

programs. In fact, this is relevant for all types of control of invasive species. Once a problem goes away, the memory of the problems caused by a species introduction can fade and cause funding to dry up and leave the potential for the problem to reoccur.

The final three chapters focus on modeling and control of invasive plants, actions to take against non-native species, and genetically modified organisms (GMO's). While no new ground is broken in these chapters, the review of the existing literature provides a good introduction to these topics and solid suggestions on how to move ahead with research and application. Although the literature is still relatively thin on the potential invasiveness of GMO's, I was particularly glad to see them included since this is a controversial topic that is often avoided. Finally, the book includes an appendix with some basic quantitative methods for sampling populations and measuring species diversity. It also includes a brief discussion of both geographic information systems (GIS) and global positioning systems (GPS).

One shortcoming worth noting is that the book does not adequately address the use of pathway analysis to predict and prevent the introduction of a potentially invasive species. Methods and technologies either already exist or are being developed that can make detection and prevention more efficient and more affordable.

*Ecology and control of introduced plants* is a laudable effort and a good addition to anyone's collection, with the qualifications noted above. The book brings together a wide array of perspectives from ecology, management, and policy and provides a handy reference in its bibliography. It has a substantial number of case studies providing excellent context for the information conveyed. While it is perhaps not the only resource on introduced plants that you will ever need, this book is a solid contribution to the field. We can all hope that similar treatments on microbial and animal invasions are forthcoming.

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#### RHINOS IN THE TERAI OF NEPAL

Dinerstein, Eric. 2003. **The return of the unicorns: the natural history and conservation of the greater one-horned rhinoceros.** Biology and Resource Management Series. Columbia University Press, New York. xviii + 316 p. \$59.50, ISBN: 0-231-08450-1 (alk. paper).

The Indian subcontinent hosts over one billion people at densities averaging more than nine times that of the United States. Despite challenges created by high human population, India and Nepal have preserved much of their native biodiversity in a system of about 500 parks and wildlife reserves. Many of the larger areas were former hunting reserves of British-supported maharajas or Nepal's royal family; more recent attention has focused on providing a system of tiger (*Panthera tigris*) reserves. Twelve of these parks include protection for about 2000 greater one-horned rhinoceros (*Rhinoceros unicornis*) with possibly 1200 in India's Kaziranga National Park in Assam, and over 600 in the Terai floodplain grasslands and adjacent forests of Nepal's Royal Chitwan National Park. This book is a result of nearly 20 years of research and conservation advocacy by the author on the greater one-horned rhinoceros of Chitwan.

The greater one-horned rhinoceros is huge with males up to 2000 kg. Of the world's five species of rhinoceros only the African white rhinoceros (*Ceratotherium simum*) is larger.

Many aspects of the biology of the greater one-horned rhinoceros are remarkable, including violent mating behavior that can lead to the death of rival males or courted females. Horns are used less than the razor-sharp lower incisors in these tussles between conspecifics, and Dinerstein makes a case that condition and size of the incisors are crucial for dominance and breeding success of males.

The Royal Chitwan National Park is in the Terai at the base of the Himalayas in an area of intense seasonality. November through April typically are dry leading to extensive fires that occur naturally or are set intentionally by local people. Elephant grass (*Saccharum spontaneum*) lowlands are especially susceptible to burning. Then the four-month monsoonal rains and flooding begin in June, redistributing silt and sand, and resulting in rapid regrowth, attracting a remarkable biomass of herbivores including gaur (*Bos gaurus*), chital (*Cervus axis*), sambar (*C. unicolor*), hog deer (*C. porcinus*), barking deer (*Muntiacus muntjac*), nilgai (*Boselaphus tragocamelus*), wild boar (*Sus scrofa*), the endangered pygmy hog (*S. salvanius*), and of course, rhinos. Historically elephants (*Elaphus maximus*) and barasingha (*C. duvaucelli*) also were part of this spectacular large-mammal assemblage.

Dinerstein observed that the floodplain grasslands of Chitwan are punctuated by copses of *Trewia nudiflora* (Euphorbiaceae) trees growing on old rhino latrines. In this book Dinerstein has devoted a chapter to the role of rhinos in

shaping the floodplain vegetation including their role in dispersing seeds of *Trewia*, similar to the story that Dan Janzen developed for seeds presumably eaten by now-extinct horses and other megafauna in Costa Rica. The large hard fruits of *Trewia* are not eaten by monkeys, bats, or birds, but are relished by rhinos. Experiments with captive greater one-horned rhinoceros at the Kathmandu zoo were used to measure preference, estimate gut passage rates, and document effects of transmission through the gut on germination of *Trewia* fruits.

The greater one-horned rhinoceros has been threatened by loss of habitats for agriculture and by illegal poaching pressures aggravated by high demand for rhino horn used for oriental medicines and dagger handles for prestigious *jam-biyas* in Yemen. To my mind the most important contribution of the book is detailing the community-based conservation programs that Dinerstein helped to develop in Chitwan. Key elements include a core protected area surrounded by a buffer zone where various types of human use are allowed to engender support by the local people. For example, local people are allowed to collect grasses for thatch and building materials during a two-week period each year. But more importantly, ecotourism provides economic incentives for conservation in Chitwan. In other parts of the world community benefits from sport hunting have provided the economic incentives that are so crucial for the success of conservation programs.

To ensure that ecotourism dollars have local influence, it is now law in Nepal that park revenues must recycle into local development programs. Economic incentives are crucial but insufficient because measures for protection are also crucial, especially for rhinos that experience heavy poaching pressures in many areas. Chitwan indeed offers sanctuary for

rhinos reinforced by military camps inside the park and an anti-poaching network outside the park.

Because of the successes enjoyed at Chitwan, the book offers an optimistic message about the potential for achieving conservation given sufficient persistence and collaboration with local people. Despite the successes at Chitwan, the reader is left wondering how widely applicable such programs might be, and Dinerstein points out that each project will pose unique challenges depending on the ecology and socio-economic milieu of the area. But we are encouraged by the recovery of the greater one-horned rhinoceros in Chitwan and must grasp at such shining lights.

The book contains a foreword by George B. Schaller who highlights how crucially important Dinerstein's persistent efforts have been for the protection of rhinos in the Royal Chitwan National Park. The book is illustrated throughout with black-and-white photographs, charts, and maps. The quality of reproduction of the maps and charts is generally poor, and in some instances almost illegible. Latin binomials are not provided for many of the animals discussed in the text. Despite these minor flaws, the book is a landmark contribution on the ecology and conservation of large mammals. The lessons learned during the hard-earned protection of the greater one-horned rhinoceros and its habitats will have applications to third-world conservation initiatives world-wide.

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#### THE EMPEROR HAS NO CLOTHES

Nadeau, Robert L. 2003. **The wealth of nature: how mainstream economics has failed the environment.** Columbia University Press, New York. xii + 253 p. \$29.50 (cloth), ISBN 0-231-12798-7 (alk. paper); \$29.50 (paper), ISBN 0-231-12799-5 (alk. paper).

In essence, what Nadeau tells the reader of *The wealth of nature* is this: neo-classical economic theory, the basis for mainstream economics as it is presently understood and practiced, cannot solve our global environmental problems because it is a sham. Its founders endowed their discipline with ill-got legitimacy and false rigor by hijacking equations from 17<sup>th</sup> century physics, replacing physical variables with economic qualities, and fostering a discipline that quickly forgot its bastard origins. Modern economics, therefore, is premised on an outmoded cosmology based on Newtonian physics, not a modern understanding of how the universe functions. This cosmology envisions a self-contained universe comprised of

autonomous parts, obeying intuitive laws, and embedded within fixed frames of reference. The modern economist does not realize, or is afraid to acknowledge, that this model is fundamentally flawed—that parts (e.g., economic actors and organisms) are interdependent and show complex behavior, that wholes (e.g., markets and ecological communities) are open systems that respond readily to outside influences, and that the accepted frame of reference (neo-classical economic theory) is in desperate need of revision. To prevent environmental catastrophe we must dismantle this antiquated and dangerous version of reality with all possible speed. In its place we must erect a new economic paradigm based on a clear-eyed understanding of the part-whole relationship and a sobering acknowledgement that complex systems, whether they be global markets or ecosystems, are interconnected, idiosyncratic and unknowable.

Rather heavy stuff, this, but Nadeau pulls it off in just 223 pages (minus introduction, notes, and index). “[A]n interdisciplinary scholar, historian of science, and a professor at