Book Reviews

Ecological Research in Alaska

Alaskan Arctic Tundra. Proceedings of a symposium, Barrow, Alaska, Aug. 1972. MAX E. BRITTON, Ed. Arctic Institute of North America, Washington, D.C., 1973. 224 pp., illus. Cloth, $10; paper, $7.50. Arctic Institute Technical Paper No. 25.

The Impact of Oil Resource Development on Northern Plant Communities. Proceedings of a symposium, Fairbanks, Alaska, Aug. 1972. BRENT H. MCCOWN and DONVAL R. SIMPSON, Eds. Institute of Arctic Biology, University of Alaska, Fairbanks, 1973. iv, 96 pp., illus. Paper, $3. Occasional Publications on Northern Life, No. 1.

Much of the success of the present accelerated research programs within arctic Alaska results from the broad base of information gained through research conducted at the Naval Arctic Research Laboratory at Barrow. *Alaskan Arctic Tundra* results from a symposium held to celebrate the 25th anniversary of the laboratory. The establishment of the laboratory in 1947 was the direct result of petroleum exploration in Alaska and the anticipated need for a broad knowledge of physical and biological processes on land and on the sea. This book is concerned with the land studies. It includes an introduction recounting the history of the laboratory, seven speeches that review the roles of the various supporting agencies, and seven technical papers. The technical papers review the major findings over the past 25 years and where appropriate relate them to the general literature.

A paper by Brown and Sellman discusses thermal and chemical properties, ice morphology, and the Quaternary history of permafrost. The authors call for coordinated, comprehensive, and sustained studies to provide a basis for regulation of the use of permafrost lands by industry and for government-sponsored development. A well-illustrated chapter by Walker discusses landforms and the processes by which they develop. The dynamics of the youthful landscapes of the arctic region is stressed, as are the short annual time periods in which many of the processes operate. Tedrow describes soils in relation to drainage characteristics and, where possible, to vegetation. Unfortunately only the older classification of arctic soils is used, with no indication of how this relates to the modified Seventh Approximation system. Kelly covers the history of micrometeorology on the North Slope, but concentrates on more recent studies on short-wave and total radiation, carbon dioxide flux, and ozone. These studies provided a sound basis for the International Biological Program (IBP) Tundra Biome research just being completed.

A detailed review of arctic limnology is given by Hobbie. He points out that although arctic lakes are at extremes with respect to limnological variables, there are no physical-chemical events or biota unique to the Arctic. The chapter by Johnson and Tieszen on vegetation covers plant community classification, structural adaptations, physiological processes, and responses of plants to perturbations (surface disturbance, oil spills, and revegetation). The IBP tundra study is greatly increasing our knowledge of arctic plant physiology. The paper by Pitelka summarizes 23 years of data on lemming cycles. The data through 1965 seemed to support the nutrient-recovery hypothesis, but since then there has been no real lemming peak, and it now appears that winter conditions (depth of snow, temperature) and predation play greater roles than was previously believed. This shows how important long-term data are in solving certain biological problems.

Those interested in arctic ecology will want to read this book for its full accounting of seven subjects that have long been studied on the North Slope. As Britton points out in the introduction, no attempt was made to cover all subjects, but the book is excellent and useful nevertheless.

The second book, coordinated by B. H. McCown and D. R. Simpson, contains 12 papers on the effects of soil surface disturbance and of crude oil, including natural seeps, on vegetation and microgranisms in Alaska. Although most of the studies reported were not completed when the symposium was held, quantitative data are presented except in the first paper, on adaptations of species for revegetation. In general the papers show that native plants, including microorganisms, have a considerable capacity to tolerate both surface disturbance of the soil and spilling of crude oil. Grass species were more easily established within the taiga and alpine sites than at the two arctic sites. Seed mixes and fertilizer levels were tested. One of the concerns has been whether plants will survive over winter on soils warmed by a hot pipeline. Growth was much greater both summers when compared to that of controls, but winter survival was reduced the second winter, largely as a result of a high population of native small mammal grazers. Application of crude oil at relatively low rates showed that arctic sedges were more tolerant than grasses. Similar spills within a black spruce forest appeared to cause little injury to trees and shrubs in two years unless branches were covered with crude. Where soils were saturated plant damage was more severe.

When surface soil is disturbed fungi decrease and bacteria increase. With the application of crude oil fungal species diversity decreased, yet populations of certain fungi increased significantly and examination of natural oil seeps revealed several species of bacteria as efficient decomposers.

The initial results of these studies funded under the IBP Tundra Biome program, several jointly with the Alyeska Pipeline Service Company, provide partial answers to questions still being investigated. The data provided by such studies are needed by both government and industry if oil field development and pipelining are to proceed in an environmentally acceptable manner. People associated with northern petroleum development in Alaska and Canada will find information in this book to be helpful in the development of management plans.

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