

pushed as they are through increasing population and exhausted land to move into areas of increasing fragility when once the ecosystem has been disturbed. The study certainly blows the gaff on those who still consider that environmental degradation is the preserve of the industrialized societies and not so much a problem of the economically developing.

There is a neat summary of the dust-bowl in the United States and the Virgin Lands Experience in the U.S.S.R., together with the steps taken to restore what had been lost. But this is not typical of the book as a whole, which seems to hark back to an earlier age when due care was taken by Man of his surroundings, however unsatisfactory the political regime may have been. Soil conservation programmes in one country are reported to have been almost abandoned on independence because of their identification with colonial rule. The South American large estate owners come in for praise as ensuring the maintenance of the resource-base that is now being lost as the great estates are broken up into small-holdings. Here too are echoes of Eliot viewing change as a collapse of an old order.

An excellent chapter on encroaching deserts gives a preview of some of the issues to be faced by the 1977 United Nations Conference on Desertification. But here there may be some exaggeration. It has not been entirely established that there were many deaths over and above normal in West Africa as a result of the Sahelian drought; certainly there were not hundreds of thousands as seems to have been suggested. Also, it is not quite clear that the Sahara is moving northwards on a broad front as well as southwards. But it is a spirited piece of writing that finds place for the theories of Professor R. A. Bryson on the possible role of Man in inducing climatic variability: something most worthy of further study.

The invasion of upland areas by farmers and the effects not only in the highlands but also downstream of areas of settlement, together with the collapse of irrigation systems, are discussed in two of the best chapters. A point that the author could have made—if my shaky arithmetic is correct—is that the figures given by Professor V. A. Kovda on the abandonment of irrigated land, along with the other figures given in Chapter 7, suggest that the sum total of land under irrigation remains constant.

Elsewhere, Mr Eckholm points to the dangers of deserts invading many areas of the humid tropics owing to the fragility of the soils heretofore protected by forest, and to the world shortage of firewood as well as to the hazards of over-fishing and ocean pollution.

This is a book worthy of its predecessors written by Lester Brown, the President of the Worldwatch Institute, on population, food, and the environment. They are all, however, long on the exposure of real and present dangers, but short on solutions. This is, perhaps, as they should be; for as Maurice Strong writes in the Foreword, *Losing Ground* is a timely and valuable contribution to public awareness. But there is always the possibility that such contributions can be counterproductive, evoking a sense of hopelessness about problems which, while being within our comprehension, seem beyond our capacity to cope—thus invoking theories of *triage* and Noah's arks. Back to Eliot again: 'humankind cannot bear very much reality'. But this is more of a suggestion for future studies where watching the world might be accompanied by a vigorous examination of how best the international community can gird itself to respond to these challenges. Man, after all, is the only being on this planet who can live in such a wide variety of ecosystems as well as change them; has at his command a tremendous range of tools and techniques; has

devised countless patterns of cooperation; and has an almost inexhaustible capacity for innovation. Yet there is another reason. The heart of the *Waste Land* is Tiresias, the narrator, who was himself symptomatic and whose very consciousness was an expression of the debased state which he described. The portrayer of collapse runs the risk of being similarly identified—unless he is prepared also to reach out and 'grasp the nettle'.

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Introduction to Ecology, by PAUL A. COLINVAUX. John Wiley & Sons, New York–London–Sydney–Toronto: ix + 621 pp., illustr., 26 × 18 × 3 cm, £6.25 (hardback), £4.80 (paperback), 1973.

The content of this book is based primarily on the author's experience as a lecturer in ecology at Ohio State University. His presentation is divided into four main sections. The first traces the evolution of ecology from, *inter alia*, biogeography and the study of plant succession, the second describes the development of the ecosystem concept including the spatial distribution of its living components and energy-flow, the third deals in some detail with population ecology, and the final section provides a review and synthesis of the preceding sections—with particular emphasis on factors that affect the distribution and abundance of animals and plants.

The approach to these topics alternates between a descriptive recital of ecological processes and an analysis of the development of present-day knowledge and hypothesis. Each chapter is preceded by a summary, and many of the chapters have a closing paragraph or two of conclusions, to re-emphasize the principal messages that the author wishes to convey. Evidence is presented in prose, diagrams, and photographs; mathematical equations, models, and system-analyses are few or absent. The illustrations are profuse, there are 18 pages of references, and the whole is rounded off with a very practical index/glossary.

Progress in dealing with the subject-matter of the opening section is slow, because the author cannot resist examining each and every tributary to the main stream of discussion. The pace improves in the second part, only to slow down again on population ecology—this time because of the space devoted to criticizing earlier theories and case-histories on the regulation of populations. Does the Kaibab deer saga really merit yet another resurrection, spread over three pages, in an ecological textbook of the 1970s? Another source of irritation is the number of minor errors in the text, maps, bibliography and, even, list of contents. Fortunately, most of them are so obvious that they are unlikely to cause any serious problem to the reader.

The book undoubtedly provides a very comprehensive review of current ecological knowledge and ideas, but the quality of the analyses of information and the conclusions that are drawn vary considerably—being sometimes extremely good but, at other times, more than a little confused. For example, regulation of animal population through social behaviour is dismissed as no more than a side-effect of habits that confer other selective advantages on individuals, because 'natural selection always chooses individuals who leave the most offspring' (a phrase that is repeated several times within the book). But natural selection surely favours species of which the adaptations enable them to continue to feed, reproduce, and retain sufficient genetic diversity to be able to respond to environmental change, while other species perish from

starvation or similar calamity: leaving lots of offspring is a good start but, as the author will appreciate in view of his subsequent comments on human population, it is not necessarily the right road to survival!

In summary, the book draws together a tremendous store of useful data which is presented in a very readable form; it will certainly provide a good introduction to the subject for the interested observer, but some degree of selection may be required in its use as a source of teaching material.

COLIN W. HOLLOWAY
(Morges, Switzerland)

Wildlife Conservation by Young People, by NEIL ARNOLD. Ward Lock Educational, London: 208 pp., 21 × 13.5 × 1.6 cm, illustr., £3.95 (cloth), £2.25 (paper), 1976.

Neil Arnold is an enthusiastic teacher at a County Primary School on the edge of an English seaside town. The school grounds and a few surrounding fields excited him as an area in which to introduce the children to biology, and instil a feeling for conservation of the natural and semi-natural environment around them. In a few years, and with the cooperation of groundsmen, school managers, parents, and above all children, he had set up a reserve in the school grounds which has now been opened to other schools and interested groups. The information that he acquired, the sources to which he referred for advice, the traps into which he fell, the despair he sometimes felt, but above all the successes he won from the children in his care, prompted him to set about producing this source-book for any other teachers and parents who might wish to help influence young people to acquire a sensible attitude to wildlife.

The approach reflects admirable common-sense rather than scholarship. A great deal has been said recently about learning by experience, about the ways to instil corporate responsibility in children, and about developing the sort of enquiring mind that makes a scientist. The nature reserve, made and maintained by the children themselves, is probably a near-perfect setting for this to happen, and Mr Arnold narrates the entire process of creating such a facility. He gives many a useful hint: 'Take a photograph of all the junk you collect on the site—its potential educational value is immense'; 'Replace a few normal bricks in a wall with air bricks, and fit test-tubes into the holes to see what uses such crevices'; or again even more simply 'Make your hide with observation slits at two heights, one for adults and one for children'.

Above all, this book emphasizes that a teacher does not need to be an expert naturalist to embark on this sort of approach to the natural environment: 'Learn with the children' is the message, and may it be widely accepted! The book's theme is that tomorrow's conservationists must be helped while young to develop that feeling for wildlife, including enthusiasm for its changing pattern, that gives them a sense of corporate responsibility for all life on Earth.*

DAVID NICHOLS
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* In response to some questions regarding this review, Professor Nichols wrote '... I very much hope you [will find] space for it, since I firmly believe that more educationists need to take a leaf out of Arnold's book. I took a crowd of 9-year-olds from my wife's school on to the beach during a low tide recently and they were completely enthralled with what they found, and were very receptive of the conservation message I tried to put across'. —Ed.

Fragile Ecosystems—Evaluation of Research and Applications in the Neotropics, Edited by EDWARD G. FARNWORTH & FRANK B. GOLLEY. Springer-Verlag, Berlin, Heidelberg & New York: xxvi + 258 pp., illustr., 23.5 × 15.5 × 1.4 cm, DM 19.20 or US\$ 7.80 (stiff paper covers), 1974.

Published as a report of the Institute of Ecology (TIE), this book results from a workshop held at Turrialba, Costa Rica, in March 1973; the project was supported by the U.S. National Science Foundation, and the workshop was attended by over 100 participants from 15 countries. The aim of the report, to which a total of over 400 correspondents contributed ideas and advice, was to summarize what is known about tropical ecology, and to define those areas of research which seem likely to require the most concentrated effort in the years ahead. Although dealing largely with general principles which are applicable to the tropical regions as a whole, the book, as its secondary title implies, is concerned most of all with the new-world tropics. The report is written primarily for research scientists interested in tropical ecology, but its style makes it comprehensible also to the educated layman.

The original workshop applied its efforts to six main fields:

1. The nature of populations in tropical ecosystems;
2. The structure and function of tropical ecosystems;
3. Recovery of tropical ecosystems;
4. The nature of the impacts of Man on tropical systems;
5. Consequences of large-scale changes in tropical landscapes; and
6. Mechanisms to support and encourage research in tropical ecology.

These six areas of research determined the general structure of the present book; the result is a comprehensive and highly useful text, which will surely have (and is presumably already having) a significant influence on research. Although it is perhaps somewhat 'flashy' in its title of 'Fragile Ecosystems', this is a practical volume: the opening section is the summary, which displays the aims and conclusions of the workshop project, and lists the major recommendations that have resulted from it. A Spanish translation of the book has also been published.

It is gratifying to see that we are beginning to grasp ecological principles sufficiently well for valid synopses of this kind to be produced; vast gaps in our knowledge will remain for a long time to come, but perhaps 'environmentalists' and 'developers' no longer view one another with the same suspicion as heretofore: the former accept that development is a process which they cannot (and possibly do not want to) stop, while the latter see that the interests of the former are not so very far removed from their own. If this is not so, then let us hope that volumes of this quality and practical nature will promote such a *rapprochement*.

The contention on page 4 of the book, however, that 'there is little need for further descriptive work' and that we should 'build on the well-developed theoretical base in population and systems ecology presently available' is, I feel, scientifically premature; a prominent feature of contemporary biology is the proliferation by theoreticians of 'models', the all-too-often hopeless inaccuracy of which can be shown by any competent field naturalist. But, to sympathize again with the authors, one recognizes that there is little time left for squabbling; applied ecology must strive to put forward unifying principles, however much they are mere approximations to the real world, or it will play little part in controlling the generally depressing changes that are occurring around us at an increasing speed.

N. V. C. P.