys of mycorrhiza, myxomycetes, soil microflora, leaf and litter fungi, viruses, actinomycetes, and microbe-controlled forest vapor. (10 chapters)

Cytological Studies Within the Irradiated Forest: Cytology and microscopic order under field conditions of selection and stress, including studies of plant nuclear volumes, DNA, ferns, walkingstick insects,

apical meristems, and *Palicourea*, a remarkable radiation-resistant shrub, which predominated the postirradiation scene. (6 chapters)

Mineral Cycling and Soils: Water and mineral cycles and their soil reservoirs, including theories of forest structural adaptations, tracer and analytical studies of major and minor elements, and biomass inventory, water and tritium cycles and their simulation; the fallout radioactivity that was prominent in the forest during the period of study; and progress reports on the continuing mineral-cycling studies at El Verde. (22 chapters)

Forest Metabolism and Energy Flows: Overall functions, forest metabolism, and energy flows, including chlorophyll; energy considerations of termites, snails, and leaf grazing, a metabolic study of forest-floor microcosms; and metabolism and evapotranspiration of component plants, soils, and animals, with results of a giant cylinder experiment with a forest prism. In the final summarizing chapter and in the appendixes, there are tabulations of data from the other chapters, conceptual energy diagrams of relations, and computer simulations of simple systems models. Comparisons are made between the mechanisms for stability in the rain forest and those evolving in complex human systems, such as the city. (10 chapters)

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