

which is needed to document this interesting flora to a fuller extent.

I wish however that the author had given more notes on ethnobotanical uses, however brief; these appear to be largely lacking; some exceptions appear in the cases of food plants, e.g., under *Metroxylon sagu*. It would have been easier to consult the vernacular names if they had been separated by a typographic or other means.

According to a rough count, there are 22 families of Pteridophytes (with 81 species), 5 families of Gymnosperms (with 16 species), and 131 families of Phanerogams present in the island. The total species count is roughly 1380; of which over 1280 are flowering plants.

B.C. STONE, *Bishop Museum*.

Ravages of Man

ALTERATION OF NATIVE HAWAIIAN VEGETATION. EFFECTS OF HUMANS, THEIR ACTIVITIES AND INTRODUCTIONS. Linda W. Cuddihy and Charles P. Stone. University of Hawaii Cooperative National Park Resources Study Unit. 3190 Maile Way, Honolulu, Hawaii. 1990. 138 pp. \$US18.00 (Paperback).

Under the above title appears an account of the ravages of *Homo sapiens*, the most destructive exotic animal species ever to reach the pristine shores of Hawaii, one of the truly remarkable ecosystems on the Planet Earth.

A chain of 18 islands, with many satellite islets and rocks, stretching northwestward across the Tropic of Cancer for over 2400 km, varying from sea level coral islands to gigantic volcanoes up to 4208 m high, and isolated by 3200 km from any major land mass, never connected with any continental land, this archipelago formed a unique biological, biogeographic, and evolutionary situation. Most of its higher land plants and almost all of its land animals were found nowhere else on earth.

Perhaps as *Homo sapiens* reached Hawaii under his own power, he should not be considered an exotic. However, since exotics are defined as organisms introduced by man, and since he brought himself, he still qualifies as an exotic. His destructive behavior, after arriving, has enormously outdone that of any subsequent introduction, as amply shown by the information collected together in this book.

This book is arranged in five parts, plus a truly remarkable list of books and papers cited. After a very short, but adequate geographic, geologic, and biogeographic introduction with maps locating place names used in the book, comes a major chapter on Hawaiian natural vegetation, descriptive and interpretive. This draws on most of the good previous works, with, however, a few curious omissions, several of which are even included in the Literature Cited. Though short, this is without question the most satisfactory available general account of Hawaiian terrestrial natural vegetation. It very adequately shows the results of attempts to picture what the islands were like, vegetation-wise, before the arrival of the Polynesians, 1500 or even 2000 years ago. Of course much of the reconstruction is speculative, but based on innumerable bits of real information, such as fossil pollen, a few fossils, the characteristics of existing plant species, and the present successions on new or recent lava flows.

The second major part deals with what the Hawaiians did to this plant cover before the coming of the Europeans. Estimates varying from several hundred thousand to over a million Hawaiians at one time all seem reasonable, based on different lines of indirect evidence and on accounts by the earliest European visitors. The truly amazing results of recent archeological work show a prehistoric agricultural system, irrigated and dryland, undreamed of only a few years ago. The impact of this on the vegetation was obviously enormous. There is shown to be little or no unaltered vegetation below 500 m elevation, except on new or recent lava. In addition to direct clearing, human-induced fire is shown to have been a major factor in modifying the dry and mesic vegetation types at low or moderate elevations on all except the very rainy steep windward coasts. The valley bottoms were the most densely populated and highly modified situations, even on windward coasts. At the time of European arrival, many landscapes, though probably originally forested, were dry barren grasslands and eroded slopes.

The next section of the book deals with changes during the early post-European period, between 1778 and 1850. Direct exploitation of timber, mostly sandalwood and koa, for export and local construction, and firewood for whaling ships, devastated lowland forest. Agriculture was intensified to supply ships. But by far the most destructive event was the introduction and natu-

ralization of four-footed herbivores, against which the native plants had evolved no defenses.

The fourth part of the book, covering the post-1850 period, portrays human-caused devastation and vegetational change increasing geometrically, until there is almost no natural vegetation left to change, though changes are still going on, involving the altered vegetation and the interactions of the exotic species among themselves. Plantation agriculture, and cattle ranching have totally eliminated natural vegetation over vast areas. Introduction of fire-promoting exotic grasses and shade-tolerant weeds now threatens what little is left. A major portion of this section is a series of detailed accounts of individual agents affecting vegetation and processes of vegetational change.

The last part is a short summary of the contents of the book.

Taken as a whole, the book portrays an appalling history of destructiveness, wanton, intentional, or unintentional, that is hard to reconcile with man as a rational or intelligent being. His effect on Hawaiian vegetation is, of course, a microcosmic example of his effect on the Planet as a whole, also of the fact that change still goes on at an accelerating rate. The earth, like the Hawaiian Archipelago, is finite in its resources, and a limit may be at hand, sooner than we think. An octogenarian begins to see some advantage in not

being here when the limit is reached. If you love the islands, read the book and weep!

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Recent Publications

Map—NATURAL RESOURCES AND CONSERVATION MAP OF THE FEDERATED STATES OF MICRONESIA. 85 × 125 cm. Designed and drawn by W. Austin Bowden-Kerby, produced by Micronesian Islands Conservation, Inc., Community College of Micronesia. 1990. Map shows seabird and turtle nesting sites, mangrove forests, etc. Available from MIC/CCM, P.O.Box 159, Kolonia, Pohnpei, FSM 96941. Black-and-white printed map \$10; hand-colored copies \$20; mailing tube (\$1.25) and postage extra.

Bibliography—BIBLIOGRAPHY OF PHILIPPINE SEAWEEDS. Compiled by Edna T. Ganzon-Fortes. Published 1990 by the Seaweed Information Centre (SICEN), Marine Science Institute, U. Philippines, Diliman, Quezon City, Philippines. 118 pp. ISBN 971-105-048-X. Includes publications and theses on Philippine seaweeds, plus works that refer to PI specimens. Eight hundred twenty-five entries are classified into subject headings (Taxonomy, Biology, Utilization, etc.).