

PERC REPORTS

FOR FREE MARKET ENVIRONMENTALISM

Can Economics and Ecology be Reconciled?





PERC

The Property and Environment Research Center is a nonprofit institute dedicated to improving environmental quality through property rights and markets.

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The connection between the fields of economics and ecology is as old as the disciplines themselves. When Charles Darwin sought to understand the spontaneous order that emerged through the interaction of species, he read Adam Smith. Both of these intellectual pioneers focused on feedback mechanisms and the dynamic processes of nature and markets.

Despite their close ancestral connection, the two fields are far apart today. What can we learn from reconciling economics and ecology? To address this question, PERC hosted 24 leading authorities spanning a variety of disciplines. The participant list was impressive: acclaimed authors Charles Mann (*1491*), Matt Ridley (*The Rational Optimist*), and Emma Marris (*Rambunctious Garden*); noted ecologist Daniel Botkin (*Discordant Harmonies*); prominent archaeologists Carl Lipo and Terry Hunt (*The Statues That Walked*); among others.

The idea behind this merger was to reunite the two fields to explore a better approach to deal with today’s environmental challenges. This edition of *PERC Reports* further investigates this topic.

Former EPA administrator TRACY MEHAN gets to the heart of the issue by asking, “What is the nature of nature?” The debate over the relationship between human beings and nature is nothing new. What has changed is the idea that human beings are now the necessary agents of environmental stewardship.

Science writer RONALD BAILEY elaborates and asks an additional question: “What institutions are best for balancing our conflicting desires and goals when it comes to the various realities we each may crave?” Although ecology and scientific insights will help us better manage ecosystems, in the end all landscapes will be shaped by human preferences.

PERC’s TERRY ANDERSON asks a few additional questions, which summarize the central dilemma of the conference: “Do humans impose costs on nature or just on other humans? Can we think of nature in any other way than imposing costs on other people?”

DANIEL B. BOTKIN begins to answer some of these questions by explaining how economists and ecologists can work together to solve environmental problems—“if only ideology and politics could get out of the way.” And MATT RIDLEY reminds us that the union of economics and ecology works because evolution works, noting that both markets and nature are “spontaneously self-ordered through the actions of individuals.”

In biology the evolutionary process is driven by variation and selection. This process is also at work in a market economy. New ideas are created, bad ideas are culled, and the good ideas spread. As Tim Harford writes in *Adapt*, which is reviewed by ROGER MEINERS in this issue, “with these elements of variation and selection in place, the stage is set for an evolutionary process; or, to put it more crudely, solving problems through trial and error.”



Tell me what YOU think
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Laura E. Huggins

Laura E. Huggins | Editor

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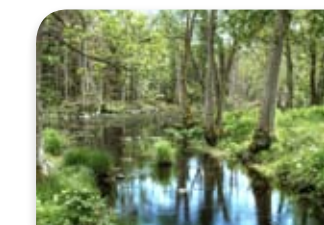
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ECON-PRAGMATISTS AND ECO-PRAGMATISTS UNITE

In the Winter 2011 issue of *PERC Reports* I used this column to commemorate Ronald Coase's 100th birthday and thank him for his insights into the role of property rights and transaction costs for resolving conflicting resource demands. Now at 102, Coase is proposing a new journal to help save "economics from economists" by urging economists "to step away from the blackboard" (whiteboard for younger folks, and PowerPoint for this generation). Coase's concern is that economists have become so fixated on complicated equilibrium models that they have lost touch with complex human action and interaction and the institutions that govern them. Coase seems to be searching for "econ-pragmatists."

Although his focus is mainly on macroeconomic concerns such as the financial crisis and growth in China, his criticism is equally applicable to environmental economics. From blackboard diagrams to explaining "externalities" to computer models of "optimal control theory," environmental economics has little to do with the interface between human beings and their use of nature's bounty.

Consider the environmental economists' call for using cap-and-trade or a carbon tax to control greenhouse gas emissions. Pretty as their diagrams may be, they ignore the political reality of assigning a cap on carbon emissions or determining the "optimal tax." This and hundreds more, are examples of Coase's criticism and indeed have been the focus of free market environmentalism since its inception in the 1980s. Blackboard environmental economics

ignores "the influences of society, history, culture, and politics on the working of the [environment]," to paraphrase Coase.

Along with Coase, environmental thinkers, many of whom attended PERC's conference on "Reconciling Economics and Ecology," and are featured here, are challenging their peers to also step away from the blackboard. These "eco-pragmatists" walk in the footsteps of respected ecologist Daniel Botkin, who was one of the first to point out the futility of applying static equilibrium models to dynamic ecological systems. His new book, *The Moon in the Nautilus Shell: Discordant Harmonies Reconsidered*, admonishes ecologists again to stop seeing the environment as a "Kodachrome still life" and to start watching the "moving picture."

Another eco-pragmatist is Emma Marris, author of *Rambunctious Garden: Saving Nature in a Post-wild World*. She asks environmentalists to "temper our romantic notion of untrammelled wilderness" and recognize that nature is resilient and ever changing.

Econ-pragmatists and eco-pragmatists UNITE. Using the Coasean lens of property rights and transaction costs, economists can offer more pragmatic and entrepreneurial ways for humans to interface with one another. Prices, property rights, and transaction costs can connect dynamic people with dynamic nature. Econ-pragmatists must provide detailed case studies to show the potential for markets to resolve competing demands on the environment and to highlight their limits so that eco-pragmatists can find new solutions.

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Consider the recent finding that lion populations in Africa have declined nearly 70 percent over the past 50 years. The economist’s diagram of lion habitat, for example, shows too little private provision of lion habitat because private benefits are seen as less valuable than social benefits. The loss of lions is therefore pegged as a market failure. The policy prescription is to list the lion as an endangered species and restrict markets for lion hunting. Will this help? Hunting was banned in Kenya in 1974, and since then, populations have plummeted from 20,000 to 2,000. Where local entrepreneur Jake Grieves-Cook leases land from Masai herders for tourist camps, however, cattle have been removed from the threat of the lions’ claws, and the locals receive revenue and jobs in return for sharing habitat with lions. Today, Grieves-Cook’s private conservancies encompass only 100,000 acres, yet they are home to more than 5 percent of Kenya’s lions.

Eco-pragmatists must do the same for ecological systems. Rather than yearning for nature as a place without humans, ecologists should provide Marris-type case studies illustrating dynamic ecosystems and highlighting the role of humans in them.

Charles Mann’s careful studies of North America before Columbus’s “discovery,” 1491, and after, 1493, should shake the confidence of any equilibrium-loving ecologist or economist. Long before the U.S. Forest Service realized the folly of its “Smokey-the-Bear” policy of putting out every forest fire and began to let some fires burn, American Indians were burning the landscape to enhance wildlife habitat. In other cases, American Indians created innovative property rights systems to encourage stewardship—witness salmon streams and clam beaches in the Northwest, beaver trapping territories in the Northeast, and water rights in the Southwest. Today, blackboard economists and ecologists label these as environmental problems caused by market failure. Think again.

Harmonizing human demands on the environment requires institutions that account for the dynamic nature of both. It calls for free market environmentalism.

In “On Target” PERC’s President TERRY L. ANDERSON confronts issues surrounding free market environmentalism. He can be reached at perc@perc.org.

The Nature of Nature and Humanity's Place in it

BY G. TRACY MEHAN, III

This fall, PERC convened a Lone Mountain Forum on “Reconciling Economics and Ecology: The Foundation of Environmental Optimism” in which this writer was privileged to participate. While economics is a common topic at PERC gatherings, this forum featured a dazzling array of disciplines represented by the likes of Matt Ridley, the “Rational Optimist,” Charles Mann, author of *1491* and *1493*, Daniel Botkin, the distinguished ecologist, as well as practitioners of anthropology, history, journalism, and law.



“Nature in the twenty-first century will be a nature that we make; the question is the degree to which this molding will be intentional or unintentional, desirable or undesirable.”

—Daniel Botkin

Facilitated by Terry Anderson, PERC’s president, the forum participants were encouraged to engage one another on an issue fundamental to the integration of economics and ecology, a question which must be faced with great realism if, ultimately, we want to succeed at environmental restoration. Specifically, what is the nature of nature?

HUMANS VERSUS NATURE

The debate over the relationship between human beings and nature is as old as history itself. Should public lands be preserved untouched or made available for “wise and multiple use?” Is nature better left alone to achieve some perceived state of balance? Or is the very idea of balance, stasis, or equilibrium a misperception of a world, which, in fact, is characterized by flux, upheaval, dynamism, and change? Moreover, are humans a “natural” part of the ecosystem or an alien invader, a destroyer of worlds, to be segregated from true nature? And which version of nature, or what kind of natural baseline, do we use in time and space to assess human actions that exploit, protect, or restore environmental amenities according to diverse human needs, wants, and expectations?

The Lone Mountain Forum was preceded by a controversy early this year in the *Breakthrough Journal*. Peter Kareiva, Michelle Marvier, and Robert Lalasz, top scientists from the Nature Conservancy, criticized other mainstream conservationists for failing to take account of the role of humans in ecosystems (“Conservation in the Anthropocene: Beyond Solitude and Fragility,” Winter 2012). This was met with strong rebuttals from other quarters, specifically the head of the Center for Biological Diversity.

“By its own measures, conservation is failing,” opined the scientists. Indeed, “Conservation binaries—growth or nature, prosperity or biodiversity—have marginalized it in a world that will soon add at least two billion people.” The Lone Mountain Forum was a timely contribution to this debate.

Forum participant Daniel Botkin wrote a path-breaking book, *Discordant Harmonies: A New Ecology for the 21st Century* (1990), which argues that human misperceptions of a natural balance in nature actually hindered scientific efforts of protection and restoration. Botkin cites the Boundary Waters Canoe Area in northern Minnesota, a very wild place, which “could persist with the least direct human



intervention.” It has from the end of the last ice age until the time of European colonization, “passed from the ice and tundra to spruce and jack pine forest.” From there it shifted to paper birch and alder, and then back to spruce, jack pine, and white pine driven by variable climate. “Which of these forests represented the natural state?” asks Botkin.

“If natural means simply before human intervention, then all these habitats could be claimed as natural, contrary to what people really mean and really want,” wrote Botkin. “What people want in the Boundary Waters Canoe Area is the wilderness as seen by the voyageurs and a landscape that gives the feeling of being untouched by people.” Botkin’s book has been reissued by Oxford University Press under the title, *The Moon in the Nautilus Shell: Discordant Harmonies Reconsidered*.



“The time has come to rethink wilderness....Far from being the one place on earth that stands apart from humanity, it is quite profoundly a human creation.”

—William Cronon

THE WILDERNESS ILLUSION

Environmental historian and Bancroft Prize winner William Cronon wrote a challenging essay in 1995 called “The Trouble with Wilderness; or, Getting back to the Wrong Nature.” He writes:

The time has come to rethink wilderness... Far from being the one place on earth that stands apart from humanity, it is quite profoundly a human creation—indeed, the creation of very particular human cultures at very particular moments in human history. It is not a pristine sanctuary where the last remnant of an untouched, endangered, but still transcendent nature can for at least a little while longer be encountered without the contaminating taint of civilization. Instead, it is a product of that civilization, and could hardly be contaminated by the very stuff of which it is made.

The trouble with wilderness is that it creates something its supporters seek to reject. “The flight from history that is very nearly the core of wilderness represents the false hope of an escape from responsibility, the illusion that we can somehow wipe clean the slate of our past and return to the *tabula rasa* that supposedly existed before we began to leave our mark on the world,” cautions Cronon. If

we celebrate “wilderness as the measure with which we judge civilization, we reproduce the dualism that sets humanity and nature at opposite poles,” he writes. “We thereby leave ourselves little hope of discovering what an ethical, sustainable, *honorable* human place in nature might actually look like.”

Botkin describes this burden of human responsibility succinctly: “Nature in the twenty-first century will be a nature that we make; the question is the degree to which this molding will be intentional or unintentional, desirable or undesirable.”

NATURE IS OMNIPRESENT

Emma Marris, a writer for the science journal *Nature* and another participant in the Lone Mountain Forum, recently presented her own view of the issues of nature, humanity, and the interaction between the two in her new book, *Rambunctious Garden: Saving Nature in a Post-Wild World*.

Marris uses the metaphor of a “rambunctious garden” both to illustrate the dynamic, changing reality of nature and the predictably unpredictable role of human beings in the natural world. The rambunctious garden, it turns out, is “everywhere.”

“We are already running the whole Earth, whether we admit it or not,” writes Marris. “To run it consciously and effectively, we must admit our role and even embrace

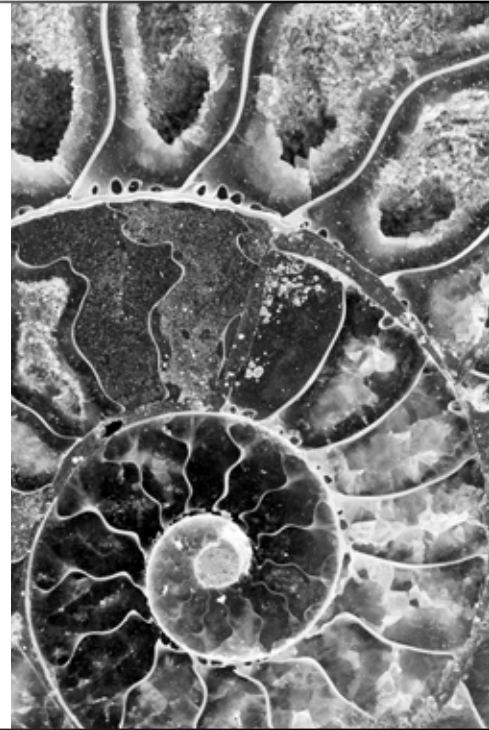


it. We must temper our romantic notion of untrammelled wilderness and find room next to it for the more nuanced notion of a global, half-wild rambunctious garden, tended by us.”

Marris sees the ecologist’s fixation on a “pristine baseline”—a “cultural construction” of the pre-European settlement variety—as the initial misstep in restoration efforts.

“But from the point of view of a geologist or paleo-ecologist, ecosystems are in a constant dance, as their components compete, react, evolve, migrate, and form new communities,” says Marris. “Geological upheaval, evolution, climatic cycles, fire, storms, and population dynamics see to it that nature is always changing.”

Humans have lived in Australia for 50,000 years. “Aborigines increased the amount of flammable plant material. This, combined with their fire-setting ways, may have changed the dominant species in many parts of the country,” says Marris. She quotes one authority that claims that “virtually all the continent’s ecosystems as being in some sense man-made.”



“From the point of view of a geologist or paleo-ecologist, ecosystems are in a constant dance, as their components compete, react, evolve, migrate, and form new communities.”

—Emma Marris

“Protected areas like Yellowstone are not the wrong model, but a crucial part of an expanded model,” says Marris. “Such protected areas become anchors, with overlapping zones of various protection regimes and conservation goals radiating out from them, like petals from the center of a rose.” Indeed, pursuing natural recovery in urban and other disturbed areas educates people and creates demand for more.

“A consequence of throwing out the ‘pristine wilderness’ ideal is that conservationists, and society at large, now have to formulate alternative goals for conservation,” says Marris. She cites seven non-hierarchical goals such as protecting charismatic mega fauna and genetic diversity, most of which are pretty conventional. “There is no one best goal,” she writes. Thus, “complex compromises” must be negotiated. “In a nutshell, give up romantic notions of a stable Eden, be honest about goals and costs, keep land from mindless development, and try just about everything.”

ENVIRONMENTAL REALISM

As Matt Ridley opined at the forum deliberations, neither ecologists nor economists really believe in equilibria anymore. Yet, does this mean we are now left with only chaos and relativism in our relationship with the natural world in a new “era of agnosticism,” as described by the environmental historian Donald Worster, in which the very idea of the ecosystem or

nature is nothing more than fiction? Is the idea of “some comprehensive order in organic nature” now totally suspect? Is the difference between a landfill and a landscape with vibrant ecological functions merely a matter of taste?

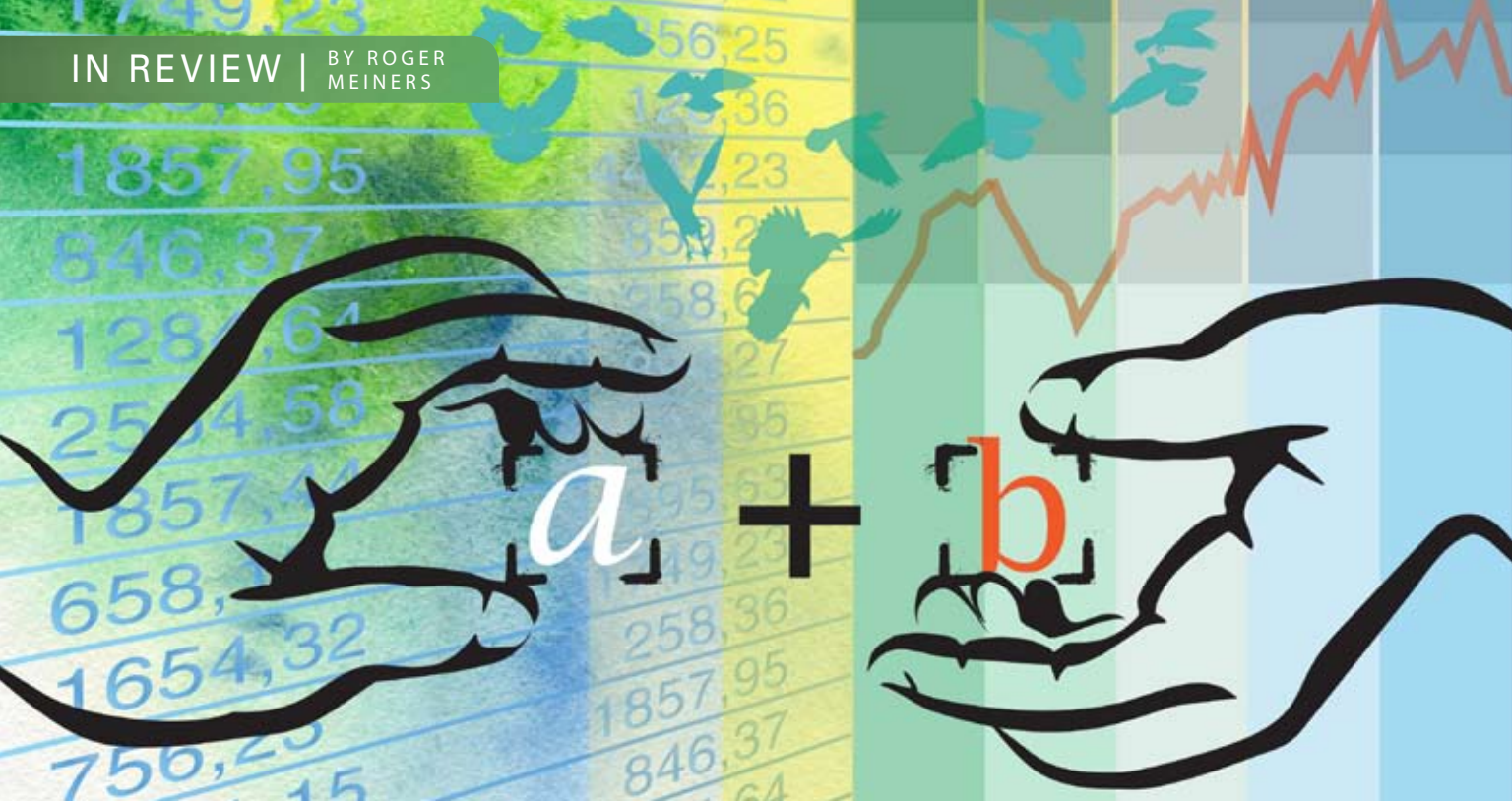
I think not. What I hear Botkin, Ridley, and Marris saying is that nature is characterized by dynamic complexity and human beings are a perplexing but intimate part of the mix. This is not pure chaos or environmental nihilism. It is realism upon which we can ground hopeful action on behalf of nature and the people who benefit from it. The laws of physics and biology, the need to protect resilience and biodiversity in nature—these do not change. What has changed is that human beings are now the necessary agent of stewardship to maintain the wonder, beauty, and bounty of the natural world.

Parts of this article originally appeared in www.spectator.org and *The Environmental Forum* (Environmental Law Institute at www.eli.org).



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ADAPT

Matt Ridley instructs us about the link between evolution and the success of the human species. *The Origins of Virtue* and *The Rational Optimist* lead the biologically ignorant into unfamiliar territory. His work is immensely enlightening but also disturbing. It reminds us that economics, which fashions itself the queen of the social sciences, is often wearing rags. Our regal models, which only explain a bit about the organization of society, are not as rich as we fancy and should not be the basis for directing social organisms.

Like Ridley, Tim Harford is a non-academic economist and a delightful writer who synthesizes a wide range of research. Most academic economists, hunkered down with members of our like-minded tribe, do not see scholarship outside of our immediate area or fail to see significant implications that may be present in unfamiliar work.

Harford's recent book, *Adapt: Why Success Always Starts with Failure*, weaves together many threads of research that, like Ridley's work, gives us insights about what needs to be done to construct richer models to help explain our world.

Harford shows that experts are generally no better at predicting the future than non-experts. Foreign policy experts cannot predict what will happen in Russia and financial gurus cannot predict stock market winners. Companies that are hailed as examples of genius in

management books end up bust. About ten percent of all firms fail annually. No one wants to fail; organizational evolution is at work. Once important, Wang computers disappeared during the booming computer era; IBM survived in a more modest form by adapting to the changing environment.

The survival pattern of organizations is surprisingly similar to that of natural organisms. Why that is we do not understand, but the evidence is powerful enough that it indicates important areas of future work. Successful organizations often come from out of the blue, not from diligent R&D work within existing dinosaurs. We know that, but our existing models do not explain why that is. Intellectual modesty is in order.

Adapt provides examples of experimentation with incentives to deal with problems of corruption and other maladies. By fumbling around with different systems, we may stumble on one that works better than others, in part because it is a better fit to local institutions that could not be intuited *a priori*. Harford's point is not that we cannot improve institutions, but that, as the central planner Chairman Mao said (but did not practice), we should let 1,000 flowers bloom so we find out what works.

Man-made climate change may be upon us but, as Harford explains, almost all common prescriptions about how to reduce our carbon footprint are irrelevant or counterproductive. The world is deeply complex and our facile prescriptions, such as buying a Prius or setting "renewable energy" quotas, are environmentally laughable and economically destructive.

"Solutions" imposed by central planners, even if devoid of political interests, cannot do better than adaptive organizations that evolve in ways we do not understand. Central planning of the environment is likely to be disastrous compared to bottom-up experimentation by individuals competing to develop successful entities, which include goals such as environmental protection.

Evolution and economic structures have important links that are not well understood. Economics is an infant discipline compared to a true queen of science, physics, which has developed profound

principles, such as the second law of thermodynamics, that are regularly put into practice.

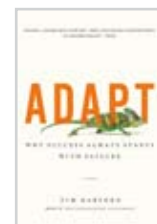
Economics is much more modest. Fancy-appearing models failed to see the economic train coming down the track that ran over us in the most recent recession. After the fact, we diligently noted that the train hit us. While macroeconomics is a failure, those toiling in the microeconomic vineyard, including environmental economists, have made some useful additions to knowledge.

When faced with evidence that the standard model we rely upon may miss the forest for the trees, it is not uncommon to reject or ignore such information. Cognitive dissonance is not surprising when one realizes that a lifetime of deep scholarship is shallower than we thought.

At PERC, we have learned to scoff at the notion that high science can divine unknown prices that planners wish to impose on environmental assets. Such "scientific" methodology is destined to be as destructive as all other central planning imposed by leaders who do not pay for the assets they wish to control or do not suffer the burden of the losses that follow.

As Harford explains, we do have some useful grounding in economics. "Hayek realized...that a complex world is full of knowledge that is localized and fleeting." We would do well to temper the notion that we know what should be imposed on the environment and economy. If we individually do silly things, we bear much of the cost of our mistakes. When we build our inadequate knowledge into environmental rules to be obeyed by all, we may pay fearful prices.

Tim Harford, *Adapt: Why Success Always Starts with Failure*, 2011.



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The Art of Managing Nature

BY RONALD BAILEY

“People in this world today crave something real, and our society is lacking that and they could come to Yellowstone and see real nature unfolding in front of their eyes with this very unique personality of a wolf and they loved her. They thought it was great,” said biologist Douglas Smith in December on a NPR program. Smith was mourning the death of the famous female alpha wolf 832F of the Lamar Canyon pack that had been legally killed by a hunter outside of the park. I, too, was thrilled when I got to watch members of that particular wolf pack wandering the landscape of Lamar Valley.

Smith’s claim that people “crave something real” gets at the heart of PERC’s recent Lone Mountain Forum, “Reconciling Economics and Ecology.” Smith is asserting that wolves wandering the landscape of Yellowstone Park are more real than...what exactly? When it comes to nature and landscapes, what is real and what is fake? And what is the “real nature” that Smith believes people are craving?



Since there is no goal or end state toward which any particular ecosystem is heading, who is to say that landscapes and ecosystems modified by human activities are somehow inferior?

NATURE AS A SOCIAL CONSTRUCT

The *Oxford Dictionary* defines nature as “the phenomena of the physical world collectively, including plants, animals, the landscape, and other features and products of the earth, as opposed to humans or human creations.” In his *Metaphysics*, ancient Greek philosopher Aristotle observed, “Of things that come to be, some come to be by nature, some by art.” Regarding those objects produced by “art,” which Aristotle called “makings,” he asserted, “All makings proceed either from art or from a faculty or from thought.” In contrast, according to Aristotle, natural entities have internal spontaneous sources of movement, whereas artificial objects are created by activity outside themselves.

Another oft-heard word in connection with nature and landscapes is pristine, which connotes an Edenic state of being “not spoiled, corrupted, or polluted.” The *Merriam-Webster Dictionary* defines it as “belonging to the earliest period or state.” The idea is that an earlier state of nature, before humanity came along and ruined it, was somehow superior, and perhaps, to use Smith’s concept, even more “real.”

In her book, *Rambunctious Garden*, conference participant Emma Marris explains, “For many conservationists, restoration to a pre-human or a pre-European baseline is seen as healing a wounded or sick nature. For



others, it is an ethical duty. We broke it; therefore we must fix it. Baselines thus typically don't act as a scientific *before* to compare with an *after*. They become the *good*, the goal, the one correct state."

Marris opened her session, "Can Ecology Guide Policy?," by observing that the science of ecology is telling us that ecosystems are dynamic, not stable. Thanks to climate change (glacial advances and melting) and anthropogenic alterations there are no ecosystems that have the same set of players they had even 12,000 years ago.

NATURE UNBALANCED

The dynamism of ecosystems has not always been recognized by ecologists. However, science has now resolved the great early 20th century debate between "balance of nature" ecologist Frederic Clements and ecosystem dynamist Henry Gleason in favor of Gleason. Clements believed that ecosystems developed through a deterministic and orderly sequence of serial stages until they reached a stable climax that, once achieved, was perfectly balanced unless disturbed. For Clements, each participant in the climax ecosystem fitted tightly into niches as a result of coevolving together.

Gleason countered that ecosystems were assembled by chance depending on what species got there first and were successful in competing with other species as they arrived. For most of the 20th century, most ecologists adopted Clements's balance of nature views. At the conference, biologist Daniel Botkin noted in passing that most ecologists still instinctively believe in the balance of nature. Scientific evidence, however, shows that Gleason was far more right than Clements—ecosystems are largely assembled by chance. For example, northern temperate forests are composed of an assemblage of species that mixed together as they raced northward out of various refugia as the glaciers retreated.

Instead of trying to force landscapes and ecosystems back toward earlier and notionally more Edenic states, Marris proposed that the right question is "What do we want for the future?" She suggested that since future generations will be richer than ours they might be able to afford and want more natural space. In addition, when thinking about modifying a piece of land, Marris suggested that a person should ask herself, what do you want this piece of land to be in 20 years,



200 years? At the conference table, a lot of the conversation about who gets to decide about the futures of landscapes turned on the pronouns, “we” and “you” in Marris’s two questions.

WHO DECIDES?

Just who “we” is can be problematic. Marris prefers what she believes to be a more democratic process in which stakeholders get to decide how landscapes should be managed and used. Thomas Bray, a former PERC board member, suggested that people who prefer an ecosystem to remain relatively undisturbed could buy a conservation easement. Marris rejected this proposal, saying, “we’re broke.”

As a counterpoint to Marris’s implication that stakeholder democracy is a better and fairer way to decide the future of landscapes, George Mason University Law professor Henry Butler asserted that, in fact, the “we” more often than not turns out to be wealthy environmentalists who prefer to federalize environmental decisions because they don’t trust local people. Given their greater access to distant bureaucratic decision-makers, environmentalists often succeed in imposing the costs of pursuing their aesthetic landscape preferences on poor people.



Q&A with Emma Marris on Turning the Conservation Movement Upside Down

PERC was very fortunate to have Emma Marris participate in the workshop on “Reconciling Economics and Ecology.” Marris is the author of *Rambunctious Garden: Saving Nature in a Post-Wild World*, which has quickly gained recognition as one of the most important environmental books on the shelves today.

Marris advances a new perspective of environmentalism that sees nature almost everywhere—in backyards, city streets, even the python-infested Everglades. The book argues that we should jettison the notion of pristine nature, and instead tend a rambunctious garden, “a hybrid of wild nature and human management.”

Q: Given that PERC is just miles from Yellowstone National Park, we are keen to learn more about the “Yellowstone Model” described in your book. Can you summarize the model?

A: The phrase “Yellowstone Model” is shorthand for a conservation strategy that focuses most or all of its attention on creating and maintaining protected areas with very strict limits on human use. In my book, I suggest that in the 21st century, we must expand our suite of tools beyond this narrow focus and complement our protected areas with conservation on private lands, working lands, urban lands, suburban backyards—in short, everywhere. But I want to make clear that I do not support abandoning or privatizing public parks like Yellowstone. They are crucial for goals like large predator conservation and preservation of opportunities for public recreation. In my book, I describe such places as “a crucial part of an expanded model. Such strictly protected areas become anchors, with overlapping zones of various protection regimes and conservation goals radiating out from them, like petals from the center of a rose.”

(continued on page 19)



PERC's Terry Anderson neatly summarized the central dilemma of the conference when he asked, "Do humans impose costs on nature or just on other humans? Can we think of nature in any other way than imposing costs on other people?" For example, the return of wolves certainly imposed costs on local ranchers and hunters in the form of predated livestock and game animals like elk.

Since there is no goal or end state toward which any particular ecosystem is heading, who is to say that landscapes and ecosystems modified by human activities are somehow inferior, sick even, and in need of healing? In his 2001 *BioScience* article, "Values, Policy, and Ecosystem Health," Robert Lackey, a fisheries biologist at Oregon State University, pointed out that "ecosystems have no preferences about their states." How do we know whether or not an acre of land would "prefer" to be a swamp or a cornfield? As Lackey notes, either of them could be considered "healthy" depending on what human preferences are being implemented. "To a conservationist interested mainly in biodiversity, we have degraded nature, but to an agronomist, we have altered wild land to make it better serve humans," noted

the Nature Conservancy's Peter Kareiva and his colleagues in their 2007 *Science* article, "Domesticated Nature: Shaping Landscapes and Ecosystems for Human Welfare."

WHO MANAGES?

PERC fellow Daniel Benjamin made the salient point that for all landscapes and ecosystems "management is not the issue. The issue is who will do the management? Everything is managed." The fact of the matter is that in an Aristotelian sense nature moves less and less spontaneously. Instead, landscapes and ecosystems are shaped by human preferences and efforts and increasingly take on the character of Aristotle's "makings."

The Yellowstone wolves are a case in point. Wolves in the park were managed into local extinction by bureaucratic fiat (stand-ins for the omnipotent "we") in 1926 when park rangers deliberately killed the last two known wolf pups. Wolves were managed back into existence in the park when "we" decided they should be deliberately reintroduced in 1995. We may be saddened to hear of the death of wolf 832F, but her presence on the landscape was the product of human prefer-



ences, not a consequence of unprompted nature. And so was her removal from it.

Even if one grants the doubtful premise that humanity was sometime in the past separate from nature, the reality is that we no longer are. All landscapes and ecosystems have been shaped in accordance with human preferences. Scientific insights derived from ecology will certainly help us better manage ecosystems. But the central question remains: What institutions are best for balancing our conflicting desires and goals when it comes to the various realities we each may crave? However ecosystems will be managed, Yellowstone and all other landscapes are and will increasingly be artificial constructions created by human minds. That is as real as it gets.



RONALD BAILEY is the award-winning science correspondent for *Reason* magazine where he writes a weekly science and technology column. Bailey is the author of numerous books including *Liberation Biology: The Moral and Scientific Case for the Biotech Revolution*. He has appeared on television and radio programs, including the *NBC Nightly News* and *PBS NewsHour*.



Q: If the pristine wilderness notion is passé what is the new paradigm?

A: We have to determine that together. The goal won't be the same in every place. Here it might be maximization of ecosystem services, there protection of biodiversity, and over there, beauty. The challenge is how to make these determinations in a fair and scientifically informed way and on the appropriate scales.

Q: How can the notion of novel ecosystems, with people at the heart of the system, help guide policy?

A: The label “novel ecosystems” is a little misleading because it suggests that there are lots of non-novel ecosystems. But science tells us that ecosystems are not static entities, so on longer timescales everything is novel. And as the climate changes, every ecosystem will display increasingly novel features. That said, I like that the label rechristens what might have been labeled “trashy areas,” “degraded areas,” or “failures” as “novel ecosystems”—something with potential conservation value, something, in short, that perhaps should not be paved over and turned into a mall or a subdivision.

Q: You dedicate your book to your mother and thank her for sending you to Audubon Camp. As a new mother, are you concerned that your child will not be able to have a similar experience in a post-wild world?

A: Part of expanding our nature awareness beyond parks is that it makes it easier to see nature on your block, in cities and suburbs. Then, instead of teaching our children to only look for nature when they visit a park, we can teach them to also see it on the walk to school or when playing in the backyard. My toddler collects leaves and seeds from street trees on our walks and has learned to tell a pine from a maple and a fir from a pine. Thus even busy, stressed parents can get their kids interested in real nature.

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Ecology or Economics: Which Has Done More for Our Environmental Future?

BY MATT RIDLEY

Extrapolate global average GDP per capita into the future and it shows a rapid rise to the end of this century, when the average person on the planet would have an income at least twice as high as the typical American has today. If this were to happen, an economist would likely say that it's a good thing, while an ecologist would likely say, that it's a bad thing, because growth means using more resources. Therein lies a gap to be bridged between the two disciplines.

GOOD NEWS IS NO NEWS

The environmental movement has always based its message on pessimism. Population growth was unstoppable; oil was running out; pesticides were causing a cancer epidemic; deserts were expanding; rainforests were shrinking; acid rain was killing trees; sperm counts were falling; and species extinction was rampant. For the green movement, generally, good news is no news. Many environmentalists are embarrassed even to admit that some trends are going in the right direction.



Pessimism should no longer be a prerequisite for being an environmentalist. Instead, the environmental movement should try optimism.

Why? The underlying assumption is that pessimism is what drives change. But great innovators from Archimedes to Steve Jobs generally lived in the richest parts of the world in their day. Driven by ambition, not desperation, they changed the world for optimistic reasons.

Pessimism should no longer be a prerequisite for being an environmentalist. It can be counterproductive because it is a counsel of despair. People do not respond well to being told disaster is unavoidable. Instead, the environmental movement should try optimism.

There is a wonderful chance that the current century is going to be a golden age for nature. Not everything is going to go right, but it is possible that by the end of the century we will have more forests, more wildlife, and cleaner air.

LIFE IS LOOKING UP

Growing up in Northern England in the 1970s, I assumed nature was in retreat. Otters had vanished, salmon were gone from the River Tyne because of pollution, and hawks and falcons had disappeared due to DDT. Conserving nature meant protecting what was left. It never occurred to me that it might mean making things better.

Now, otters are thriving, salmon are back, and seabirds on the nearby Farne Islands have doubled in numbers. Seals have tripled, ospreys are starting to breed, and cranes are returning. Today, I expect nature to improve every year.



What is really making a positive dent in the environmental arena is the unintended effects of technology rather than nature reserves or exhortations to love nature.

It is the same for Spitsbergen, an Arctic island I visited four times in the 1970s and 1980s: Barnacle geese, ringed seals, white whales, walrus, and polar bears have all dramatically increased since then.

Britain has three times as much forest as it did 100 years ago. Could the rest of the world experience this too? I don't see why not. In fact, it is almost inevitable. The "forest transition"—the point at which a country stops losing forest and starts regaining it—is happening all over the world: Forest cover is increasing in Bangladesh, China, Costa Rica, Cuba, Denmark, Dominican Republic, El Salvador, France, Gambia, Hungary, Ireland, Morocco, New Zealand, Portugal, Puerto Rico, Rwanda, Scotland, South Korea, Switzerland, the United States, and Vietnam.

It is not too late for rare wildlife, either. As climate change specialist Willis Eschenbach has shown, according to official records kept by the Committee on Recently Extinct Organisms, if you consider Australia an island rather than a continent, then just three continental mammals and six continental bird species have gone extinct since records began several hundred years ago—far short of predictions based on theories about habitat loss. (Islands are a different matter. There have been hundreds of extinctions due mostly to invasive species, not habitat loss.)

MORE FROM LESS

Why are environmental trends mainly positive? In short, the gains are due to "land sparing," in which technological innovation allows humans to produce more from less land, leaving more land for forests and wildlife. The list of land sparing technologies is long: Tractors, unlike mules and horses, do not need to



Q&A with Charles Mann on The Pre-Columbian World Revisited

As part of PERC's Lone Mountain Forum, "Reconciling Economics and Ecology," PERC board member Steven Hayward sat down with author Charles Mann to revisit contemporary understandings of pre-Columbian America. Mann is the acclaimed author of *1491: New Revelations of the Americas Before Columbus* and *1493: Uncovering the New World Columbus Created*.

Q: It might be fair to say that you've done more than anyone in recent years to challenge the popular view that Columbus represented the North American equivalent of the invasion of the Garden of Eden and the fall from Edenic paradise. What larger lessons should people take away from studying this story more closely as you have?

A: When I went to school, we learned that Indians had walked across the earth about 12,000 years ago, which is not that long ago as these things go, and they lived for the most part in these small scattered bands. When Columbus came to North America, the Indians had had such little impact on the environment that he walked into what for all intents and purposes was a wilderness. And now almost all researchers think that all three of these are wrong.

The Indians were here for far longer than previously believed, in far greater numbers than previously believed, and they had far more environmental impact than previously believed. Which means many things. Both changing our understanding of our past which changes our understanding of our present, but particularly in regard to environmental issues. So many of our environmental laws are based on the idea that there is this baseline of 1492 with no human presence. Now we know that these ecosystems we are all concerned about evolved with people in them and with people affecting them for thousands and thousands of years.

(continued on page 27)

feed on hay. Advances in fertilizers and irrigation, as well as better storage, transport, and pest control, help boost yields. New genetic varieties of crops and livestock allow people to get more from less. Chickens now grow three times as fast as they did in the 1950s. The yield boosts from genetically modified crops is now saving from the plow an area equivalent to 24 percent of Brazil's arable land.

What is really making a positive dent in the environmental arena is the unintended effects of technology rather than nature reserves or exhortations to love nature. Policy analyst Indur Goklany calculated that if we tried to support today's population using the methods of the 1950s, we would need to farm 82 percent of all land, instead of the 38 percent we do now. The economist Julian Simon once pointed out that with cheap light, an urban, multi-story hydroponic warehouse the size of Delaware could feed the world, leaving the rest for wilderness.

It is not just food. In fiber and fuel too, we replace natural sources with synthetic, reducing the ecological footprint. Construction uses less and lighter materials. Even CO₂ emissions enrich crop yields.



Paradoxically, economics has done more for nature than ecology has. Yet there is still much that both fields can learn from the other.

WHAT COULD GO WRONG?

All the economic models agree that the fastest economic growth will produce the smallest population, the most frugal use of resources, and the most land sparing. So what could go wrong?

The Jevons Paradox argues that we compensate for greater efficiency by using more of a resource because it is cheaper. But this is no longer true of land: There is a steady release of land from farming going on in countries like the United States. Of course, we might see a reversal of the demographic transition and a rise in birth rates. Yet all the evidence suggests that this is far more likely to happen if the world remains or grows poor than if it becomes rich.

Catastrophic climate change might undo us. Yet moderate climate change will only help with land sparing. Moreover, the empirical data increasingly support the probability that climate change will be mild and slow for many decades. One should be more concerned about the effects of climate change policies, which are horribly land-hungry and harsh toward nature. This includes biofuels, wind power, hydroelectric power, and the refusal to back fossil fuels for the rural poor, which results in the continued exploitation of forests for fuel. In other words, when it comes to climate change, the cure might be worse than the disease.

Organic farming is another example of ecologically good intentions that would pave the road to environmental hell. Organic farming is nice enough as a local fad, but if it were pursued on a global scale it would require a doubling of the amount of land devoted to agriculture, because organic yields are necessarily much lower than those using synthetic fertilizer. In effect, organic farmers have to grow their own fertilizer as “green manure” or dung from livestock, which takes up far more land than making fertilizer in a factory. If the world



Q: We think of this as the New World, but in fact as you argue this really in some ways is the Old World and Europe, in some ways, is the New World.

A: Right. Much of Northern Europe was covered by ice for a long period of time. 10,000 to 12,000 years ago you couldn't live in England because there were giant ice sheets on top, whereas the civilizations in Mesoamerica and South America were flourishing.

Q: Are there large, outstanding questions in this area?

A: Oh, huge ones. Now the problem is that it's almost universally accepted that Indians were here for 17, 18, 19, maybe even 25,000 years and it would be very nice to know how they got here. Right now the main theory is that they came by boat. But the reason they have that theory is that all of the other theories seemed to have been proven wrong.

Q: We know from the archeological record that a lot of these pre-Columbian civilizations collapsed on their own before any Europeans arrived. What were some of the leading causes of the ups and downs of the pre-Columbian civilizations?

A: Civilizations all around the world rise and fall. And they typically do so for a variety of reasons. Relatively low on that list of reasons is environmental impact. Typically they tear themselves apart, through war, through unrest of all sorts. It's a really interesting area and I'll probably have to write another edition of the book soon.

were to go organic, it would require a renewed and massive assault on forests, wetlands, and nature reserves to feed the global population.

Paradoxically, economics has done more for nature than ecology has. Yet, as discussed at PERC's recent forum, there is still much that both fields can learn from the other. Economics could learn something from Charles Darwin and ecology could evolve from revisiting Adam Smith. Indeed, Charles Darwin read Smith, so there is an ancestral connection between the two fields: they both stress the emergence of phenomena rather than their direction from above. And, there is much activity in evolutionary biology and ecology that is parallel to what is occurring in economics and vice versa. Nobel laureate F. A. Hayek knew this and went across to evolution to pinch ideas, so there is fruitful dialogue between ecology and economics and plenty of room for more.

▶ Watch Ridley on PERCtv: www.youtube.com/perctv



MATT RIDLEY is a scientist, journalist, and businessman. With a Ph.D. from Oxford University, he is a *New York Times* best-selling author and former editor of *The Economist*. In his latest book, *The Rational Optimist: How Prosperity Evolves* (HarperCollins 2010), Ridley turns from exploring human nature to investigating human progress.

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THE FRACKING REVOLUTION

Beginning in 2005 natural gas production in the United States has risen sharply. This has caused natural gas prices to fall, lowering energy costs and expanding natural gas consumption at the expense of coal. The new natural gas also fuels the turbines that serve as backup power for new wind and solar power installations.

The source of these events is the rapidly spreading use of hydraulic fracturing (fracking) to extract natural gas from shale. This technique entails the injection of water, sand, and small amounts of chemicals deep underground to fracture the shale and release the natural gas it contains. Concerns have arisen, however, over the potential adverse effects of fracking—events said to range from groundwater contamination to earthquakes. Recent research helps us understand whether we should—or should not—fear fracking (Hitzman et al. 2012, Moniz et al. 2012, and Fulton et al. 2011). There are several issues.

Water usage—A typical shale gas well requires about 4 million gallons of water to fracture the rocks and get the gas flowing at commercially profitable levels (Moniz et al. 2012). This sounds like a lot of water, but it is less than a typical golf course uses in two weeks. Roughly 80 percent of the water used in fracking a well stays underground. The rest comes back up as return flow and must be cleaned before it can be safely consumed or used in agricultural or commercial operations. The cleanup is not cheap, but it is a routine undertaking, in part because most of the chemicals used in fracking are those that many people have around the home, including those found in deodorants, glass and other cleaners, and even chewing gum and cosmetics.

An additional complication for fracking in some areas is that a variety of contaminants, including chloride and bromide salts, are brought from underground

to the surface in the return flow water. Historically, this contaminated wastewater has been too costly to treat, so it has been re-injected deep underground into separate EPA-regulated wells designated for this purpose. The costs of cleaning such contaminated water are falling rapidly, however, and a new industry has emerged in the last few years: cleaning and recycling this water for use in fracturing other wells.

Groundwater contamination—Fracking wells are drilled vertically for thousands of feet before they turn horizontally to go into the shale, fracture it, and retrieve the gas. The fracking itself occurs far from any water sources, but when the gas comes up the vertical pipe it is possible for some of it to escape the pipe. If the vertical well shaft passes through a surrounding aquifer from which people draw their water, leaking gas can contaminate the water.

Gas that escapes the pipe is gas that cannot be sold. Drilling companies prevent leaks by injecting cement into the well, encasing the pipe and sealing the gas off from any nearby aquifer (or indeed anything else). Leaks do happen, but the issue here is not fracking, per se. Gas can escape from virtually any gas or oil well. The key to preventing this is careful well construction. As long as standard drilling practices are adhered to, groundwater contamination is extremely rare (Moniz et al. 2012). What of the Internet film clips that show flaming water coming out of kitchen spigots? Well, naturally-occurring methane in groundwater supplies is common in areas such as Pennsylvania lying over fossil fuel reserves. Setting one's water on fire has long been a party trick where the natural methane concentrations are high enough to be readily flammable.

Earthquakes—Much has been made about the potential for fracking to cause earthquakes. As long as 90 years ago, scientists realized that conven-

tional oil and gas production can cause small quakes. More recently, it has been found that the production of geothermal power also induces earthquakes. Even the impoundment of large amounts of water behind a dam can put enough stress on the earth to cause earthquakes. According to the National Academy of Sciences (Hitzman et al. 2012), however, the chances are negligible that fracking would prompt an earthquake of a magnitude that would harm humans or property.

Air pollution and greenhouse gases—Coal-fired power plants are a major source of carbon monoxide, nitrogen oxides, sulfur dioxide, and particulate matter. Compared to coal, burning natural gas generates only 20 percent as much carbon monoxide and nitrogen oxides, and virtually *no* sulfur dioxide or particulate matter. Fracking is displacing coal, so it is reducing air pollution.

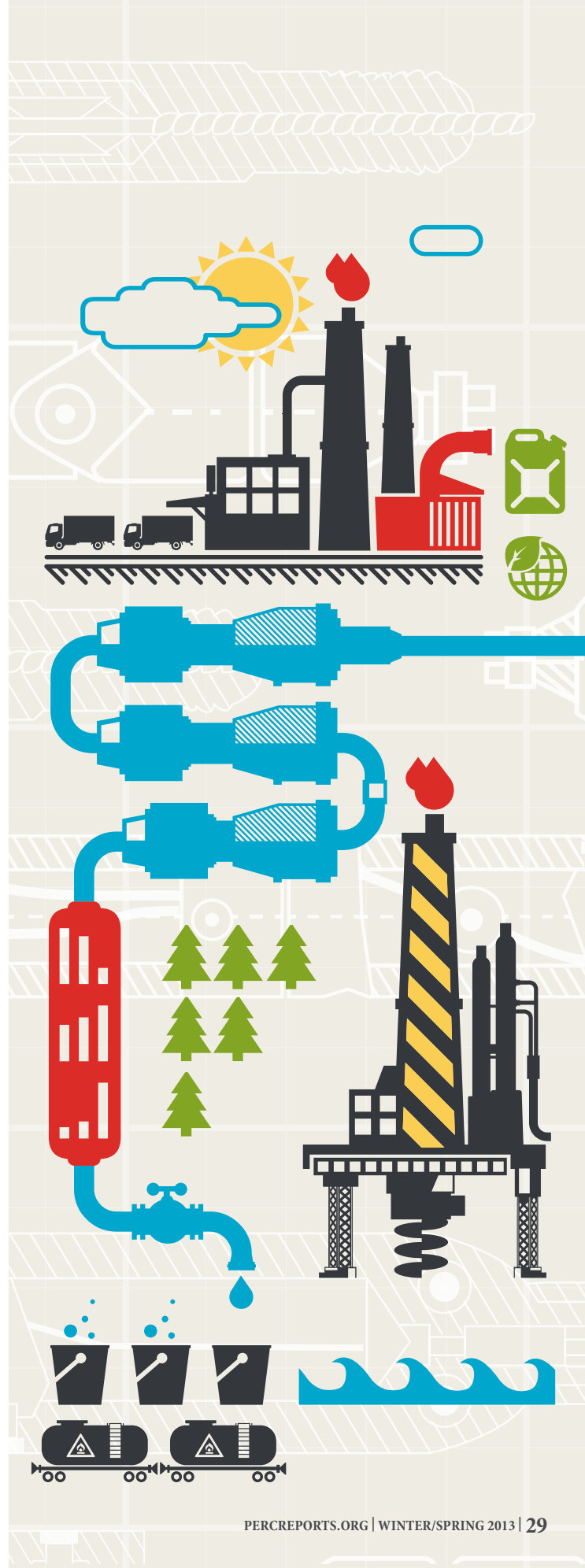
Methane is regarded as a potent greenhouse gas. It is also the principal component of natural gas, and all natural gas production causes the release of some methane. Fracking does seem to cause a higher rate of release of methane into the atmosphere, however. Balanced against this is the fact that burning natural gas generates about only half as much CO₂ per unit of energy as burning coal does. Replacing coal with natural gas—fracked or otherwise—likely *reduces* overall greenhouse gas emissions by about 50 percent (Fulton et al. 2012).

Fracking entails tradeoffs, as do all activities. But the purely economic benefits of the process are clear. It even appears, on balance, as though the environmental benefits outweigh any environmental downsides. So, although some commentators have characterized hydraulic fracturing as being “all fracked up,” it seems much more likely at this point that it is, in fact, a “fracking good deal.”

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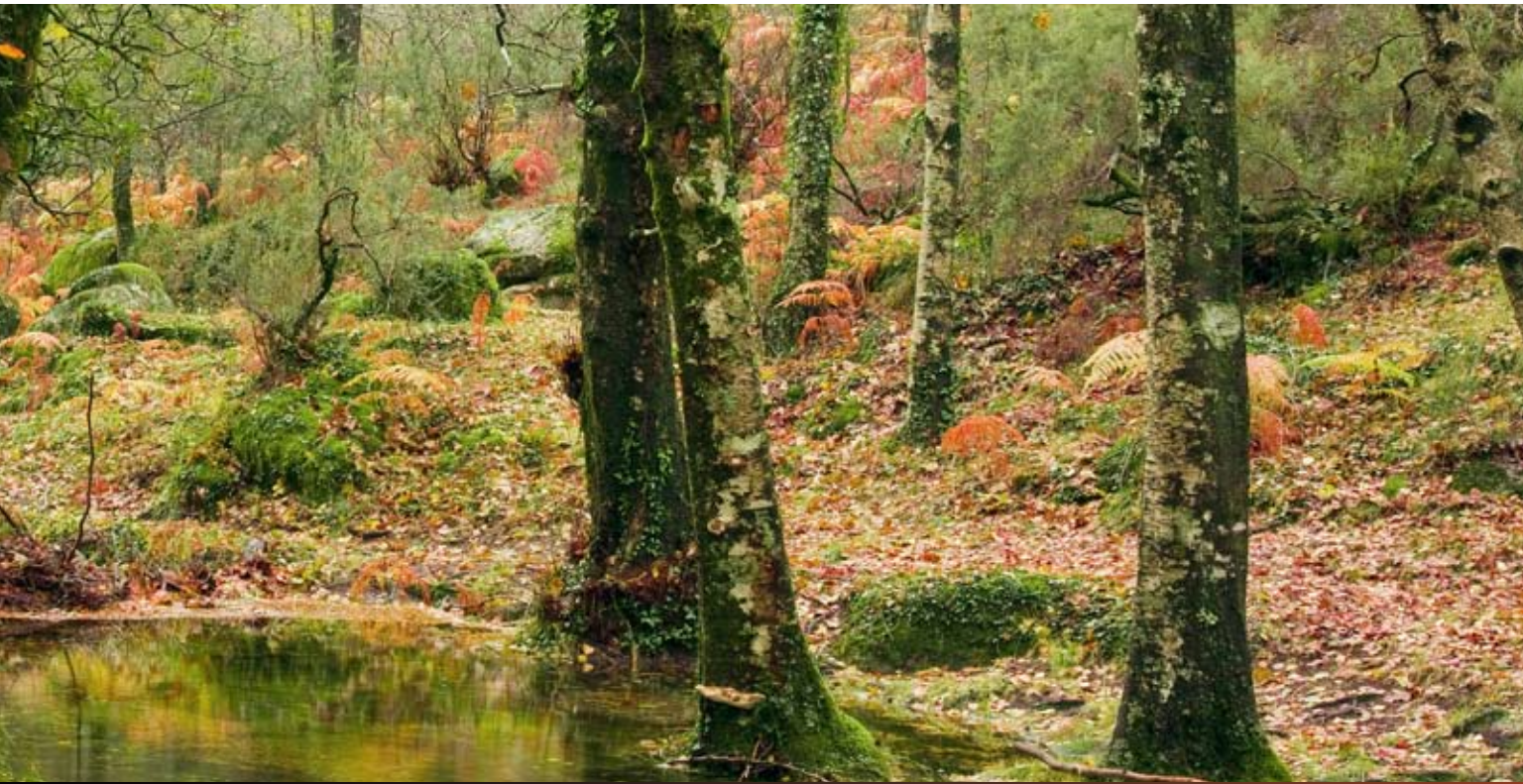
Ecology & Economics Can Save Forests —But There’s a Catch

BY DANIEL B. BOTKIN



Conflicts over living resources arise mainly from the question of use versus preservation: *use* meaning harvesting a resource as needed by people; *preservation* meaning leaving nature alone so that people can't have negative effects on it. The conflict is particularly intense for forests because they play so many roles for humans and for nature. Forests cover vast areas of the Earth, provide clean water and habitat for many species, including endangered ones, and serve to retard erosion and sequester carbon. Equally important, people have valued forests for their resources for millennia. Firewood, for example, was for many centuries a primary fuel and remains so in many parts of the world.

With the rise of the modern environmental movement in the 1960s, forest conservation received increasing attention, which continued throughout the rest of the twentieth century. A characteristic feature of the debate over forests was that all forests should serve all purposes—both use by humans and preservation of nature from humans. Furthermore, if forests were going to be harvested, logging should be done in a “natural” way. This led to battles over individual forests and became especially intense in the Pacific Northwest’s Douglas fir forests,



where clear-cutting was widespread, leaving the land looking bleak and destroyed. Conservationists argued that these forests were especially important as habitat for two endangered species, the spotted owl and the marbled murrelet, and also for protecting breeding habitat for salmon.

ECONOMIST MEETS ECOLOGIST

In the 1990s, Resources for the Future economist Roger Sedjo and I sought a solution by bringing together our different areas of expertise. We began with the simple observation that in order to make a forest and its harvests sustainable, the amount of timber harvested from a forest could not exceed its average annual wood production. There are two alternatives for obtaining timber: cutting wood from old-growth and other natural forests, or harvesting wood from intensively managed plantations that produce high yields on relatively small areas of land.

At the end of the twentieth century, the average annual worldwide consumption of timber was 1.5 billion cubic meters and had been fairly constant for a number

of years. Sedjo suggested this amount could provide an estimate of the average annual world production of timber, a more difficult number to quantify directly. The growth rate of usable timber in natural forests ranged from 1 to 3 cubic meters per hectare per year. If harvested sustainably from natural forests, between 0.5 and 1.5 billion hectares would have to be harvested annually to meet the world's timber needs. Forests cover approximately 3.4 billion hectares. If in the best case, all forests provided the maximum production of 3 cubic meters per hectare a year, then 15 percent of the world's forestland would undergo harvests. In the worst case, forests would produce 0.5 cubic meters per hectare a year, and 44 percent of the growth would have to be cut. A realistic estimate would be somewhere in the middle, but would still amount to a large fraction of the world's forestland. Thus, in those areas the conflict over use versus preservation would continue.

In contrast, plantations—with fast-growing tree species planted and managed much like agricultural lands—could produce 10 cubic meters per hectare annually. If the world's timber was provided

Intensively managed plantations could meet the world's major timber and fiber needs using less than 10 percent of the world's forest area.



exclusively from plantations, then only 0.15 billion hectares, or roughly 4 percent of the total forestland, would undergo harvests. Even an average production of 5 cubic meters per hectare would require only 8 percent of the world's forests.

PLANTATIONS TO THE RESCUE

Why not divide forestland into two categories: plantations to provide harvestable timber, and all the rest of the world's forests, to provide the non-harvesting functions of forests? The plantations would have to be carefully managed, of course, keeping factors in mind such as biological diversity, streamside buffers, and ecologically sound methods of pest management in mind.

The solution is not perfect. A problem, for example, with this proposal is that plantations often use exotic species. Because of the well-known environmental problems associated with the introduction of exotic species, plantation managers should select species carefully. Even allowing for these environmental considerations, Sedjo and I concluded that intensively managed plantations could meet the world's major timber and fiber needs using less than 10 percent of



the world's forest area. It seemed a win-win situation, providing economic benefits to timber producers and environmental benefits for conservationists. The solution to the long-standing debate over how forests should be managed seemed an easy one, and readily at hand.

THE CATCH

But here's the catch. Many environmental organizations felt that plantations were not forests and therefore could not be certified as sustainable and could not be part of the solution to the forestry problem. At the time, certification of forests as sustainable had a significant influence on retail sales. This was a resurrection of the ancient idea of a "balance of nature," the idea that nature undisturbed achieves a constant condition that has maximum biomass and diversity, and will persist indefinitely as long as people do nothing to affect it. People were believed to have only negative effects on nature, especially forests.

Yet as I describe in my book *Discordant Harmonies: A New Ecology for the 21st Century* (1990), this mythological balance of nature has never existed.

Furthermore, many regions of Earth's lands were greatly modified by preindustrial peoples. American Indians intentionally burned most of the forestland of North America. The result was the kind of forests that conservationists liked and believed had come about by being untouched by people. Following from this belief, plantations were by definition not forests and could not provide part of the solution to managing and conserving forests. This widespread belief remains. As a result, I have addressed the balance of nature myth in its modern context in my new book, *The Moon in the Nautilus Shell: Discordant Harmonies Reconsidered* (2012).

Around the time I was working with Sedjo, I visited Plum Creek Timber in Maine where professional forester Carl Haag took me to a beautiful plantation of mature spruce. The trees were evenly spaced, and the area between them quite open because of the dense shade created by the spruce and the deep layer of needles on the ground. Haag said that the company ran tours for the public on its lands, including this plantation. He told me that a woman on one of the tours swore that this area had to be natural although he showed her cor-

The combined work of economists and ecologists can result in practical solutions to many environmental problems related to forests.



porate records proving the area had been a farm, revealed when tree planting occurred, and explained that natural seed dispersal could not have created such even spacing between trees. It was the beauty of the plantation that persuaded her that it must have been natural.

FORESTS FULL OF IRONY

Management of America's forests is full of irony. Until the end of the twentieth century, private timber corporations and environmental organizations believed they had the best interests of forests at heart and knew how to best manage them. But each group had its own perception of how that management should be done. At the time, while doing ecological research in forests, I knew individuals on both sides, and some of the foresters from private corporations genuinely wanted to have sustainable forests and tried their best to work with environmental groups. Perhaps the height of the attempt at cooperation was when a combination of environmental organizations in Maine got together with representatives of private timber corporations to seek a way to sustain biological diversity in the forests of that state.



In the end, a significant change in forest ownership took place—in part because the timber corporations found that no matter what they suggested, it was never accepted by environmental groups, and also because of other economic considerations. The major timber corporations sold off all or most of their lands, which they managed with professional foresters, and focused on wood processing by simply buying timber on the open market. Much of their land was purchased by investment corporations that were interested in forests for their short-term financial profit, but with little expertise in silviculture. Today, much of the timber purchased by U.S. timber corporations comes from abroad, including developing countries where little attention is paid to sustainable forestry.

As interest in forest research declined, some U.S. timber corporations reduced their large staffs of professional foresters. At the same time, environmentalist pressure on the U.S. Forest Service led to dramatic declines in timber harvests on public lands as well as decreases in forestry research budgets.

The combined work of an economist and an ecologist resulted in a practical solution to many environmental problems related to forests. But the ideologies at the time and the politics of the green movement prevented its application. Today, forests are not the center of environmental concern that they were in the late twentieth century. We hear about them when forest fires destroy property, and we hear about them as places that might sequester carbon to help us deal with climate change. Concerns about when and how to harvest timber, however, rarely appear in the media. Economics and ecology have much to offer to help solve environmental problems, but too often ideology and politics get in the way.



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FEDERAL FLOOD WATER INTRUDES ON PRIVATE PROPERTY

If the federal government flooded your property and destroyed 18 million board feet of oak timber in the process, you might expect to be compensated for the loss. Yet, in *Arkansas Game and Fish Commission v. United States*, the government argued—and a lower court agreed—that, because the flooding was only temporary, no compensation was owed. On December 4th, in the first takings case since John Roberts became the Chief Justice, the Supreme Court unanimously rejected this argument and ruled in favor of the property owner. Though narrow, the holding is a signal of the Supreme Court's reluctance to further erode the Takings Clause.

The flooding occurred on the 23,000-acre Black River Wildlife Management Area owned and operated by the Arkansas Game and Fish Commission. The property lies on both sides of the Black River, 115 miles downstream of the U.S. Army Corps of Engineers' Clearwater Dam near Piedmont, Missouri. From 1993 to 1998, the Corps deviated from its official Water Control Manual and released excess water from behind the dam. These releases, which caused more severe and more sustained flooding than had previously been recorded in the area, weakened and eventually killed off huge swaths of hardwood timberlands on the state's property.

The case was first litigated in the Court of Federal Claims, which ruled in favor of the Commission and awarded \$5.5 million for the timber and \$178,428 to regenerate forest habitat on the property. The federal government appealed to the Court of Appeals for the Federal Circuit, which overturned the ruling and both financial awards on the premise that government-induced flooding can only support a takings claim when the flooding is permanent or inevitably recurring.

The Supreme Court has previously held that federal government action that permanently floods private property constitutes a taking of that property and requires compensation. Indeed, the first inverse condemnation case ever decided by the Court was *Pumpelly v. Green Bay Co.*, an 1872 flooding case in Wisconsin. More recent cases that do not involve flooding have also established the government's duty to compensate private landowners for temporary takings, with the compensation paid reflecting the takings' temporary nature.

The question in this case was whether the Supreme Court would carve out an exception to the Takings Clause for government actions that only temporarily flood private property. According to the federal government’s brief, previous opinions by the Court had already done so by using terms such as “permanent” and “inevitably recurring” to describe flooding that constituted compensable takings. The government’s attorney claimed during oral arguments that, when the flooding is only temporary, federal agencies can adjust the burdens and benefits of owning riverfront property without judicial oversight, even if the resulting damage to private property is permanent.

Admonishing the government’s attorneys for inferring too much from non-dispositive portions of previous opinions, Justice Ginsburg explained, “We do not read so much into the word ‘permanent.’” According to Ginsburg, there is “no solid grounding in precedent for setting flooding apart from all other government intrusions on property.” “Flooding cases,” the opinion reads, “like other takings cases, should be assessed with reference to the ‘particular circumstances of each case,’ and not by resorting to blanket exclusionary rules.”

By reversing the Federal Circuit’s opinion that sought to create a blanket exception to the Takings Clause, the Supreme Court’s ruling has broader implications than just flooding; it affirms the notion that “when the government physically takes possession of an interest in property for some public purpose, it has a categorical duty to compensate the former owner.” The Court’s opinion holds federal agencies accountable for invasions of private property, even the temporary ones, and this is an important victory for property rights because it reduces the potential for government overreach and other property rights abuses.



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Rent-A-Green Box

► For more information: www.rentagreenbox.com

Moved lately? Frustrated by spending hundreds of dollars for boxes that are simply thrown out weeks later? Recopack has the answer for you. Recopack is the recycled eco-packaging solution. Spencer Brown, an enviro-innovator, uses recycled plastics to create recyclable boxes that are rented for two weeks at a time. The boxes are delivered and picked up at no additional charge and can save movers 50 percent on the costs of traditional cardboard boxes in their boxing needs. Recopacks maintain their integrity for up to 400 round trips before they are ground up and reformed into more boxes.

While Recopacks are an innovative product that meets the desires of many consumers, whether they are greener than the cardboard alternative depends on the goal of being green. Use of Recopacks reduces landfill waste and the need for increased cardboard production. Trees, however, are a renewable resource and are grown to meet the demand for timber products. And rather than send the cardboard waste to the landfill, the Recopack requires its own transportation and cleaning, which has its own environmental impacts. There are many shades of green.

Fifty Shades of Green

► For more information: www.nest.com

When it comes to home heating and cooling, do you embrace the keep-it-constant method or are you the turn-it-up/turn-it-down type? While there are some rather sophisticated home heating systems on the market, most of us use the standard thermostat and adjust it occasionally (or often) to meet our comfort level.

Tony Fadell, an innovator, has helped create a better way. Fadell and associates recently introduced the Nest Learning Thermostat—a smart thermostat. Fadell helped develop the iPod and the iPhone. He is one of those entrepreneurs that knows how to improve existing technologies and, as a result, make them greener.

The Nest is similar to most household thermostats, but smarter. It learns from your daily adjustments and creates an automatic schedule to match your personal preferences. Or, if you prefer, you can adjust the thermostat remotely from the Nest's mobile app. The Auto Away feature can sense human presence in the room and adjust the temperature accordingly. It's a family "energy partner" making use of the latest technology to improve energy efficiency.



About nine percent of the energy consumed in the United States is controlled by residential thermostats. The idea that programmable and “smart” thermostats could save energy seems like a no brainer. Studies show, however, that their “greenness” relies on the user. To realize energy savings occupants must program the device to use less energy, such as lowering night or daytime temperatures. Evidence demonstrates that little or no significant savings have resulted from the array of programmable thermostats available. Whether that is due to misuse or comfort over cost is unsettled.

Envirofit for Cleaner Air For more information: www.envirofit.org

Acute respiratory infections are the number one cause of death in developing countries, killing more than 4 million people annually. Nearly 2 million of those deaths are the result of indoor air pollution, a consequence of burning biomass for heating and cooking, the method used by over half of the world’s population.

Envirofit, as the name implies, creates products that fit the needs of the masses while improving the environment. Developing and manufacturing clean burning, efficient, and affordable cook stoves are an example. Founded in 2003, the company’s mission is “to create products that reduce pollution and energy dependence while yielding health, environmental, and economic improvements.”

With more than 450,000 stoves now in use, the company estimates that two-million people are breathing cleaner air, emitting less carbon, and harvesting less wood from the forest. Envirofit stoves use 60 percent less fuel than a standard cook stove, emit 80 percent less carbon, and cost around \$25.

Just as important are their global partners that help produce and distribute stoves in Asia, Africa, and, soon, Latin America. With multiple stove types, Envirofit strives to customize products that meet the needs of consumers worldwide. Envirofit also takes manufacturing to local markets, with plants in China and India and new developments starting in Kenya and Ghana.

Staying aware of market behavior is key for the company to ensure that products fit the needs of consumers and the environment. Products such as clean, efficient cook stoves are important because, according to Envirofit, the problem of indoor air pollution is “too large to be tackled via subsidy or give-away programs. A true market-based solution is needed.”

"I can't think of another author who has had so great an impact on natural resource management as Daniel Botkin...*The Moon in the Nautilus Shell* challenges us to rethink ecology in the same way the *Origin of Species* changed the approach to biology."

– Kerry Fitzpatrick, Wildlife Ecologist,
Michigan Department of Natural Resources

"Solving environmental problems calls for candor—which is the beauty in the stories here. They are indeed earnest, and elegantly written."

– Alfred Runte, author of *National Parks: The American Experience*

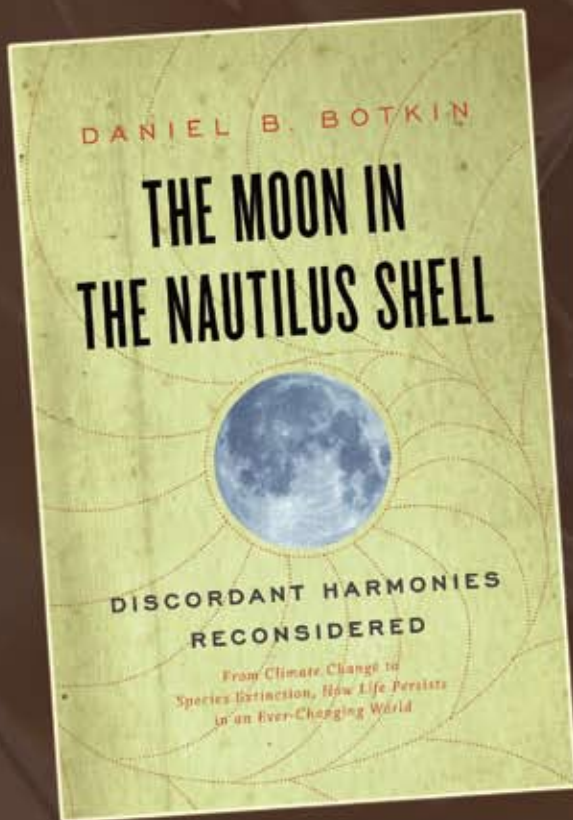
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From the author of *Discordant Harmonies*, one of the most important books of the modern environmental movement, comes a new classic



THE MOON IN THE NAUTILUS SHELL DISCORDANT HARMONIES RECONSIDERED

From climate change to species extinction,
how life persists in an ever-changing world

BY DANIEL B. BOTKIN

The Moon in the Nautilus Shell shows that much of our laws, policies, and actions intended to improve the environment are bound to fail because they assume that nature exists in a perfect balance, unchanging except for human actions. But as the book shows, based on the best modern science, nature is actually just the opposite—constantly changing. Therefore, Botkin writes, we can't destabilize climate because it has always been changing, nor can we restore endangered species to a single number because they are also constantly fluctuating. The implications reach from how each of us can connect to our ever-changing natural world to how our technological civilization can enhance the sustainability of life on Earth.

More information at www.danbotkin.com

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