Charles Perrings

The economic value of healthy ecosystems: 'optimizing' biodiversity conservation

There are many reasons for being interested in the health of ecosystems, but for many of us the most compelling is that it pays us to do so. All ecosystems have been impacted by people to some degree, and many have been completely reconstructed to make them more valuable to people. Few rangelands, forests, farmlands or cities bear any resemblance to the ecosystems they have replaced. But they are still ecosystems, and their capacity to deliver the services people want depends on their ability to function effectively over a range of environmental conditions. Conserving the species that make this possible is critical to the supply of all ecosystem services—from the production of commodities, to the maintenance of landscapes valued by people for ethical, religious or aesthetic reasons, and to the protection of the environmental conditions required for human, animal and plant health. Markets have signaled the importance of some valuable ecosystem services (e.g. foods, fuels, fibers, pharmaceuticals, freshwater) leading people to conserve the species needed for their production. But there are no markets for other equally valuable services (e.g. environmental public goods such as pollution buffering, climatic regulation or the control of invasive pests and pathogens damaging to human, animal or plant health). Where there are no markets or other signals for valuable ecosystem services, people have no incentive to conserve the species needed for their production. If such services are produced on private lands, the role of government is to provide appropriate incentives, whether through the tax system or through well-designed systems of payments for ecosystem services. If such services are produced on public lands, the role of government is to secure their provision through conservation so as to best meet the interests of society.

BIO

Charles Perrings is a Professor of Environmental Economics at Arizona State University, where he directs the Ecoservices Group—a research (and research training) group that focuses on ecosystem services. Previous appointments include Professor of Environmental Economics and Environmental Management at the University of York; Professor of Economics at the University of California, Riverside; and Director of the Biodiversity Program of the Beijer Institute, Royal Swedish Academy of Sciences, Stockholm, where he is a Fellow. He was the founding editor of the Cambridge University Press journal, *Environment and Development Economics*, and he remains on the editorial board of this and several other journals in environmental, resource and ecological economics, and in conservation ecology. He is Past President of the International Society for Ecological Economics, a society formed to bring together the insights of the ecological and economic sciences to aid understanding and management of environmental problem, and has published 12 books and edited volumes and around 150 scientific papers in this field. Most recently, he served on the PCAST Working Group on biodiversity and ecosystem services whose report to President, Sustaining Environmental Capital: Protecting Society and the Economy, was released in July.

Don Weller and Tom Jordan

Streamside forests reduce nutrient pollution of aquatic ecosystems

Streamside forests provide many valuable ecological benefits, especially the service of removing pollutants in the water draining from uphill areas. This helps keep pollutants from agricultural and developed lands out of waterways and reduces damage to aquatic ecosystems. For years, scientists have measured pollutant removal by these "riparian buffers," but only in small study areas, not across entire watersheds or broader regions. We developed new methods to estimate the combined benefits of all the riparian buffers in an entire watershed. We tested the new methods on 321 study watersheds that lead to the Chesapeake Bay. We focused on nitrate, the dominant form of nitrogen lost from agricultural fields and an important contributor to environmental problems in Chesapeake Bay. We found that riparian buffers greatly reduce the amount of nitrate in the streams that drain agricultural watersheds. Aggregate nitrate removal by riparian buffers was less than suggested by many small-scale studies, but still very significant. The existing buffers in the study watersheds remove an average of 16 percent of the nitrate that flows from croplands. Replanting missing riparian buffers downhill from croplands might further reduce the nitrate in streams by up to 32 percent below current levels, which could significantly improve water quality in the Chesapeake Bay. Buffers in Coastal Plain watersheds removed much more of their nitrate inputs than buffers in other parts of the Chesapeake Bay drainage. Our findings provide decision makers with realistic regional estimates for nitrate removal in riparian buffers and help identify where buffer restoration can offer the greatest additional benefit.

BIOS

Donald Weller is a Senior Scientist and Quantitative Ecologist at the Smithsonian Environmental Research Center in Edgewater, Maryland. He earned a B.A. in Biology from Wabash College, and a Ph.D. in Ecology from the University of Tennessee. He has almost 30 years of post-graduate research experience. Don has expertise in ecological modeling and landscape ecology. His recent research has focused on the linkages of watersheds to wetland condition, to stream chemistry and biology, and to estuarine health.

Thomas Jordan is a Senior Scientist and Chemical Ecologist at the Smithsonian Environmental Research Center in Edgewater, Maryland. He earned a B.S. in Biology from Bucknell University and a Ph.D. in Biology from Boston University. He has 31 years of post-graduate research experience. His research focuses on processes controlling the flows of nitrogen and phosphorus through ecosystems, especially flows from watersheds to estuaries and the role of wetlands in modulating these flows.

Brian Palik

Sustaining Healthy Forests Using Natural Models to Guide Management

Our nation values its forests perhaps more than any other native ecosystem. As such, maintaining healthy forests should have high priority for agencies and institutions that provide forest-derived goods and services to people. Historically, a healthy forest was viewed as one that produced wood products and protected watersheds, with somewhat secondary objectives of producing game species and providing recreation opportunities. For decades, these objectives have been achieved largely using an agricultural model of forest management. While these traditional services are still important today, ecosystem research demonstrates that forests managed to optimize their production can be inherently unhealthy, at least from the standpoint of sustaining the broad array of organisms (biodiversity) that make up a forest. At the heart of this issue is the realization that forests managed for traditional services are very different in structure and composition from their unmanaged counterparts. We also know that this difference, i. e, a simplification of the managed forest, can have important consequences for ecosystem processes, such as carbon sequestration and storage, nutrient cycling, and climate change adaptation. Moreover, simplified forests have heightened susceptibility to a variety of health threats, including severe wildfire, invasive species, and disease and insect outbreaks. A renaissance in forest management is occurring as a result of the discoveries by forest ecosystem scientists. A management paradigm based on natural models of forest dynamics is being discussed broadly and applied, with increasing frequency, across our nation's forests. This model posits that a forest managed for traditional products and services will be inherently healthy, by all measures, if it looks like and functions like its natural counterpart, across all stages of its development, from very young to very old. A national landscape composed of forests managed following natural models will increase opportunities and options for sustaining a broad array of ecosystem services into the future.

Bio

Brian Palik

Brian Palik is research forest ecologist and team leader with the USDA Forest Service- Northern Research Station's, Center for Research on Ecosystem Change. He has Ph.D. and M.S. degrees in forestry and ecology from Michigan State University and a B.S. from Alma College. He is a past recipient of the Forest Service's Chief's Award for Early Career Scientists and the Presidential Early Career Scientist Award. Dr. Palik is an adjunct faculty member at four major research universities, including Iowa State University, University of Minnesota, Michigan Technological University, and Lakehead University.

Dr. Palik has been studying forests, with a distinctly applied perspective, for over 20 years. He and his research team work broadly on questions related to the sustainability of forest management, by studying natural ecosystems and their managed counterparts. He is the author of over 130 research publications on topics of forest ecology and management. Dr. Palik actively works with collaborators across the USA, as well as colleagues in Canada, Finnoscandia, Germany, Australia, and the Czech Republic.

AERC Congressional Briefing and Symposium
October 19, 2011
Dr. Rebecca Moore

Abstract

Ecosystem services are those things nature provides that are of direct benefit to humans. Forests provide essential ecosystem services including timber provision, recreational opportunities, water filtration, carbon storage, wildlife habitat, scenic beauty. Some of these services primarily benefit the owners or users of the land, such as private individuals, corporations, or, in the case of public land, the general public. But other ecosystem services benefit everyone, including those that don't own, or directly interact with, forest land. Efficient land use decisions and forest policy must take into account the total economic value of each land use option, which includes both these direct use and indirect use components. Complicating matters, many of these "other" ecosystem services (water quality, air quality, wildlife benefits, etc.) are non-market services; there is no economic market in which to observe the value people place on them. While this makes it more difficult to estimate their value, doing so is required for informed decision-making. Not considering these values will lead to less land in forest cover, reduced ecosystem services, and reduced benefits to everyone. This presentation will describe recent research estimating the economic value of the water, air, wildlife, soil, aesthetic and cultural-related ecosystem services forests provide. Using a combination of ecological and social data, we identify key factors that affect the ecosystem service value of forestland, and then estimate these values using multiple valuation methods. We describe the results of a case study which estimated Georgia's 22 million acres of privately own forests provide over $37 billion/year in non-timber, non-recreation related benefits. The average per-acre values range from $264 to $13,442/year depending on the forest characteristics. Higher per acre values generally come from forested wetlands or riparian forests in urban areas while lower per-acre values come from non-wetland forests in rural areas.

AERC Congressional Briefing and Symposium
October 19, 2011
Dr. Rebecca Moore

Bio

Dr. Rebecca Moore is an Assistant Professor of Natural Resource Economics in the Warnell School of Forestry and Natural Resources at the University of Georgia in Athens, GA. She has been at UGA since 2006. She received a Ph.D. in Applied Economics from the University of Wisconsin in 2006, and a B.A. in Geology from the University of Colorado in 2000. Dr. Moore's research focuses on how environmental resources are valued by individuals, and how economic models of decision making can be combined with models of ecological systems to improve our understanding of how humans and the environment interact. Her recent research projects have investigated values and decision making related to Georgia's private forests, the National Wildlife Refuge System, sustainable tourism in Costa Rica, endangered species protection, watershed and reservoir management, organic farming, and other important natural resource topics. Her research has been recognized for both its contribution to the research community and its practical importance. In addition to research, Dr. Moore teaches undergraduate and graduate classes to economics and ecology students.

The importance of healthy ecosystems for fisheries and coastal communities –

Andrew A Rosenberg, Chief Scientist Conservation International and Professor of Natural Resources and the Environment, Univ. New Hampshire

Coastal communities in the US and around the world depend upon healthy and sustainable marine ecosystems for their economy, way of life and character. While it is often the case that critical sectors of the coastal economy such as fishing, tourism and transportation are though of in isolation they all come together through the ecosystems upon which they depend. Therefore, to maintain or restore a sustainable coastal economy we need to understand and plan for how different sectors can co-exist while maintaining the underlying structure and function of the marine ecosystems. There are numerous examples of the social and economic impacts of the decline marine ecosystems, and the opportunity to take a different path is clear.

Dr. Andrew A. Rosenberg is Senior Vice President for Science and Knowledge at Conservation International and a Professor in the Institute for the Study of Earth, Oceans, and Space at the University of New Hampshire where, prior to April 2004, he was dean of the College of Life Sciences and Agriculture. From 2001-2004, he was a member of the U.S. Commission on Ocean Policy and continues to work with the US Joint Ocean Commissions Initiative. Dr. Rosenberg was the Deputy Director of NOAA's National Marine Fisheries Service from 1998-2000, the senior career position in the agency, and prior to that he was the NMFS Northeast Regional Administrator.

Dr. Rosenberg's scientific work is in the field of population dynamics, resource assessment and resource management policy. He holds a B.S. in Fisheries Biology from the University of Massachusetts, an M.S. in Oceanography from Oregon State University and a Ph.D. in Biology from Dalhousie University.