

Nutrient Cycling and Limitation

Hawai'i as a Model System

PETER VITOUSEK

The availability of or lack of nutrients shapes ecosystems in fundamental ways. From forest productivity to soil fertility, from the diversity of animals to the composition of microbial communities, nutrient cycling and limitation are the basic mechanisms underlying ecosystem ecology. In this book, Peter Vitousek builds on over twenty years of research in Hawai'i to evaluate the controls and consequences of variation in nutrient availability and limitation.

Integrating research from geochemistry, pedology, atmospheric chemistry, ecophysiology, and ecology, Vitousek addresses fundamental questions: How do the cycles of different elements interact? How do biological processes operating in minutes or hours interact with geochemical processes operating over millions of years? How does biological diversity interact with nutrient cycling and limitation in ecosystems? The Hawaiian Islands provide the author with an excellent model system for answering these questions as he integrates across levels of biological organization. He evaluates the connections between plant nutrient use efficiency, nutrient cycling and limitation within ecosystems, and nutrient input-output budgets of ecosystems.

This book makes use of the Hawaiian ecosystems to explore the mechanisms that shape productivity and diversity in ecosystems throughout the world. It will be essential reading for all ecologists and environmental scientists.

"Peter Vitousek is tied closely to the 'vina—the land—of Hawai'i, both by birth and by the successful scientific career he has nurtured over the past two decades. His personal, and sometimes passionate, presentation sweeps across habitats, across phyla, and across disciplines. It is an authoritative account of his research and his vision."

—David M. Karl, University of Hawai'i

"This book by Peter Vitousek represents a major milestone in the field of ecosystem ecology. Well written and well organized, it combines nicely a comprehensive picture of ecosystem processes in Hawai'i with generalizations that are important to ecosystem ecology as a whole. The book goes a long way toward transforming the field from a descriptive science to one based on understanding of the underlying processes. For this reason, it will be widely read by both students and scientists."

—F. Stuart Chapin, III, University of Alaska

"Most people know Hawai'i as the world's playground. Serious students of the earth know better. Vitousek uses the unique characteristics of Hawai'i's climate and geology to unlock the secrets of nutrient cycling there, testing general principles as his reward. Ecologists, biogeochemists, and soil scientists should read this book."

—Robert B. Jackson, Director of Duke University's Global Change Center and author of *The Earth Remains Forever*

"This book is a sure winner! Vitousek is an insightful scientist and an excellent writer. His work is based on an impressive record of research in Hawai'i that has produced important results." —Ecosystem

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