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**Life Support: The Environment and Human Health, edited by
Michael McCally**

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article, it is clear that the reader will gain much more from the entire collection if he/she has a good understanding of mathematics and economic modeling.

Part II, Salinity and Water Allocation, presents four articles that speak to an immensely important problem in the arid and semi-arid Southwest, how to use water to keep soils from becoming too salty for plant growth without contaminating surface and ground water with return flows. The papers take on a variety of scales of the problem from the individual farmer up to the entire Colorado River basin. The editors use the word "problemshed" to describe the Colorado River, a word that is very appropriate for our own Rio Grande.

Part III, Water Reallocation and the Environment, contains the remaining six articles. It is in this part that instream flow benefits, including enhanced habitat for endangered species, are considered. The editors have chosen to include "Water Allocation in the American West: Endangered Fish Versus Irrigated Agriculture" by M.R. Moore, A. Mulville, and M. Weinberg, which appeared in the Spring 1996 volume of this very publication, the *Natural Resources Journal*. The last article in this part, and in the book, "Limiting Pumping from the Edwards Aquifer: An Economic Investigation of Proposals, Water Markets, and Spring Flow Guarantees" by B.A. McCarl, C.R. Dillon, K.O. Keplinger and R. Lynn, is of note because it recognizes the interconnect between ground water and surface water. The authors account for groundwater pumping in the economic model that was developed. This type of tradeoff between pumping and surface water flow is a very important aspect of water management in alluvial valleys of the west.

The editors note that the articles they have chosen to include in this volume were selected to provide both theoretical and empirical guidance for the different topic areas as grouped into the three parts. They also state that what was included, or not included, in the volume was their responsibility. Anytime one makes a "best of" list, someone else will point out the failings of those included or the virtues of those that were not. I believe that the editors have pulled together an interesting group of articles that will appeal to resource economists and water managers who are interested in the impact of agriculture on water resources. I do caution again that one should have a good understanding of economic modeling and mathematics to understand many of the articles.

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Life Support: The Environment and Human Health. Edited by Michael McCally. Cambridge, MA: MIT Press, 2002. Pp. 312. \$19.55 paper.

In *Life Support: The Environment and Human Health*, Michael McCally continues his ambitious documentation of the public health threat posed by the current assault on our global ecosystem. Published in 2002, this collection of essays is a revised and expanded tenth-anniversary follow-up to McCally's groundbreaking book *Critical Condition: Human Health and the Environment*.

Printed just in time for the 1992 UN Earth Summit in Rio de Janeiro, *Critical Condition* was an original—and quite technical—contribution to the growing debate in the public health community regarding the impact of a degraded environment on global human health. The collection of essays was an early effort by McCally, his co-editors, and the book's contributors to create a bridge between the international environmental movement and a public health community not used to thinking about public health in the context of a single, integrated worldwide ecological system. Toward this end, *Critical Condition* attempted to catalogue the effects on biodiversity and human health from polluted food, water, and air; the changing climate and depleted ozone layer; war and population growth; species extinction; and occupational hazards and radiation.

While McCally's earlier book was well received in many circles, the ambitious undertaking also drew criticism, including allegations that McCally and his co-authors were biased and that the book contained numerous factual errors. The most pointed complaints leveled at McCally and his contributors came from fellow public health workers who argued that the authors spent too much time fretting over trace pollution in food, air, and water, while ignoring the really big global threats to public health, such as unsanitary living conditions and inadequate immunization programs.

With the publication of *Life Support*, McCally attempts to answer some of the criticisms leveled at his earlier effort. In addition to soliciting ten new chapters from leading thinkers in the fields of biostatistics, risk assessment, global ecology, public policy, and epidemiology, McCally has also revised earlier essays to include a broader examination of the public health threats that developing nations encounter. McCally succeeds in resolving some of the problems in *Critical Condition* without backing away from its original premise—a healthy global ecosystem is necessary to sustain human health in the long term. The result is a highly accessible, well-annotated read that covers a broad array of environmental threats to public health and includes concrete recommendations for managing these hazards.

One of the central concerns running throughout the more recent collection of essays is the paucity of experimental data linking global ecological changes to degraded human health. According to McCally,

there is not much of this sort of data because research assessing the public health impact caused by global changes is complex and multi-disciplinary and governments are generally reluctant to fund it.

In order to address the data gaps and uncertainty inherent in a broad survey of environmental conditions and their associated health effects, McCally has included a useful essay called "The Science of Risk Assessment" by John C. Bailar III, University of Chicago Professor Emeritus in Health Studies, and A. John Bailer, Miami University Professor of Statistics. Bailar and Bailer give the lay reader a basic primer on how to assess the relative risks that environmental hazards pose to human health when the data needed to make such an assessment is incomplete. Their risk model includes (1) identification of the hazard in question, (2) creation of a dose-response model, (3) assessment of the level of exposure, and (4) categorization of the level of risk to human health.

The authors explain that each step in the risk assessment process is expensive, requires input from many fields, and contains its own, inherent uncertainty. So why engage in the process at all? Because, Bailar and Bailer argue, the "needs of risk assessment provide powerful incentives for more and better science" examining the effects of ecological change on human health. In the meantime, risk assessment provides society with a method of defining acceptable risk in the face of uncertain and incomplete data. In other words, risk science is the best tool we have for measuring global public health dangers posed by our changing environment.

As a counterpoint to the risk assessment chapter, McCally includes an essay titled "The Precautionary Principle: A Guide for Protecting Public Health and the Environment," a collaborative piece by Ted Schettler, Science Director of the Science and Environmental Health Network; Katherine Barrett, Research Associate with the Polis Project on Ecological Governance; and Carolyn Raffensperger, Executive Director of the Science and Environmental Network.

In their essay, Schettler, Barrett, and Raffensperger review the effect of human activities on the environment, including alteration of the earth's surface and atmosphere through degraded air, soil, and water quality. The authors then put forth their version of a precautionary principle (adopted from the German environmental movement's *Vorsorgeprinzip* or "forecaring principle"), envisioned as a guide for policy makers confronted with complex environmental issues with the potential to negatively impact human health. In contrast to principles underlying risk assessment and risk management, precautionary principles are based on avoiding harm rather than determining how much harm is acceptable. In essence, the authors propose lessening the

burden of proof required to dissuade decision makers from pursuing an environmental policy “more likely than not” to cause harm to public health. While an interesting theory, it is not at all clear how the authors would successfully put such a principle into practice. Politicians of all persuasions are loathe to set policy based on suspected – but unproven – threats to health, particularly when economic considerations tug at their purse strings.

As editor, McCally contributes a very compelling preface to the essay collection. Entitled “Environment, Health, and Risk,” his introductory chapter provides a strong case for calling the state of the global ecological system a “crisis.” According to McCally’s annotated review of the literature, one-third to one-half of the surface land on Earth has been altered by human activity; atmospheric CO₂ concentrations have increased 30 percent since the onset of the Industrial Revolution; humans are responsible for pulling more atmospheric nitrogen from the air than all natural processes combined; greater than 50 percent of the Earth’s accessible freshwater resources are being tapped by the human population; an estimated 25 percent of bird species have been pressured to extinction – and the list goes on.

In response, McCally endorses an ecosystem-based health perspective that considers “the health-related services that nature provides,” such as water cleansing, pollination, and soil production, and “acknowledges the fundamental connection between an intact environment and human health.” McCally recognizes that because average life expectancy has been increasing in many countries and child mortality has been decreasing, it has been easier for policy makers to downplay the relationship between global environmental change and public health problems. Thus far, the food supply has kept up with population growth and public health program access has improved in developing countries. Such progress in the public health arena threatens to be short-lived, however. According to McCally, scientists and health officials need to consider with great urgency the tremendous burden human development is placing on the global ecosystem and – by extension – on human health worldwide.

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