

to do something, which does not contribute much to better understanding or to prevailing philosophy.

The book is readable and informative, especially to those interested in a broad overview of California salmon and steelhead resources. The numerous photographs provide additional interest, and this book is clearly the product of dedicated efforts by those involved in its creation. This book is replete with a list of abbreviations, a glossary, a general index, an annotated list of contributors, and a suggested reading list. The latter will be particularly useful to laymen wishing to explore the subject in more depth. The cost of the book is a small price to pay for all this information.

SAUL SAILA
*Graduate School of Oceanography
University of Rhode Island
Narragansett, RI 02882*

THE GREAT BEAST

Elephant Life: Fifteen Years of High Population Density. Irven O. Buss. Iowa State University Press, Ames, 1990, 191 pp., illus. \$49.95 (ISBN 0-8138-0139-7 cloth).

This book primarily reports the results of elephant studies by the author, Irven O. Buss, for many years professor of wildlife biology at Washington State University, and his students. The focus is on the material and observations obtained during two major research trips and two shorter visits to East Africa between 1958 and 1971. Buss reports the analysis of the material collected during those trips; previously published results are modified and updated. The itinerary is described in the introduction and likely will interest only those who have a personal relationship with the participants. The introduction reflects the tone of the book: it is a highly personal account of one man's research, a man obviously enthralled with elephants. What also emerges from reading this book is the difficulty of studying this animal in the wild.

It is not clear for whom this book is intended. Although chapter 1 is titled "Behavior," there is no coherent account of elephant behavior. A reader

wishing a good description of social behavior can do no better than to consult the excellent summary in E. O. Wilson's *Sociobiology* (1975, Harvard University Press). None of the behavioral material Buss presents has the perspective of modern behavioral ecology. On the positive side, the accounts of elephants coming to the assistance of wounded associates or defending a killed elephant are engrossing and moving. The suggestion that the elephants' graveyard myth may have originated from finding skeletal remains in habitats where old bulls linger has the ring of truth.

A particular difficulty throughout the book is that much of the information is presented as anecdotes. Many of these anecdotes are interesting, but the reader must slog through considerable detail to read these paragraphs that are of interest. Details of elephant movements in various geographic districts overwhelm the reader. The accompanying maps help, but I had difficulty finding or could not find many of the geographic names. The great detail on where elephants were sighted, how big their tusks were, the reproductive condition of animals shot for study, and the detailed arguments for each age estimation suggest this book is intended primarily for those concerned with elephant management. Because there is so much detail in so much of the descriptive material, the usefulness of the book to a wider readership would have been markedly improved by the inclusion of chapter summaries.

Chapter 2, on structure and function, describes body temperature and has a long section on age estimation based on dental characteristics, which will interest managers but not many others. Age estimation is used to construct a growth curve, and the relationship between body mass and body length is presented. Evidence that the ears function in thermoregulation is the highlight of the chapter.

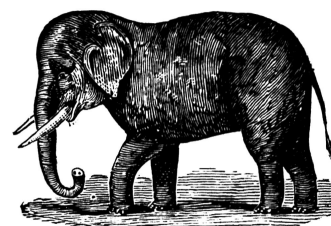
Chapter 3 is the focal point of the book, a discussion of distribution, movements, and numbers of elephants at a time of high density. This condition that may not return because of habitat destruction, human incursions, and poaching, except where elephant numbers locally exceed environmental carrying capacity through inability to migrate from lim-

ited areas where there are no population curbs. The descriptions of herd size, migration patterns, movements in relation to wet and dry seasons, and annual increments to the population may now be chiefly of historical interest, but they will provide a valuable perspective to students of elephant ecology.

The chapter on reproduction reports observations on mating behavior and the relationship between birth and rainfall patterns. Approximately half this chapter describes the estrous cycle, with emphasis on the corpus luteum and a comparison of cell types. Although considerable detailed measurements and descriptions are presented, I never got the sense of why these measurements were made and what they were meant to tell us about elephant reproduction.

Chapter 5 details many observations of what elephants do in and to forest vegetation. An important finding was that although the incidence of woody forage consumption was as high as that of herbaceous forage, the total volume consumed was much lower for woody forage. This result is strongly supported by the following chapter, which describes food habits. Contrary to the impression that one may get from nature films, grasses are the overwhelmingly most significant dietary item of elephants. Furthermore, elephants may ingest soil to obtain needed mineral nutrients. However, when movements are restricted, elephants can seriously damage forest habitat.

This book is not one for the general biologist to sit down and read. However, anyone interested in elephants can find many interesting anecdotes and much quantitative data on body temperature, food habits, and age estimation. The index provides a useful guide to topics of interest. Furthermore, each chapter is aptly divided



into sections and subsections with appropriate headings so that readers can quickly browse through the text and stop at those sections that draw their interest. The drawings and photographs contribute greatly to the value of this book; they cannot help but induce a feeling of empathy for these great monarchs as they make their last stand against their only major enemy.

KENNETH B. ARMITAGE

Department of Systematics and Ecology
University of Kansas
Lawrence, KS 66045-2106

THREATS, RECLAMATION, AND DOMESTICATION

Wetlands: A Threatened Landscape. Michael Williams, ed. Basil Blackwell, Cambridge, MA, 1991. 419 pp., illus. \$79.95 (ISBN 0-631-16614-9 cloth).

This book will be of interest to a wide range of people who deal with wetlands, more perhaps because of what it says about fields of wetlands study outside a reader's particular areas of expertise than for the detail within his or her narrow discipline. Michael Williams has gathered input from a thought-provoking group of contributors. Half the authors are geographers, as is Williams, who edited the book and contributed 3 of the 11 chapters. Three of the remaining authors are ecologists, one a historian, and one a student of environmental policy. The authors are from the United Kingdom, the United States, and Australia; however, the treatment of wetlands and their problems is global.

The editor's goal is to emphasize generic phenomena and threats to wetlands ecosystems, and the authors do so effectively with numerous case studies. As with any appraisal of such a widely distributed and diverse family of ecosystems, the geographic coverage is somewhat uneven and reflects the experience of the authors.

The first chapter of this volume, the 25th in a series by the Institute of British Geographers, is an overview of wetlands by the editor. It is a good primer for readers outside the wetlands field, as well as a summary of

the breadth of wetlands science and the past, present, and probable future roles of these areas in human existence.

The next three chapters focus on wetlands morphology, hydrodynamics, soils, and ecology, summarizing the science of wild wetlands. Chapter 2 ends with the important point that we often think that today's "condition of wetlands represents a steady state equilibrium, with surface form responding to changes that are compensating over time." Climatic change beyond the control of humankind will bring about change regardless of societal impacts.

The remaining two-thirds of the book deals with the effect of humans on wetlands and the consequences of the attitudes that society has held over the years. The first chapter in this sequence is on wetlands archaeology and describes evidence of human use of wetlands from early Paleolithic sites to near-present villages. Wetlands were settled by early humans because they are rich in wildlife and plants, are defensible against intruders, and their rich, moist soils are well suited to agriculture. Today, the wildlife and soils aspects of wetlands are causing conflicts between naturalists and farmers.

The value of wetlands as archaeological sites is enhanced by the slowness of decomposition processes in anaerobic soils. Many artifacts only found in decayed states in upland soils are found intact, protected from oxidation, deep in the nearly lifeless muds and peats. Hence knowledge of fragile human products such as fabrics is enriched by exploration of these sites. The author of this chapter, Bryony Coles, is concerned that draining wetlands for agriculture or industry will result in the destruction of archaeological treasures by oxidation, even if they are not physically disturbed.

The next two chapters deal with agricultural effects on temperate and tropical wetlands. Destruction for agricultural purposes has been the single most important factor in the decline of wetlands worldwide. In chapter 2 and many of the other chapters, the term *reclaimed* is used in referring to what happens when wetlands are drained and used for agriculture. In chapter 4 (tropical wetlands), the

phrase *domestication of wetlands* is used. Both authors appear to be talking about the same process; only the geography differs. Domestication seems to convey a sense of value for both wild and modified marsh, whereas reclamation has the connotation that the wild marsh has no value and that the land has value only when it is altered for another use. Although the latter was the popular attitude in the past and still is in many places, domestication seems more appropriate for today's thought climate. Any time a book has many contributors, such differences in the use of terms is likely; perhaps those differences enhance rather than detract from the text.

An even more devastating impact than agriculture is port development and urbanization, discussed in the next chapter. Not only are the wetland plants gone, but so is the soil that sustained them, covered by fill or dredged out for a port. D. A. Pinder and M. E. Witherick detail numerous cases where large wetlands have been converted to urban use.

The final chapter, on human activities in the wetlands, deals with recreational activities. Balancing human use and preservation is debated. Increased awareness of wetlands and their role in life on our planet has a negative as well as a positive side. On the positive side, the public is more aware of their natural value, but the awareness also attracts more people to use the wetlands for recreation and often fragile systems are damaged.

A summation of the effect of all these activities on the gains and losses of wetlands is found in chapter 10. Both quantitative losses and gains are described, but the most thought-provoking aspects of the chapter are comments about the effect of cumulative losses on a regional or even a global scale.

The final chapter details efforts to protect wetlands in various parts of the world. In the United States, elaborate federal legislation and state laws exist, but graphs and tables in earlier chapters cast doubt on the effectiveness of this effort. On the other end of the spectrum, Williams reports that many developing countries are under great population pressure to produce more food, and they have aggressive "reclamation" pro-