BOOK REVIEWS

Ecology and Reclamation of Devastated Land

These are two volumes which contain the proceedings of a symposium held at The Pennsylvania State University, 3–16 August 1969. The stated goals of the symposium were to determine our present state of knowledge on the ecology and reclamation of devastated land, define the most critical gaps in this knowledge, and plan future research to provide needed information. Unfortunately, the proceedings were not published until 1973. However, they contain considerable basic information on the approaches to reclamation of disturbed land areas.

There were 66 papers presented by scientists from the United States and 10 other countries. The books consist of seven main parts: four in volume one and the remaining three in volume two. A discussion section follows each paper. In Part I, physical and chemical properties, there are 10 papers concerned with plant establishment and growth on the waste materials from mining of kaolin clay, copper, lead, uranium, oil shale, and coal. Also discussed is reclamation of deposits of pulverized fuel ash from power plants.

Physical properties of soil materials influence moisture-holding capacity, compaction and suitability of the areas for various crops. In general, the physical properties have not received as much attention as the chemical properties.

One major problem with spoil materials from coal mining in the eastern and central USA and other countries is the oxidation of iron disulfide which produces sulfur and acid. In one paper, a method was outlined for identifying and eliminating unsuitable overburden materials from the surface of the mined areas during the mining operation.

Generally, most spoil materials from surface mining are low in available nitrogen for plant growth. Other elements, such as phosphorus, have been found deficient in some spoils. Also, toxic levels of soluble Mn, Al, and other elements have been found in highly acid spoils.

In Part II, the hydrology and pollution of watersheds that have been stripmined for coal are discussed. Some of the changes noted in a watershed were increased ground water supplies, aid in flood control, and changed water quality in some areas.

The nature of the geologic material exposed and the presence of neutralizing materials will affect acid pollution of streams due to surface mining. Other reported factors which can influence acid production are the oxidation rate of the pyrite in the mineral and associated strata, the presence of iron bacteria, and the neutralizing capacity of the existing ground water.

Studies of the moisture and density relationships of graded stripping spoils are also reported. Differences in moisture and density relationships were evaluated in areas where the spoil was initially piled as well as the effect of grading on compaction.

Part III, biological changes, covers plant invasion and plant establishment on acid coal mine spoils including the invasion of terrestrial plants on a new volcanic island.

The presence of microflora and soil fauna in coal mine spoils and the return of these organisms to mined areas are discussed.

Sixteen strains of Rhizobium were evaluated for nodulating Robinia pseudacacia grown on four acid spoils ranging in pH from 3.9 to 5.0.

Studies are reported on the presence of small mammals on surface mined land in southwestern Indiana and on the wildlife benefits from reclamation in Appalachia.

Part IV, effects of plants, includes papers on the effect of physical and chemical properties of spoils on tree growth, time of planting, and evaluation of Alder species. The transpiration rate of two introduced species of grass was compared to a native grass on a high elevation site.

In a discussion of the resistance of plants to heavy metals, it is suggested that cell physiological test methods be used in screening plant species to be introduced on soils containing active heavy metals.

Part V, species evaluation, shows that considerable effort has been devoted to the selection of plant species that will survive and grow on drastically disturbed areas. The adverse site conditions should be evaluated and plant species selected that are most tolerant of these adverse conditions. Plant species that have been evaluated for such adverse sites are listed in this section.

Part VI, modification of adverse conditions, indicates there are a number of amendments that can be applied to ameliorate adverse conditions for plant growth on adverse sites. Some of the materials reported on in this section include: fertilizers, lime, sewage sludge, power plant fly ash, manure, bitumen emulsion, and mulch. A mechanical operation in which the spoil is graded into basins to increase leaching of salts and acid is discussed.

Part VII, advances of reclamation, this section discusses successful reclamation efforts on such adverse sites as gold-mine dumps, severely eroded areas, coal surface mining areas affected by SO2 from mining, and iron ore tailings. The use of aerial photo interpretation for landscape planning on an ecological basis and other reclamation measures are discussed. One paper discusses the use of landscape design principles in reclamation.

Reclamation of drastically disturbed areas involves many areas of expertise which is readily apparent from this review. The broad coverage of reclamation in these two volumes of Ecology and Reclamation of Devastated Land makes them valuable as reference books for soil scientists and others interested in land reclamation.—PAUL SUTTON, Professor, Department of Agronomy, Ohio Agricultural Research & Development Center, Caldwell, Ohio.

Heat and Mass Transfer in the Biosphere: Part I, Transfer Processes in the Plant Environment

Lectures and papers presented at a seminar on “Heat and Mass Transfer in the Environment of Vegetation” make up this volume. The seminar, which was organized by the International Centre for Heat and Mass Transfer, was held at Dubrovnik in August 1974, so the coverage is up to date. The volume is divided into sections: (i) Basic Processes and Methods of Observation, and (ii) Applications. The first part has sections on soil, lower atmosphere, and plants. The second part has sections on phytotransfer and pollution in the plant environment. Each section contains both review and research papers.

The lower atmosphere section is the largest (about 40%) and, I think, the best section of the volume. Most of the current problems in radiative-convective exchange involving leaves and plant canopies are discussed. Discussions were generally up to date, not only in outlining the current status, but in indicating the important problems of the near future.

I found the section on plants also interesting. It is a short section (10% of the volume) but has good discussions on water transport in plants. The review article by Jarvis on “Water Transfer in Plants” in particular brings together most of the current thinking on this subject and indicates problems with current concepts. I would rate this as worthwhile reading for anyone involved in water relations research.

I was somewhat disappointed in the soils section. It contained interesting papers, but most covered material which has been published elsewhere in a more usable form. However it does contain some useful discussions of water movement in swelling soils, and computer models and methods for solving simultaneous heat and water flow problems are presented. This section makes up about 20% of the volume.

Some of the reviews tended be bibliographic in nature. I personally would have welcomed additional detail in these reviews and evaluations of current techniques and theories by the reviewers. The papers were reproduced by offset printing of the original manuscripts, so the quality is only fairly good, especially variable throughout the volume. As one might expect for a volume of this type, the quality of the papers also is highly variable. In spite of this, I feel that the book contains the best currently available summary of literature and thought on heat and mass transfer in the biosphere.—GAYLON S. CAMPBELL, Biophysics and Soils, Washington State University, Pullman, Wash.