Protecting Endangered Species in the United States

Biological Needs, Political Realities, Economic Choices

Edited by
Jason F. Shogren
University of Wyoming

John Tschirhart
University of Wyoming
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To Deborah and Daniel, and Maija and Riley
May their days in nature be as good as ours
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About the Authors

Terry Anderson
Terry Anderson is executive director of the Political Economy Research Center, a think tank focusing on market solutions to environmental problems located in Bozeman, Montana, a senior fellow at the Hoover Institution, Stanford University, and professor emeritus at Montana State University. His work has helped launch the idea of free market environmentalism and has prompted public debate over the balance between markets and government in managing natural resources. Anderson is the author or editor of twenty-four books, including Sovereign Nations or Reservations? An Economic History of American Indians (Pacific Research Institute 1995) and Enviro-Capitalists: Doing Good While Doing Well (Rowman & Littlefield Publishers, 1997), coauthored with Donald Leal. He has published widely in both professional journals and the popular press, including the Wall Street Journal, the Christian Science Monitor, and Fly Fisherman. Anderson received his Ph.D. in economics from the University of Washington in 1972. He has been a visiting scholar at Oxford University, the University of Basel, and Cornell University Law School. He was awarded a Fulbright Research Fellowship to Canterbury University and was a National Fellow at the Hoover Institution. Anderson is an avid outdoorsman who enjoys fishing, skiing, and ice climbing. He is a skilled bow hunter and has hunted throughout Montana and in Africa.

Amy Whitenour Ando
Amy Whitenour Ando received her Ph.D. in economics in 1996 from MIT, where she held a National Science Foundation Graduate Fellowship. She taught at the University of Virginia as a Lecturer in Economics for the academic year 1995–96, and was a research Fellow at Resources for the Future in the Quality of the Environment division from 1996 to 1999. She is now on the faculty at the University of Illinois. She has done empirical research on the political economy of the Endangered Species Act, and studies cost-effective methods of choosing and protecting land for conservation reserves. She is also involved in a program of research on motor-vehicle regulation. As part of that research, she
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has evaluated the efficiency of current inspection and maintenance programs designed to reduce mobile-source air pollution, and is embarking on a project to explore links between fuel-economy and emission-rate regulations, safety, and the shift in new-vehicle purchases from cars to light trucks.

Steven R. Beissinger

Steven R. Beissinger is a professor of conservation biology at the University of California, Berkeley. He received a Ph.D. from the University of Michigan, and was a NSF Postdoctoral Fellow in Environmental Biology at the National Zoo. His work centers on the conservation, behavior, and population ecology of birds, but he has also studied mammals, amphibians, and aquatic invertebrates. Beissinger’s research includes field studies of endangered species (e.g., Snail Kites in the Everglades and Marbled Murrelets in the Pacific Northwest) and exploited birds (e.g., parrots in Venezuela), the use of computer models to determine risks of extinction and to evaluate recovery strategies, and continental level analyses of ecosystem conservation priorities. Dr. Beissinger is a Fellow of the American Ornithologists’ Union, serves on the Editorial Boards of Conservation Biology and Current Ornithology, and is the senior editor of New World Parrots in Crisis: Solutions from Conservation Biology (Smithsonian Institution Press 1992).

David S. Brookshire

David S. Brookshire is Chair and Professor of Economics at the University of New Mexico, specializing in natural resource, natural hazard, and environmental economics. He performs studies pertaining to public policy issues in these areas and has also contributed to the development of the contingent valuation method for valuing environmental goods. Dr. Brookshire received his B.A. from San Diego State University in 1970, and a Ph.D. in Economics from the University of New Mexico in 1976. He served on the faculty of the University of Wyoming from 1976 to 1989, and was Policy Sciences Editor of Water Resources Research from 1987 to 1992. He has served on the Board of Directors of the Association of Environmental and Resource Economists, and as a panelist on ground subsistence for the Committee on Ground Failure Hazard of the National Research Council, and on earthquake loss estimation for the National Institute of Building Sciences.

Gardner Brown

Gardner Brown is Professor of Economics and Adjunct Professor in the Program for the Environment at the University of Washington. He has played a leading role in environmental and resource economics over three decades, with numerous professional articles in outlets such as the American Economic Review, the Journal of Political Economy, the Review of Economics and
Statistics, International Economic Review, and the Journal of Environmental Economics and Management. He has been a member of two National Academy of Science panels: the Ocean Studies Board, Committee on Fisheries and the Committee on Endangered Species. He has been a visiting professor at Stanford, Cambridge, and the Universities of Geneva, Aix-Marseilles, and Gothenburg; and a visiting research fellow at Woods Hole Oceanographic Institute and Beijer Institute. Specific areas of research include renewable resources, including predator-prey and meta population models; theory and application of nonmarket valuation methods; biodiversity; and the economics of antibiotic resistance.

David W. Cash

David Cash is a doctoral candidate in Public Policy at the John F. Kennedy School of Government at Harvard University, and a research fellow on the Global Environmental Assessment Project at the Belfer Center for Science and International Affairs. His research investigates the role of science in the development and implementation of environmental policy, focusing on (1) how scientific assessment of global environmental risks are linked to local decision making and local environmental risk management – with specific interest in how information and decision-making systems can best support the management of cross-scale environmental risks; (2) how participation is structured in environmental assessment processes and what influence participation has on the outcome of assessments; and (3) the role of science in endangered species and biodiversity conservation. David has also worked extensively with the U.S. Global Change Research Program/Office of Science and Technology Policy’s U.S. National Assessment of Climate Change.

Don L. Coursey

Don L. Coursey is the Ameritech Professor and former dean of the Irving B. Harris Graduate School of Public Policy Studies at the University of Chicago. Coursey is an experimental economist whose research is concerned largely with eliciting reliable measures of preferences and monetary values for public goods. It has focused on comparisons of demand for international environmental quality, environmental legislation in the United States, and public preferences for environmental outcomes relative to other social and economic goals. Coursey’s 1994 report “The Revealed Demand for a Public Good: Evidence from Endangered and Threatened Species” was widely noted for its analysis of public expenditures per animal on the endangered species list. His research indicated that federal expenditures reflect public preferences for large, familiar animals such as panthers, bald eagles, or grizzly bears rather than animals such as spiders, snails, or insects, regardless of each species’ biological value in the ecosystem. Coursey has also consulted with NOAA in the wake of the Exxon Valdez oil spill to develop guidelines for environmental disasters. Coursey joined the faculty of the Harris School in 1993, received a
About the Authors

B.A. in mathematics and a Ph.D. in economics from the University of Arizona, and has previously taught at the University of Wyoming and Washington University in St. Louis. He has received the Burlington-Northern Foundation Award for Distinguished Achievement in Teaching; the Greater St. Louis Award for Excellence in University Teaching; and the John M. Olin School of Business Teacher of the Year Award in 1989 and 1990.

Thomas D. Crocker

Thomas D. Crocker is J. E. Warren Distinguished Professor of Energy and Environment in the Department of Economics and Finance at the University of Wyoming. He was the first Director of the Institute and the School of Environment and Natural Resources at Wyoming. His published research has involved most areas of environmental economics, with a recent focus on interactions of human capital formation and environmental states, endogenous risk, and the ways in which ecological and economic systems mediate each other’s responses to change. For twenty-four years, Tom Crocker has been trying to use economics to connect the state of Maine to the University of Wyoming. The effort is beginning to get a bit wearing. His current ambition is to continue that part of his program which involves writing in environmental economics, roaming around in the woods, drinking beer, and hanging out with his wife and his friends.

J. R. DeShazo

J. R. DeShazo is assistant professor in the School of Public Policy and Social Research at the University of California at Los Angeles. He holds a B.A. in economics/history from the College of William and Mary, a M.Sc. in development economics from Oxford University, where he was a Rhodes Scholar, and a Ph.D. in Urban Planning from Harvard University. His research has focused on protected areas management, regulatory reform, environmental economics and policy and economic development. He has worked for the EPA, NSF, the United Nations, the World Bank, U.S. AID, the U.S. Geological Survey and several foreign governments and non-profit organizations.

Boyd Gibbons

Boyd Gibbons is President of The Johnson Foundation in Racine, Wisconsin. As Secretary of the President’s first Council on Environmental Quality and Deputy Secretary of the Interior in the Nixon administration, he was instrumental in helping develop many of the nation’s environmental policies, giving particular attention to the problems of land-use policy. A lawyer, Mr. Gibbons was most recently Director of the California Department of Fish and Game, responsible for administering, in that most contentious of states, the California Endangered Species Act in coordination with the federal ESA. Under his leadership, California DFG undertook mitigation banking and the use of other
innovative incentives in protecting habitat and species, including a massive multispecies effort covering nearly a half million acres of contested real estate in Southern California. Formerly at Resources for the Future and legislative assistant in the U.S. Senate, Boyd Gibbons was for many years a member of the Senior Editorial Staff of the National Geographic magazine. He has written numerous Geographic articles and two books of nonfiction: Wye Island and The Retriever Game. Described by William H. Whyte as a “first-rate social history...a fine study of a classic land-use encounter,” Wye Island won the American Library Association’s Award as one of the ten best books of 1977.

Rob Godby

Rob Godby is an Assistant Professor in the Department of Economics and Finance at the University of Wyoming. Rob grew up in central Ontario in a small town called Peterborough, and spent most summers vacationing in the old-growth forests near Temagami, in Northern Ontario. Both experiences made impressions on a young mind – Peterborough was a town where urbanites from Toronto flocked to spend weekends in their cottages on the many lakes near the city. To young eyes these cottage communities seemed like no escape from the city, only a continuation of it. In Temagami, Rob encountered his first taste of environmental conflict when loggers began to clear-cut the forests, and people he actually knew were arrested while protesting these activities. Still naive, Rob began studying economics in 1985 at Trent University in Peterborough as an undergraduate, hoping he could change the world somehow. This hope persisted during graduate studies at the University of Guelph and McMaster University. After graduation with a Ph.D., Godby began teaching at Laurentian University in Sudbury, Ontario, before coming to Wyoming. Not surprisingly, Rob’s primary research interests are in environmental and macroeconomic policy. As trite as it sounds, Rob still hopes to someday help make the world a better place, even if only marginally.

Greg Hayward

Greg Hayward is Assistant Professor of wildlife biology at the University of Wyoming and Regional Wildlife Ecologist with the USDA Forest Service, Rocky Mountain Region. Greg’s research focuses on the ecology of birds and mammals in subalpine forests with an emphasis on habitat relationships and population dynamics. He is also involved with conservation planning for certain Threatened and Endangered Species, most notable the Amur Tiger. His recent research is published in Conservation Biology, Ecological Applications, Condor, and other biological journals.

Robert Innes

Robert Innes is a Professor of Agricultural and Resource Economics at the University of Arizona. Innes was educated at the London School of
About the Authors


David Layton

David Layton is an Assistant Professor in the Department of Environmental Science and Policy, at the University of California, Davis. He is also a member of the Graduate Groups in Ecology and in Statistics. After earning his doctorate in Economics at the University of Washington, he was a postdoctoral fellow at the Center for Conservation Biology at Stanford University. His research and teaching focus on issues in environmental policy and in nonmarket valuation. His policy work has considered the conservation of endangered species and the economics of emerging antibiotic resistant bacteria. His work on nonmarket valuation focuses on developing econometric methods suitable for Stated Preference surveys. His applications in this area include valuing forest loss due to climate change, improving fish populations, the northern spotted owl, costs of electric power outages, recreational fishing, and beach recreation.

John B. Loomis

John Loomis has worked for twenty years as a natural resource economist, first for two federal agencies (Bureau of Land Management and then U.S. Fish and Wildlife Service) and more recently with two universities (University of California, Davis and now Colorado State University). This has provided an opportunity to understand what agencies actually do, as well as to research ways to improve their performance. Dr. Loomis has published more than 100 scientific journal articles and two books. Several of the journal articles deal with estimating the economic benefits provided to society from protection of threatened and endangered species and their habitats. This research indicates that such benefits can be reliably measured and the benefits are widely distributed over the entire U.S. population. How nonmarket
valuation techniques can be used to improve the efficiency in allocating natural resources is the focus of his *Integrated Public Lands Management* book.

**Henry R. Maddux**

Henry Maddux is currently the Director of the Upper Colorado River Endangered Fish Recovery Program, U.S. Fish and Wildlife Service. He has been working on Colorado River and other endangered fish issues since 1984. He started with the Fish and Wildlife Service in 1991, working on Great Basin and Colorado River endangered fish issues out of the Salt Lake City Ecological Service’s Office. While there he was the June Sucker Recovery Team leader and served on the Virgin River Fishes Recovery Team. In 1995, he transferred to the Upper Colorado River Endangered Fish Recovery Program as Instream Flow Coordinator, becoming director in 1997. Henry has worked for both state and federal natural resource agencies, including serving as aquatic project leader for Arizona Game and Fish working in the Grand Canyon. Henry was born in Kingman, Arizona, and graduated from Death Valley High School in California. He has his Bachelor of Science in Fisheries from the University of Arizona and his Masters degree in fisheries from South Dakota State University. He now lives in Littleton, Colorado, and has been married for eighteen years.

**Andrew Metrick**


**Stephen M. Meyer**

Stephen Meyer is Professor in Political Science at the Massachusetts Institute of Technology, having joined the MIT faculty in 1979. Professor Meyer’s principal area of teaching and research is in public policy, focusing on U.S. domestic environmental policy. He directs the MIT Project on Environmental Politics and Policy. His forthcoming book *Environmentalism and Economic Prosperity*, which examines the economic impact of environmental regulation, will be published by MIT Press. Currently Professor Meyer serves as chairman of the Sudbury Conservation Commission, is a member of the Board of Directors of the Sudbury Valley Trustees, a participant of the Massachusetts Herpetological Atlas Project, and a member of the Massachusetts Division of Fisheries and Wildlife Non-Game Wildlife Advisory Board.
About the Authors

Norman Myers

Norman Myers is an independent scientist and a Fellow of Oxford University. He has an interdisciplinary background based on systems ecology and resource economics, with a Ph.D. from the University of California at Berkeley. He has spent twenty-four years in Africa, based mostly in Kenya and Ghana, traveling widely and repeatedly throughout the continent. He has also made extended visits to many parts of both Latin America and Asia. He undertakes research projects, development analyses and policy appraisals for the U.S. National Academy of Sciences (where he is a member), the World Bank, United Nations agencies, the White House, the MacArthur and Rockefeller Foundations, and the European Commission. He has served as a Visiting Professor at Harvard, Cornell, and Stanford Universities, also the Universities of California, Texas, and Michigan. He has published more than 250 scientific papers and more than 300 popular articles, together with fifteen books with total sales of more than one million copies. He was the first British scientist to be awarded the Volvo Environment Prize and the UNEP Sasakawa Environment Prize, and the second British scientist to receive a Pew Fellowship in Conservation and Environment. He has been awarded the Gold Medal of the World Wildlife Fund International and the New York Zoological Society, and the first Distinguished Achievement Award of the Society for Conservation Biology. In 1998, he was awarded a Queen’s Honour with appointment to the Order of St. Michael and St. George, for “services to the global environment.” He originated the hotspots thesis in the late 1980s; since then it has mobilized more than $400 million for biodiversity conservation.

William Noonan

William Noonan, Colorado Partners for Wildlife Coordinator, received a B.S. in Animal Ecology in 1980 from Iowa State University and started employment with the U.S. Fish and Wildlife Service in 1983, working with the Endangered Colorado River fishes. In 1985, he began a ten-year term as an Ecological Services staff biologist in the Colorado Field Office. In 1995, the Colorado Division of Wildlife and the USFWS initiated a four-year Intergovernmental Personnel Act agreement to establish a full-time coordinator for the Partners for Wildlife program in Colorado. The agreement ended in March 1999, and he continues to serve as Coordinator as a full-time U.S. Fish and Wildlife Service employee.

Clifford Nowell

Clifford Nowell received his Ph.D. in economics at the University of Wyoming in 1988. He is currently the Willard L. Eccles Professor of Economics and Chair of the Economics Department at Weber State
University in Ogden, Utah. His primary fields of inquiry are environmental economics, recreation demand, and the economics of education. He has participated on numerous environmental projects for agencies such as the Sierra Club, Henry's Fork Foundation, and the U.S. Forest Service. He is currently studying the recreation benefits associated with angling in and around Yellowstone National Park. His publications have appeared in journals such as *Ecological Economics, Land Economics, Southern Economic Journal, The Journal of Economic Behavior and Organization, The Review of Economics and Statistics, The Journal of Regulatory Economics, and The Journal of Economic Education*.

**John Perrine**

John D. Perrine is a Ph.D. candidate in the Ecosystem Sciences Division of the Department of Environmental Science, Policy, and Management at the University of California, Berkeley. His primary research area is resource utilization by red foxes and other medium-sized carnivores in the Sierra Nevada and Cascades Mountains of California. Prior to attending U.C. Berkeley, John was a policy analyst for Defenders of Wildlife, where he specialized on the ESA, international wildlife trade, and carnivore management on public lands.

**Stephen Polasky**

Stephen Polasky is the Fesler-Lampert Professor of Ecological/Environmental Economics at the University of Minnesota, and formerly a Professor in the Department of Agricultural and Resource Economics at Oregon State University. Prior to OSU, he was an Assistant Professor in the Department of Economics at Boston College. He has served as a Senior Economist for environmental policy on the President’s Council of Economic Advisers, and has been a Senior Visiting Research Fellow at the Marine Policy Center, Woods Hole Oceanographic Institution. He received his Ph.D. in economics from the University of Michigan in 1986 and a B.A. from Williams College in 1979. His research interests include biodiversity conservation, endangered species policy, common property, renewable and nonrenewable resources, and environmental regulation. His research has been published in such journals as *Biological Conservation, Journal of Environmental Economics and Management, International Economic Review,* and *Science*. He is currently serving as an Associate Editor for the *Journal of Environmental Economics and Management*.

**Todd Schatzki**

Todd Schatzki is an economist focusing on energy and environmental issues. His past work examines the optimal design of policy mechanisms, strategies...
About the Authors

to achieve cost-effective climate, air quality, and water quality programs; the effect of environmental policies on economic markets; and the role of real options in decision-making and optimal policy. This work has examined policies and economic impacts in the electric power, automotive, manufacturing, and fisheries industries, including economy-wide analyses. He has a Ph.D. in Public Policy from Harvard.

Stuart Shapiro

Stuart Shapiro received a Ph.D. in public policy from Harvard in 1999. He is currently working as a policy analyst for the Office of Management and Budget.

Jason F. Shogren

Jason Shogren is the Stroock Distinguished Professor of Natural Resource Conservation and Professor of Economics at the University of Wyoming. Before returning to his alma mater, he taught at Appalachian State, Iowa State, and Yale. In 1997, Shogren served as the senior economist for environmental and natural resource policy on the Council of Economic Advisers in the White House. He is currently a member of the International Panel on Climate Change. He was an associate editor of the Journal of Environmental Economics and Management, and is currently an associate editor of the American Journal of Agricultural Economics. Recent publications include Environmental Economics (Oxford University Press) and Private Property and the Endangered Species Act (University of Texas Press); and essays on risk, conflict, valuation, environmental policy, and experimental economics. Shogren was invited to brief the western governors at their annual meeting on the political economy of endangered species on private land.

Rodney B. W. Smith

Rodney Smith is an Associate Professor in the Department of Applied Economics at the University of Minnesota. He received his Ph.D. in agricultural economics at the University of Maryland, 1992. Journals in which he has published include the American Journal of Agricultural Economics, the Journal of Environmental Economics and Management, and Land Economics. Current research involves studies on the design of contracts and regulatory schemes under private information and hidden action, and natural resource policy.

John Tschirhart

John Tschirhart is Professor of Economics, Director of the Public Utility Research and Training Institute, and past Chair of the Department of
About the Authors


Gary Watts

Gary Watts is a natural resource and environmental economist with a private consulting practice located in Laramie, Wyoming. He specializes in economic issues and problems associated with water resource development and allocation. Over the past twenty years, he has directed dozens of applied research and policy studies in these areas for federal, state, and private institutions in the western United States. In recent years, he has assisted in quantifying federal reserve water rights on six Indian reservations in the Rocky Mountain region and has been involved in interstate water allocation studies in the Arkansas River and North Platte River Basins. He has been retained as an expert witness in numerous water rights litigation matters and has advised Attorneys General of five western states on water-related issues. Mr. Watts has authored refereed journal articles on water issues in natural resource related journals, and is the author of numerous research reports. He is a member of the American Economic Association, the American Water Resources Association, and several other professional organizations.

Martin L. Weitzman

Martin L. Weitzman is Ernest Monrad Professor of Economics at Harvard University. He has worked in many areas of environmental economics. He was elected a fellow of the Econometric Society and a member of the National Academy of Arts and Sciences.
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FOREWORD

The Biodiversity Outlook

*Endangered Species and Endangered Ideas*

Norman Myers

I. INTRODUCTION

This Foreword will not venture into deep discussion of the major themes adumbrated in this book. Written by economists for the most part, they are not my “bag”: I am not a card-carrying economist. Rather, I specialize in being a generalist. I am also one who prefers to side-step the usual practice of supplying new answers to established questions. I prefer to raise new questions. So I propose to try my hand with a number of fresh perspectives on endangered species, in the hope that they will serve to expand the policy purview for the issue. Some perspectives are not so much fresh as “fresh-ish” since they have been around, in principle at least, for some years, while receiving only moderate attention from ecologists and economists. Nor shall I focus on the United States after the manner of most contributors to this book. After spending lengthy periods in a dozen countries West, East, North, and South, I prefer to look at the endangered species question as manifested in the world at large, though many of the points apply specifically to the United States.

II. TRIAGE PLANNING FOR ENDANGERED SPECIES

We are far from possessing sufficient conservation resources – funds, scientific skills, and the like – to help all species in trouble. Even if resources were to increase several times over, we could not hope to save more than a proportion of all species at risk. When we allocate funds to safeguard one species, we automatically deny those funds to other species. We thereby express a preference for certain species over others. We may choose contingently rather than deliberately. But we choose. Current conservation practices imply – whether they intend it or not – that the majority of Earth’s species are insufficiently worthy of preservation efforts except as incidental parts of ecosystems.

I appreciate the many helpful comments on an early draft received from Gretchen Daily, David Duthie, Jennifer Hughes, Jeff McNeely, Dan Perlman, David Pimentel, Peter Raven, and Terry Root.
protected by parks and reserves. Yet it is among this “mystery majority” that most extinctions are occurring.

This raises a basic question. How shall we allocate our scarce resources with most methodical discretion? We have reached a stage where there is merit in determining which species are “most deserving” of a place on the planet. Agonizing as it will be to make choices between species – to implement a triage strategy – we should clearly make our conservation strategy as logically selective as possible.

We can make a start on the challenge through systematic analysis of biological factors, for instance, taxonomic distinctiveness, or those attributes that make some species more susceptible to extinction than others (e.g., sensitivity to habitat disruption or poor reproductive capacity). Then we can evaluate species for their ecological value as intrinsic components of ecosystems. Which species contribute to ecosystem workings more than others through, for example, energy flow or their role as keystone species? Are certain species essential to the survival of their ecosystems, and can some be regarded as superfluous? Although the disappearance of any species is to be deplored, the ecological loss can range from “regrettable but marginal” to “critical if not worse.” Much the same applies to genetic and evolutionary values inherent in species. Thereafter we can consider economic values, and even political and sociocultural aspects of the situation. When we integrate all the various factors that tell for and against particular species, we shall have a clearer idea of where we can best apply our conservation efforts.

To some extent, we can finesse the dilemmas of species ranking by elevating the analysis to the level of premium ecosystems insofar as certain habitats, ecozones, and entire sectors of biomes are biotically richer than others. By safeguarding these areas, we can preserve more species than through protecting much larger areas in other biomes. Yet when we pitch our analysis at this broader-scope level, we still face agonizing choices. How do we choose between those ecosystems where safeguard efforts would be appropriate, helpful, or important, and those where they would be crucial (given that we cannot afford to preserve the whole lot)? How should we rank, say, key sectors of tropical forests, coral reefs, and wetlands in order of priority? This is a taxing challenge indeed.

Many hard, even harsh decisions will have to be made. Nobody cares for the prospect of deliberately consigning certain species or ecosystems to extinction. But insofar as we are undoubtedly doing that already, we might as well do it with as much selective discretion as we can muster. In other words, we should make our choices explicitly rather than implicitly: We should determine the future of species by design rather than by default. We have tried playing Noah and have goofed: Our Ark is too small. We are short of the sort of wisdom that would enable us to play God.

To reiterate the central point: The obvious response is to engage in a more methodical and science-based approach. After all, the question is not “Shall we attempt to apply triage?” It is “How shall we apply triage to better
effect?” Hence the need for sustained analysis to determine which species and ecosystems shall be deemed most “worthy” of our conservation support. Yet even though the issue was raised fifteen years ago (Myers 1983) and has generated a fair amount of agreement in principle among the conservation community, it remains a black hole in practice because of the meager research directed at the issue.

III. EFFICIENT FUNDING AND BIODIVERSITY HOTSPOTS

For all that there is a severe shortage of conservation funding, monies are often spent with less than tight targeting. There is much scope to do a better job. Consider, for example, the “hotspots” strategy. These are areas that (a) feature exceptional concentrations of endemic species, and (b) face exceptional threat of imminent destruction (Myers 1988, 1990; Myers et al. 2000; see also Mittermeier, Mittermeier, and Myers 1999). Research of the late 1980s revealed that eighteen localities contained the sole habitats of at least 20 percent of all plant species in just 0.5 percent of Earth’s land surface, these being areas that for the most part have already lost the bulk of their habitats. The hotspots thesis, as formulated in the late 1980s, has merited conservation priority to the extent that it has attracted $210 million of funding from the MacArthur Foundation over a period of ten years, plus substantial support from the W. Alton Jones Foundation, the Global Environment Facility, and private bodies such as Conservation International and the World Wildlife Fund–U.S. The total spent on hotspots to date is at least $400 million, the largest amount ever assigned to a single conservation measure. This sum is only 0.8 percent of the amount spent by governments during the same period on biodiversity, roughly $40 billion, together with $10 billion by international NGOs, these monies being assigned mainly to across-the-board activities rather than the sharply focused efforts advocated here. It is to be compared with the $250 million for the Pathfinder mission to Mars, which along with many other space probes has been justified largely on biodiversity grounds, namely, the search for extraterrestrial life.

The original hotspots assessment has been greatly expanded and refined recently. The list has been expanded from eighteen to twenty-five hotspots; in addition to plants, the focus has been extended to four vertebrate groups – mammals, birds, reptiles, and amphibians (fish have been omitted for lack of comprehensive data). The analysis also has been extended to consider factors such as area/species ratio and congruence among taxa. It now turns out that 44 percent of Earth’s plant species and 35 percent of the four vertebrate categories are confined to 1.4 percent of Earth’s land surface. Note, in addition, that conservation needs in terms of protected areas, ex-situ protection (zoos, herbaria, gene banks), and other traditional measures (though not including nontraditional measures such as reducing population pressures and poverty in developing countries of the tropics) amount to a sum sometimes estimated at $17 billion
a year (e.g., McNeely, Harrison, and Dingwell 1994). By contrast, we could go far to safeguarding the hotspots and thus a large proportion of all species at risk for just $500 million a year, which is only 12.5 times the annual average over the past ten years. The traditional scattergun approach of much conservation activity, seeking to be many things to many threatened species and thus failing to be much to most, needs to be complemented by a silver bullet strategy in the form of hotspots with its emphasis on the most cost-effective measures.

This tightly targeted strategy could generate a handsome payoff in stemming the biotic crisis. It is often supposed that, were the global mass extinction to proceed virtually unchecked, somewhere between one-third and two-thirds of all species could well be eliminated within the foreseeable future (Raven 1990; Pimm et al. 1995; Wilson 1992). The hotspots analysis indicates that perhaps half of the overall problem could be countered through protection of hotspots covering an aggregate expanse of only a little over 2 million square kilometers. In short, the prospect of a mass extinction can be made far less daunting and much more manageable.

All this does not mean – I emphasize the point – that we should subject non-hotspot areas to benign neglect. They all have their biodiversity values. Nonetheless, I sometimes wonder if it is worthwhile to spend such large funds on biodiversity in my own country, Britain, when so much more is at stake and at greater risk elsewhere. After all, if Britain disappeared beneath the waves, the most species we would lose from the planet would not exceed a dozen, whereas we are losing several dozen every day in Amazonia and Borneo alone.

IV. THE MINI-MASS EXTINCTION SINCE 1950

It is sometimes supposed, at least implicitly, that the mass extinction of species is something that largely lies ahead of us, and so we still have time to talk about it, to analyze it, to plan for it, and to do lots of other things. Yet we are well into the opening phase of the mass extinction. Try a brief thought experiment. Consider the period since 1950, that is, since the time when humans began to increase their numbers and environmental effects with unprecedented impact. Guesstimate how many species have been eliminated to date. Suppose we have been losing species in just tropical forests during the 1990s at an average rate of 27,000 per year (a conservative estimate based upon a planetary total of 10 million) (Wilson 1992; see also Ehrlich and Daily 1993). Suppose too that during the 1980s and given the rate of tropical deforestation then (Myers 1980), the annual extinctions total was one-tenth as many as today, or 2,700 per year. Let us further suppose that during the 1970s, once again the rate averaged one-tenth as many, or 270 per year; and during the 1960s, 27 per year. The total for 1960–2000 comes to roughly 300,000 out of a planetary stock of 10 million, or 3 percent in total.

Of course this reckoning, if indeed it deserves that designation, is not so much preliminary and approximate as rough and ready in the extreme. It is even speculative – but surely not spurious. It is advanced with the sole
purpose of getting a handle on how far we are already into a mass extinction episode. It shows that the biotic crisis has been working up momentum for a good while, and of course it could well maintain its momentum for a good while to come. This places a super premium on calculating how much time we have left to mobilize our conservation forces to best effect, bearing in mind the planning syndrome of the lily pond and the twenty-ninth day.

The upshot is that the main phase of the current mass extinction could overtake the biosphere sooner than we may anticipate. More significant still, the time left for us to stem and slow the process could be a lot less than we often suppose. This raises the most critical question of all for ecologists and economists alike, also political leaders, policy makers, and other lever pullers. What we should be asking ourselves is not whether we are now doing better than before (and in certain respects we are doing much better). There is only one question that ultimately counts: Are we doing enough? And if not, what more should we or could we be doing to help us get on top of the problem before it terminally gets on top of us? This could rank as the biggest research challenge of all. The literature offers scant clues to how we are making out. What sort of research agenda would we need to come to grips with this issue?

V. SPECIES AND THEIR POPULATIONS

There is more to the biotic crisis than sheer loss of species. The term “biodiversity” comprises life in its complete panoply. So we should consider populations as well as species – and with good practical cause. Any species has subgroups such as races; and subgroups of races are populations, or assemblies of individual organisms that resemble each other more than members of other populations. It is populations rather than species that supply the many environmental services that keep our ecosystems ticking along, and it is populations with their many environmental adaptations that maintain ecological stability around the world.

Obviously populations greatly outnumber species. Earth’s 10 million species feature a rough total of 2.2 billion populations – and we are losing these populations at a rate of 43,000 per day, which is, proportionately, far faster than we are losing species (Hughes, Daily, and Ehrlich 1997). So perhaps it would make more sense for conservationists to focus on the mass extinction of populations. This is all the more an imperative insofar as it is populations that help maintain watershed functions, generate topsoil, disperse pollutants, regulate weather and climate, and provide the raw materials for new drugs, foods, and industrial products, among a host of other services. If the mass extinction proceeds unabated, it seems we are likely to lose perhaps half of all species and maybe 90 percent of all populations. Which will do more to undermine the environmental stability of the planetary ecosystem, and do it in what will surely be a world of environmental uproar?

The biggest service of biodiversity via populations is ecosystem resilience, being an amorphous attribute that has long resisted ecological quantification
(Tilman et al. 1997) and economic evaluation (Perrings et al. 1995). While we wait for uncertainties to be clarified on that one, we can be glad that certain brave analysts have attempted an economic assessment of the other and better known services. Estimates range from $2.9 trillion per year (Pimentel 1997) to $33 trillion per year (Costanza et al. 1997). Either way, environmental services are significantly valuable, and global natural product figures alongside global economic product. Hurrah for populations, unsung as they generally are.

VI. PROTECTED AREAS: NO LONGER THE FRONT-LINE STRATEGY?

Many conservation efforts are reactive and defensive in nature. They implicitly acknowledge that biodiversity habitats are being eaten away by the growth in human numbers and material aspirations; and they propose that a sound way to counter this process is to build bulwarks against the rising tide of human activities. “Parks are the answer, we must have more parks.” True, there is massive reason to expand our networks of parks forthwith. Ecologists estimate we need at least twice as large an expanse, located far more strategically and much better protected. This is the case particularly in tropical forests, as well as coral reefs, wetlands, and other prime localities in the tropics with their ultrarich reservoirs of species.

Alas, many present parks are “paper parks.” One-third of such areas in the tropics are already subject to encroachment by landless and impoverished peasants. During the past few decades, some 200 million landless peasants have found themselves squeezed out of traditional farmlands, and, feeling they have no other option if they are to keep putting supper on the table, they pick up machete and matchbox and head off toward the last unoccupied lands they know of, tropical forests. Or they take their digging hoes to savannahs and grasslands, often desertifying them. This is the greatest land-use change in human history, precipitated by the greatest migration ever to occur in such a short span of time – yet it remains almost entirely undocumented in overall terms, even to the extent that we have next to no idea of how fast their numbers may build up during the foreseeable future (Myers 1992). Driven by their desperation and poverty (cash incomes of less than $1 per day), these are marginal people in marginal environments. Often enough, the marginal environments are parks and other protected areas.

The displaced peasants, or “shifted cultivators” as I call them, are no more to be castigated for encroaching onto parks than soldiers are to be blamed for fighting wars. They know little of the ultimate pressures that drive them to do what they do, and even if they did understand they would be largely powerless to do otherwise. Meantime, we need more parks that are much better protected. No doubt about it.

What is in doubt is whether parks, together with other protected areas, can keep on doing as good a job as in the past. Setting aside a park in the overcrowded world of the late twentieth century is like building a sandcastle
on the seashore when the tide is coming in deeper, stronger, and faster than ever. While building more and stronger sandcastles, we must also do more about the tide – to deflect it and reduce it. We must find ways to curb population growth, to relieve poverty, to cut back on environmentally harmful forms of consumption, and many other things as well – all things that we should be doing on plenty of other good grounds anyway.

For example, consider the Cape Peninsula stretching southward from Cape Town in South Africa. In its 475 square kilometers, little over half the size of New York City, there are 2,250 plant species, or one-seventh as many as in the United States and Canada combined. Of these species, almost 200 are endemic. Given its small expanse, it is a global epicenter of species richness. Although the new South African government has taken measures to protect it more than ever, it is threatened by the expansion of Cape Town’s burgeoning populace. That threat could theoretically be countered by building a 20-meter high wall across the Peninsula just south of the city. But it would not keep out a still larger threat in the long run: global warming.

As the planet warms up and temperature bands move away from the equator toward the poles, they will be followed by vegetation bands. In the United States, the vegetation of Florida will be able to “migrate” toward the mid-Atlantic states and even farther northward if need be. True, the plant species will find it a tough trip, having to traverse farmlands, cities, and other forms of “development deserts.” The Cape Peninsula’s plants will have no place to go except into the sea. To save the Peninsula’s flora, we shall need to do much more than support conservation on the spot. We shall need to tackle the main source of global warming: those countries that burn most fossil fuels, notably the country where people burn most per capita – the United States. Even if South Africans were to do a perfect job with their sandcastles, that would avail them little unless Americans play their part to tame the tide.

I often think of a future envisaged by Jeffrey McNeely (1990), head of biodiversity at the World Conservation Union. He proposes that in fifty years’ time we may have no more protected areas, and for one of two reasons. First is that they will have been overtaken by landless peasants or global warming or other megathreats. Or, second, we shall have found ways to manage all our landscapes in such rational fashion that we shall automatically make provision for species habitats. It is a Heaven Forbid scenario versus a Golden Age scenario.

VII. ENVIRONMENTAL SURPRISES: DISCONTINUITIES AND SYNERGISMS

The need for a holistic or a biospherewide approach is all the more pertinent in light of some potential environmental surprises ahead. These surprises could prove to be so potent that they could cause the mass extinction to gather pace until it overwhelms the biosphere even more rapidly than is usually supposed. The surprises include environmental discontinuities with
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their ecological synergisms, both of which will surely become front-rank issues for conservation. The analytic rationale is grounded in the notion that the future is not going to be a simple extension of the past. We should anticipate that environmental discontinuities will become a prominent phenomenon, many of them arising from synergistic interactions between two or more environmental problems.

Both discontinuities and synergisms have the capacity (1) to be profoundly disruptive of ecosystems, ecological processes, biodiversity habitats, and species communities; and (2) to catch us unaware by overwhelming our anticipatory and preventive capacities. Indeed, the worst environmental problems ahead will often be the ones we have scarcely thought of. To cite Benjamin Disraeli, “What we anticipate does not regularly occur, while what we least expect often happens.”

These surprises deserve priority attention from conservation practitioners. Yet a library computer check reveals few substantive efforts to broach them even in exploratory terms. They remain black holes of research. For some very preliminary and exploratory work on discontinuities, see Costanza and Cornwell (1992); Faber, Manstetten, and Proops (1992); and Schneider and Turner (1995); on synergisms, see Ehrlich (1986); Odum (1993); and Ricklefs (1990); and for a recent overview, see Myers (1996a).

Prominent examples of environmental discontinuities are acid rain, deforestation-derived declines in tropical rainfall, ozone-layer depletion, and global warming. Lesser instances include the bleaching of coral reefs, mass mortalities of dolphins and seals, phytoplankton blooms, cancer epizootics in fish, and miscellaneous population declines such as those of amphibians worldwide, the anchoveta fishery off the coast of Peru, passerine birds in the northeastern United States and Western Europe, and saguaro cactuses in the southwestern United States and northern Mexico.

We constantly claim to be surprised by the “sudden” onset of a discontinuity. Yet in the cases of global warming and ozone-layer depletion, our most advanced atmospheric models tend to discount, by virtue of their very structure, the possibility of discontinuities. We should anticipate, moreover, that as human communities continue to increase their numbers, consumption demands, and overexploitative technology—a redoubtable triad—they will exert ever-expanding pressures on ecosystems and natural resource stocks. In turn, certain of these ecosystems and stocks will prove increasingly less capable of supporting the needs of humans, let alone those of biodiversity. The plausible upshot is that environmental discontinuities will become more frequent. To illustrate the scope of potential impacts, the human triad can readily overwhelm the environmental underpinnings of agriculture, leading to a downturn in the capacity of agriculture to sustain human communities at their erstwhile level (Brown 1998; Pimentel et al. 1994). As a result, established farmlands will no longer be able to do their job of feeding humankind with its burgeoning numbers, notably in the Indian subcontinent and Sub-Saharan Africa. As a result, subsistence agriculture will increasingly encroach onto wildlands and biodiversity habitats.
As for synergisms, recall that while we are well aware of the main mechanisms of extinction, we tend to study these mechanisms in isolation from each other. We know much less and understand less still about the dynamic interplay between discrete mechanisms. Yet synergisms (literally, the uniting of energies) are unusually significant. For instance, a biota’s tolerance of one stress tends to be lower when other stresses are at work. A plant that experiences depleted sunlight and hence reduced photosynthesis is unduly prone to the adverse effects of cold weather, and it thereby suffers more from the cold than would a plant enjoying normal growth and vigor. A similarly amplified effect operates the other way round as well (Mooney, Winner, and Pell 1991). In certain circumstances, a synergisms-induced outcome can be a whole order of magnitude greater than the simple sum of the component mechanisms. Among probable synergisms at work with respect to biodiversity are the impact of acid rain on logged forests, and global warming working in conjunction with ozone-layer depletion (for details, see Myers 1996a).

Synergisms in the biodiversity sphere, working collectively and with compounding impact, will surely lead to an extinction episode of greater scale than usually envisaged. They may also cause the episode to be telescoped in time, meaning that the full biotic crisis could arrive even sooner than anticipated. To the extent that we can discern some possible synergistic interactions, the better we shall start to understand some potential patterns and processes as the species extinction spasm works itself out – and the better we shall be able to anticipate and even prevent some of them.

VIII. PERVERSE SUBSIDIES

Next, consider a factor that rarely appears in the conservation debate: perverse subsidies. These subsidies are harmful to both the economy and the environment (Myers and Kent 1998). A notable example lies with marine fisheries, which have left numerous fish species on the edge of commercial if not biological extinction. The fisheries catch – well above sustainable yield – costs more than $100 billion a year to bring to dockside, whereupon it is sold for around $80 billion, the shortfall being made up with government subsidies. The result is depletion of major fish stocks and endangerment of certain species, plus bankruptcy of fishing businesses and much unemployment.

Perverse subsidies are prominent in five leading sectors: agriculture, fossil fuels/nuclear energy, road transportation, water, and fisheries. Subsidies for agriculture foster overloading of croplands, leading to erosion of topsoil, pollution from synthetic fertilizers and pesticides, release of greenhouse gases, and grand-scale loss of biodiversity habitat. Subsidies for fossil fuels aggravate pollution effects such as acid rain, urban smog, and global warming, with all the profound impacts these will generate for wildlands. Subsidies for road transportation promote pollution at local, national, and global levels, plus excessive road building with loss of landscapes. Subsidies for water encourage misuse and overuse of supplies that are increasingly scarce in
many lands. As noted, subsidies for fisheries foster overharvesting of depleted fish stocks. Not only do these environmental ills entail economic costs in themselves, but the subsidies serve as direct drags on the efficient functioning of economies overall. All help to deplete wildlands and thus to undermine species’ habitats if not to threaten species directly.

Subsidies in these sectors are estimated to total around $1.9 trillion per year, and perverse subsidies almost $1.5 trillion. Plainly, perverse subsidies have the capacity to (a) exert a highly distorting impact on the global economy of $29 trillion, and (b) promote grand-scale injury to our environments. On both counts, they foster unsustainable development. Ironically, the total of almost $1.5 trillion is two and a half times larger than the Rio Earth Summit’s budget for sustainable development – a sum that governments claimed could not be found at all. To the extent that we have reached a stage when we can save biodiversity only by saving the biosphere (for instance, by staying off global warming with its grand-scale disruption of natural environments), species habitats will be best preserved in a sustainably developed world. The perverse subsidies total is also three times larger than the annual cash incomes of the 1.3 billion poorest people, whose impoverished status causes them to degrade many tropical forests and savannas.

If perverse subsidies were to be reduced, there would be a double dividend. First, there would be an end to the formidable obstacles imposed by perverse subsidies on sustainable development. Second, there would be a huge stock of funds available to give an entirely new push to sustainable development – funds on a scale unlikely to become available through any other source. In the case of the United States, for instance, they would amount to more than $300 billion, or more than the Pentagon budget. An American pays taxes of at least $2,000 a year to fund perverse subsidies, and pays another $1,000 through increased costs for consumer goods and through environmental degradation. Were just half of the world’s perverse subsidies to be phased out, just half of the funds released would enable most governments to abolish their budget deficits at a stroke, to reorient their fiscal priorities in fundamental fashion, and to restore environments more vigorously than through any other single measure. They offer vast scope here to find funds to do a better job of protecting endangered species, and to stop other species from becoming endangered in the first place.

IX. FUTURE EVOLUTION

Finally, the biggest “fresh perspective” of all: If we allow the mass extinction to proceed virtually unchecked, the length of time it will take for evolution to generate replacement species with numbers and variety to match today’s will be, so far as we can judge from recovery periods following mass extinctions of the prehistoric past, some 5 million years (Myers 1996b). This is twenty times longer than humans have been a species. Consider the numbers of our descendants who will be affected by what we do, or don’t do, in the next few
decades (or just the next decade, given the accelerating pace of the debacle?). Suppose too that the average global population during that period will be, say, only 2.5 billion people. The total affected will be 500 trillion, or 10,000 times more than all the people who have existed to date. Just 1 trillion is a large number; figure the length of time represented by 1 trillion seconds.

This raises all manner of questions in terms of fairness to future generations. The most far-reaching analyses of intergenerational justice (e.g., Rawls 1971; Weiss 1988) do not extend beyond a dozen generations. Here lies a lodestone of research for moralists and ethicists. In many respects it is a question that raises the issue way beyond conventional economics. But this is not to say there is not a role for economists. On the contrary, it highlights the urgency of economics research that points the way to more productive measures to slow the biotic debacle while we still have time. Time is probably the most valuable and scarcest of all our conservation resources. Hence I hail the chance to contribute to this fine book.

References

Norman Myers