

cess and failure, something that undoubtedly moves some ecologists outside of their scientific comfort-zones. That frustration surfaces occasionally in the writing, but on the whole, the restoration efforts shared in this volume inspire optimism.

The case studies presented in *Large mammal restoration* focus on North American species and ecosystems. The exception is one chapter exploring the potential for tiger (*Panthera tigris sumatrae*) restoration in Sumatra, which serves as a curious outgroup. In a geographic sense, this chapter seems not to fit with the rest of the material. In another, it subtly challenges North American readers to consider international restoration efforts where sociological and ecological factors are far more unstable and uncertain than in North America. Additional international examples would broaden and enrich this understanding. Perhaps the editors can be encouraged to consider a second book detailing international restoration efforts for large mammals. It would be a valuable companion volume and would make available a more global chart for the emerging practice of restoring large mammals to ecosystems.

This book will be of interest to managers who plan and implement wildlife restoration projects, and to researchers and students studying large mammal ecology and conservation. The growing body of evidence for the pivotal roles of large mammals in ecosystems should also draw those inter-

ested in ecosystem function and management to the book. That this volume is the product of a one-day symposium is both impressive and meritorious.

While most chapters have a single-species focus, a few offer a perspective on restoration at the level of the community, landscape, or biotic province. Maehr's closing chapter applauds these progressive visions for restoration of ecological and evolutionary processes, which he contrasts with more parochial "get realists" attitudes inherent within some agencies. However, rather than berating agencies and managers for failing to recognize and implement such visions, we can and should take leadership roles in integrating restoration at multiple spatial and ecological scales. The overarching vision of ecosystem restoration is a goal to work towards. Where this book really succeeds is in demystifying how to implement that vision one step, one species, one system at a time.

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A WALK THROUGH THE AMAZON FROM A BIOGEOCHEMICAL PERSPECTIVE

McClain, Michael E., Reynaldo L. Victoria, and Jeffrey E. Richey, editors. 2001. **The biogeochemistry of the Amazon Basin**. Oxford University Press, New York. xi + 365 p. \$60.00, ISBN: 0-19-511431-0 (acid-free paper).

Amazon forests, with their high net primary productivity, have been referred to as the "lungs of the earth," and in many ways the Amazon basin plays an important role in global plumbing as well. The Amazon River is the largest river on Earth in terms of volume, and moves immense amounts of water and dissolved substances from the atmosphere and land to the ocean. There is little argument that the terrestrial and aquatic ecosystems of the Amazon basin play an important role in global processes. There is much less known about how deforestation, agricultural conversion, and human settlement in Amazonian forest and river systems are likely to impact local, regional, and global-scale climate. The first step in determining these impacts is to establish how chemical elements cycle through the air, biota, soils, and water, and how biogeochemical cycles are affected by disturbance and land use practices.

McClain et al. take this first step by describing the key components of biogeochemical cycling in the Amazon basin, a daunting task for a region renowned for high diversity of organisms and ecosystems, high productivity, and some of

the most rapid rates of land conversion globally. This volume contains a wealth of information on basic biogeochemical processes in aquatic and terrestrial systems, and new information on the impacts of human use of the environment. The book provides a good overview of biogeochemical cycling in the Amazon for graduate students and a useful reference book for ecologists and biogeochemists interested in particular ecosystem types, elemental cycles, or research approaches. It was refreshing to see analyses of the real and potential biogeochemical impacts of land use so seamlessly integrated among discussions of basic processes in old-growth or intact ecosystems. Human activity has long been a component of the Amazonian landscape and an analysis of the basin would be far from complete without a thorough review of biogeochemistry in human-dominated systems. One strength of this book is the broad coverage of biogeochemistry including discussions of the atmosphere (two chapters), land surface (nine chapters), and aquatic ecosystems (six chapters) together in one volume. Although it is well known that air, land, and water form parts of a biogeochemical continuum, it is rare to see all the components covered in one place because of the dissimilar approaches used to measure the movement of chemical elements through these different media. Another important strength of this volume is the contributions by authors from countries that make up the Amazon basin. These authors collectively represent a wealth of research experience

in biogeochemistry and bring to light sources of information that are often difficult to access for non-Portuguese or non-Spanish speakers, including research papers, technical reports, and student theses published in languages other than English.

The book starts out with an excellent overview of the climate system of the basin, including a summary of seasonality, rainfall, and the effects of the southern oscillation on hydro-meteorology. Water is one of the primary conduits for the movement of chemical elements within and across ecosystems and the authors stress the importance of the net water balance of the basin while placing it in the context of the largest hydrographic system on earth. They conclude with a section discussing model predictions of the local, regional, and global climate effects of Amazonian deforestation that highlights the complexity of this topic and the need for new approaches that integrate biogeochemical cycling at a basin-wide scale.

About half the book is dedicated to chapters on terrestrial biogeochemical cycling. These cover a wide range of topics from reviews of research in terra firme forests and Cerrado ecosystems to analyses of the impacts of cattle ranching, forestry, and extractive reserves. The strong focus on land use impacts is particularly valuable. Cattle ranching is arguably the most important land use in the basin, and linkages made between pasture management and biogeochemical cycling provide important insights into the potential sustainability of various practices (Chapter 6). The authors give a thorough overview of the topic and highlight the importance of research on natural and amendment P cycling for pasture ecosystems. Extractive reserves are a relatively new approach to conservation management in the tropics (Chapter 8). Extractive reserves can supply subsistence or supplemental income to local residents while maintaining forest cover and minimizing C exports. Unfortunately there is little actual biogeochemical data reported from extractive reserve systems, but the authors do a good job of outlining the value of extractive reserves and other non-conversion land uses for the study of C cycling. They provide a "how to" guide for participatory research and stress the value of including local people with life-long knowledge of forest and land dynamics in research projects.

The editors of this book have strong publication records in aquatic biogeochemistry and hydrologic cycling in upland and wetland ecosystems. These strengths and those of their colleagues are apparent in the chapters that cover terrestrial inputs to stream systems, nutrient dynamics in plant com-

munities at the terrestrial-aquatic interface, and the biogeochemical cycling of wetlands, lakes, streams, and the main stem of the Amazon river (Chapters 12–17). As primarily terrestrial ecologists, we learned an immense amount from this section of the book. These chapters are well written, data rich, and comprehensive. The floodplains of the Amazon and its tributaries can experience extreme variations between wet and dry periods. These fluctuations can impact both the temporal and spatial extent of wetland habitats. The authors do a good job of describing the role of fluctuating water levels in biogeochemical cycling. They show how sources and sinks of inorganic and organic nutrients and carbon move across this ever-changing and heterogeneous environment. The book ends with a detailed examination of the biogeochemistry at the mouth of the Amazon River. Again, there is a wealth of information here, including a review of previously published work, synthetic components, and the identification of gaps in knowledge.

As mentioned above, this book represents a good first step in describing the biogeochemistry of the Amazon basin in terms of its ecological, geological, and socio-political complexity. The next step will require a more integrated approach that can scale biogeochemical processes from the microbes responsible for trace gas production to the impact of changes in agricultural technologies on global atmospheric processes. Fortunately, a large and integrated effort is underway in the NASA sponsored Large Biosphere-Atmosphere Experiment in Amazonia (LBA). With many of the same scientists involved as contributed to this volume, LBA promises to provide the next step.

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SCENT AND TASTE OF THE DEEP BLUE SEA

McClintock, James B., and Bill J. Baker, editors. 2001. **Marine chemical ecology**. CRC Press Marine Science Series. CRC Press, New York. 610 p. \$129.95, ISBN: 0-8493-9064-8 (alk. paper).

The vast majority of marine organisms perceive the world using chemical signals. Consequently, most interactions in marine systems are chemically mediated. For that reason, it may not be surprising that marine organisms exhibit a vast array of secondary metabolites—those compounds not di-