SPECIAL ANNIVERSARY ISSUE

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PERC REPORTS

40 YEARS OF FREE MARKET ENVIRONMENTALISM

A DIFFERENT SHADE OF GREEN

FROM THE EDITOR by Shawn Regan

This year, PERC celebrates its 40th anniversary—an impressive milestone. For four decades now, PERC has explored ways to apply property rights and markets to address environmental problems. As many will attest, there's no place like it.

I started working at PERC ten years ago—first as a summer intern, then an outreach assistant, research fellow, publications director, and now as the vice president of research. Over the past decade, I've worked with such diverse groups as national environmental groups, free market policy groups, top scholars in economics and law, federal and local policymakers, national park superintendents, environmental entrepreneurs, Native American tribes, ecologists, philanthropists, journalists, and more. No other organization does that.

But that's just a quarter of PERC's existence. Long before that, a bold group of economists set the stage for me and others at PERC. They laid the intellectual foundation for what became known as free market environmentalism. They built a movement that has grown PERC from a voice in the Montana wilderness to a nationally recognized institute known for its high-quality research, policy chops, and commitment to conservation. It's their ideas that we get to apply, adapt, and expand upon every day.

This issue of *PERC Reports* honors our 40th anniversary. It reflects on PERC's ideas and the influence they've had on conservation, economics, policy, and environmentalism broadly. But as much as it celebrates the past, it looks toward the future—to new opportunities and challenges, and to creative ways to apply free market environmentalism in the 21st century.

So, whether you're a friend, supporter, donor, fellow traveler, skeptic, or just an interested reader, thank you for your interest in what we do. I hope that you continue to support PERC and *PERC Reports*—the only magazine dedicated to exploring and advancing market approaches to environmental problems—so that the decades ahead can be even more productive than the past four.

For 40 years, *PERC Reports* has been the only magazine devoted to exploring market solutions to environmental problems. We depend on your support.

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

TABLE OF CONTENTS

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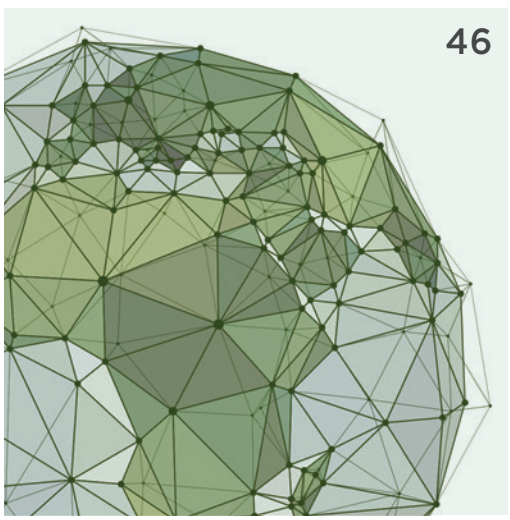

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A Pirate Looks at 40

Reflections on PERC's milestone anniversary

My migration to PERC was a generation in the making. In the mid-1990s, working for a Florida think tank founded by an up-and-coming policy junkie named Jeb Bush, I was struggling to find an approach to conservation issues that would appeal to those who loved nature and the outdoors but understood there were limitations to government solutions. What came across my desk one day was more newsletter than magazine: a black-and-white pamphlet with a splash of green called *PERC Reports*. It might not have been much to look at, but the ideas and articles resonated. This little organization in faraway Montana, then known as the Political Economy Research Center, was advancing a unique approach to conservation. And that approach was free market environmentalism.

The ideas were provocative and counterintuitive. Rather than just criticizing excessive government regulation or environmental litigation, PERC scholars were offering real solutions, like individual fishing quotas and water markets, that improved conservation outcomes. To them, the environment was not a religion but a science, and as such, something that economics could improve for the better.

Years later, after going on to work for Governor Jeb Bush, I became PERC's first adjunct fellow. It was a nice (and no-cost) way for founder Terry Anderson to include a non-academic like me in some of PERC's research and writing. I had also become a conservationist and policymaker myself, going on to serve 14 years as a commissioner on Florida's Fish and Wildlife Conservation Commission. And there I ran into PERC again.

In 2007, Florida and other Gulf Coast states were grappling with overfishing of red snapper. It was a classic case of the tragedy of the commons—a race to catch the fish was causing overharvest, a conservation disaster. The red snapper population had fallen to just 4 percent of its historical levels. PERC and Environmental Defense Fund teamed up to educate fish commissioners and biologists on how property rights through individual fishing quotas, now known as catch shares, were helping recover fisheries around the world and could do the same for imperiled Gulf Coast fisheries.

The tradable quotas were a better way to manage the commercial harvest of fish, moving away from fishing derbies to a property rights-based system that created incentives for stewardship. As James Workman explains (p. 40), under catch shares, fishery managers set a sustainable total harvest, and each fisherman is assigned a portion of the catch, which they can buy, sell, or lease. Everyone has a stake in the future of the fishery, encouraging collective stewardship.

The idea was not without controversy. Anything akin to private ownership of a common resource was anathema to some commissioners. But after robust discussion and debate, we supported a catch-shares system, and today, those fisheries have made remarkable comebacks. Overfishing in the commercial fishery ended, and the red snapper spawning stock tripled.

The success of catch shares demonstrates two lessons that help drive PERC in its 40th year. First, PERC, while a research center at its core, has incredible potential to influence public policy related to the environment, not to mention on-the-ground conservation. Second, PERC's work is even more effective when we partner with other open-minded, outcome-oriented conservation organizations like Environmental Defense Fund.

> Rather than just criticizing excessive government regulation or environmental litigation, PERC scholars were offering real solutions that improved conservation outcomes.

PERC is still working with many of the same environmental organizations and others on issues like habitat restoration, conservation leasing, and forest resiliency. Our researchers are regularly asked to testify at congressional hearings and to brief officials at the Department of the Interior and other agencies. We are partnering with national park superintendents, including at nearby Yellowstone, to improve park management and address the overdue maintenance of our most treasured lands. Overseas, you will find our ideas in action in Africa, helping preserve habitat for big-game species and other wildlife. Throughout the American West, we engage with cattle ranchers and biologists to conserve some of our nation's greatest land-mammal migrations. And, true to our roots, we are still a research hub for scholars, economists, and scientists alike, hosting workshops and bringing diverse perspectives to the table.

Today, 2,000 miles from Florida and living in Bozeman, I sense there is palpable excitement about the future of PERC. Forty years ago, our founding fathers faced extreme headwinds and plenty of criticism. It was not fashionable then to think that market approaches could help the environment. But now, throughout the world of conservation, you see plenty examples of their vision in action—water markets to protect freshwater flows, catch shares to manage marine fisheries, innovative incentives to steward private working lands, policy reforms to promote the recovery of rare species, and user-pays systems to support public land conservation.

In recognition of our influence on conservation, PERC recently won a distinguished prize for "punching above its weight class." As environmental journalist Todd Wilkinson likes to say, "PERC is no longer a garage band." With four decades under the belt, we've arrived on the big stage of conservation, and that's where we plan to stay.

Brian Yablonski is the CEO of PERC. In "Frontiers," he describes how PERC seeks to advance creative conservation through incentives, innovation, and cooperation.

Pandemic spells trouble for African wildlife. The Covid-19 pandemic has shut down tourism that funds wildlife conservation across Africa. Hunting guides, wildlife safari operators, conservancies, and government agencies all face a decrease in revenue, meaning less money available for programs that combat poaching or mitigate human-wildlife conflicts in countries like South Africa, Kenya, and Zimbabwe. This is causing some conservationists to rethink the way conservation is financed in Africa. As PERC research fellow Catherine Semcer recently told *The New York Times*, "We don't want to decouple conservation from tourism, but I think we need to expand the range of sectors that support it."

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A promising candidate. In March, the Fish and Wildlife Service announced a plan to incorporate the transportation and energy sectors into the recovery of the monarch butterfly. Under a "candidate conservation agreement with assurances," state transportation departments and energy industry partners will conserve and plant milkweed and other nectar plants that sustain the migratory insect. In return, the partners would face no additional restrictions if the agency lists the butterfly under the Endangered Species Act, a decision expected by the end of 2020. The timing is apt—winter monarch counts suggested a 50 percent population decline from a year ago, largely attributed to drought.

Bearly listed? Despite the Fish and Wildlife Service's assertion that Endangered Species Act protections for the Greater Yellowstone grizzly are no longer needed or necessary, debate over whether to delist the bears rages on. The Ninth Circuit Court of Appeals recently heard oral arguments about the population's status, a case to which PERC submitted an amicus brief in 2019. The brief stressed a point that PERC also underlined in a recent public comment to the agency regarding the grizzly's status: a main driver of species recovery is the notion that it "will lead to a return to state management and reduced regulatory burdens for landowners"—something that perpetual federal listing would undermine.

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Smile, you're on warrantless camera. Terry Rainwaters inexplicably found two trail cameras planted on his 136-acre property in 2017. A few days later, they were gone. He eventually learned that the Tennessee Wildlife Resources Agency posted the cams—without a warrant—to monitor for potential hunting violations. The agency claims it can get away with the surveillance due to a 1920s U.S. Supreme Court decision that ruled unreasonable searches don't apply to "open fields." The Institute for Justice is representing Rainwaters and his neighbors in a lawsuit against the agency, hoping that Tennessee will follow a handful of other states that have rejected the outdated and wrongheaded doctrine.

© Jim Peaco / YNP

Yellowstone research hotter than ever. In 1969, scientists discovered a microbe in Yellowstone's hot springs that later revolutionized scientists' ability to rapidly replicate DNA samples. The process, called polymerase chain reaction, or PCR, is now commonly used to identify criminals and research cancer, and today it is central to the standard tests that diagnose Covid-19. Yellowstone has received none of the economic value PCR has brought society. Since that discovery, however, the National Park Service has entered into "benefits-sharing agreements" between parks and researchers, meaning that the next great biological discovery could transform science while also helping fund the parks we love.

Paying with plastic. At least 8 million tons of plastic wash into the ocean each year, making up 80 percent of all marine debris. The Plastic Bank aims to change that by transforming the material into currency. Collectors gather plastic waste that might otherwise flow into the ocean and use it to buy everything from cooking fuel to school tuition at Plastic Bank stores. The company recycles the material and sells it to S.C. Johnson, Evian, and other corporations interested in reducing marine waste. Now in Haiti, the Philippines, and Indonesia, and plans to expand into Brazil, the Plastic Bank has kept more than 22 million pounds of debris out of the ocean.

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Conservation deal put out to pasture. In the late 1990s, the nonprofit Grand Canyon Trust struck a deal with several ranchers in Utah: The trust would pay the ranchers to voluntarily retire their grazing permits to lands within Grand Staircase-Escalante National Monument. The deal was a win-win. The trust wanted to preserve the monument's delicate ecosystem, and the ranchers preferred to graze elsewhere. Two decades later, the Trump administration now plans to reopen grazing on almost all of the land protected by the deal, a reversal that threatens the local environment and undercuts trust in future cooperative agreements between ranchers and conservationists.

Digging up disincentives. A new report by the Government Accountability Office estimates that 390,000 abandoned mines pockmark public lands in the West, degrading the environment for people and wildlife. Federal cleanups at such sites are slow, expensive, and limited by available funding. However, as research fellow Jonathan Wood explains in a February report for PERC, private groups would voluntarily clean up more abandoned mine sites if it wasn't for regulatory disincentives that expose them to liability risk for the full cost of pollution they didn't produce. Wood demonstrates that rewarding voluntary action and reducing liability would give ample incentive to Good Samaritans interested in cleaning up abandoned mines.

Federal Rules Discourage Cleanup of Abandoned Mines

Better incentives will motivate efforts to rid western landscapes of lingering pollution

Throughout the West, abandoned mines release toxic pollutants, harming water quality, fish, and recreation opportunities. The private sector has long expressed interest in cleaning up these mines, but federal regulations make such projects too risky by imposing unlimited liability on anyone who touches an abandoned mine—even to reduce pollution.

This is no theoretical concern. Consider Midas Gold's proposal to restore parts of the Payette and Boise National Forests, which were heavily mined in the early 20th century, in exchange for the right to mine the area for the next 20 years. The abandoned adits and tailings on the site contribute dangerous levels of heavy metals and other toxins to the South Fork of the Salmon River, according to a U.S. Geological Survey study. The company's proposal would seek to remediate these pollution sources and restore the watershed.

The proposal is controversial among conservation groups that believe too much mining is proposed relative to the area restored. The project remains under consideration by federal agencies, which may ultimately reject it or demand substantial changes.

The case is interesting not because of the dispute over how much mining should be allowed in exchange for restoration. Rather, the proposal demonstrates the serious obstacles faced by anyone considering cleaning up abandoned mines.

An opponent of the project has sued the company, seeking to hold it liable for the environmental consequences of historic mining in which the company played no role. According to that lawsuit, by acquiring access and other rights to the site, the company gained "control" and is liable under the Clean Water Act for the pollution coming from the site's abandoned mines.

The suit seeks up to $54,833 in penalties for each day that the abandoned mines leak pollutants into the headwaters of the Salmon River. It also seeks to force the company to perform the restoration work it has proposed (and likely more) without the benefit of any mining to offset the costs.

How many local governments, conservation groups, and mining companies could afford to clean up abandoned mines at the cost of such massive liability risk?

The company asked the court to delay consideration of the case while federal agencies considered its proposed plan. It noted that the mere threat of these penalties would undermine its ability to raise funds to pursue its plan to restore and then mine the area, even if the agencies eventually issued permits and took other steps to protect the company from liability. But the court denied that request, and the potential fines continue to mount.

How many local governments, conservation groups, and—yes—even mining companies could afford to clean up abandoned mines at the cost of such massive liability risk? Cases like this send a clear message to any would-be Good Samaritan. As a judge on the federal Ninth Circuit Court of Appeals put it nearly 30 years ago: "[I]t takes no genius or epopt to see what the message will be. Do nothing! Let someone else take on the responsibility. Let the water degrade, let the fish die, but protect your pocketbook from vast and unnecessary expenditures."

The consequences of this approach are equally clear. Today, there are approximately 500,000 abandoned mines. They leak toxins that impair 40 percent of headwater streams in western states. In many of these streams, water quality has degraded to the point that fish can no longer live in them.

Federal funding is nowhere near sufficient to address such a large problem. And, although conservation groups and private companies have expressed an interest in pitching in, the risk of liability significantly constrains their ability to do so.

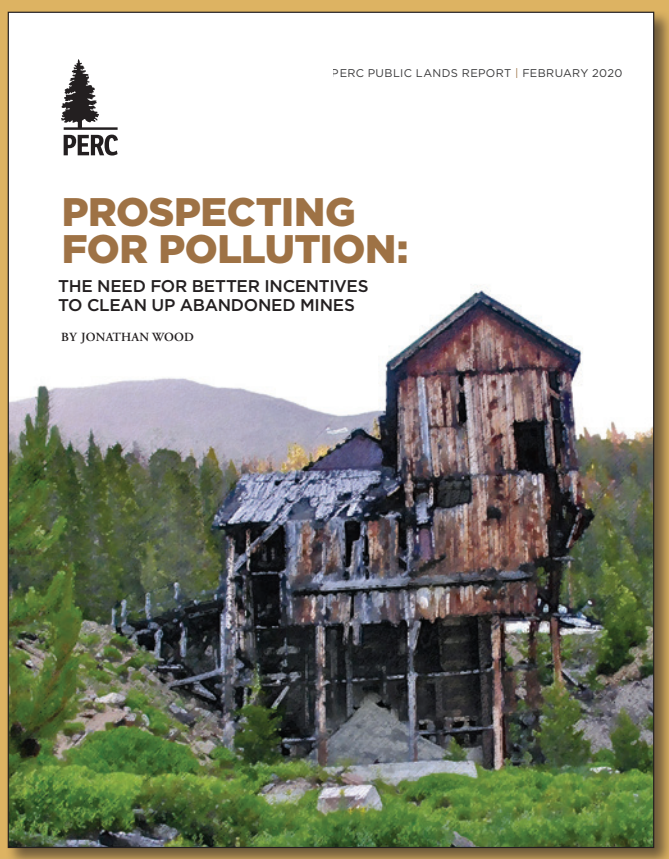
Tackling this problem requires reforms that eliminate the disincentives faced by these Good Samaritans. Indeed, they should be replaced with positive, market-based incentives that reward private cleanups for the substantial public benefits they bestow.

Visit perc.org for more, and read PERC's new report "Prospecting for Pollution: The Need for Better Incentives to Clean Up Abandoned Mines" by Jonathan Wood at perc.org/mines.

Jonathan Wood is a research fellow at PERC and an attorney at Pacific Legal Foundation.

PROSPECTING FOR POLLUTION:

THE NEED FOR BETTER INCENTIVES TO CLEAN UP ABANDONED MINES



"Jonathan Wood shines a bright light on the single greatest and least addressed environmental problem in the western United States. The more that people learn about the scope and scale of the abandoned mine problem, the more likely we are to address the funding and liability issues that have made cleaning up abandoned mines such a challenge."

— Chris Wood, President and CEO of Trout Unlimited

Now available at

PERC.ORG/MINES

Economics Meets the Environment

A personal reflection on the PERC experience

BY BRUCE YANDLE

PERC Conference, Bozeman, 1990

In 1980, a small band of economists and political scientists at Montana State University launched a brash new think tank that had the audacity to suggest that economics could shed beneficial light on environmental problems. At the time, environmentalism was riding high, and for many in the green movement, markets were the enemy. Economists who favored markets were not exactly seen in a favorable light, to put it mildly. So just putting the two words—environment and economics—in the same sentence was considered by many to be modern blasphemy.

Then called the Political Economy Research Center and led primarily by Montana State faculty members John Baden, Rick Stroup, and Terry Anderson, PERC, as it was called, became an early rallying place for a handful of economists, political scientists, and legal scholars; a few philosophers; and a scattering of other academics who relished the opportunity to examine environmental issues through a lens that would soon be called free market environmentalism. I had the special privilege of being included in this group. The small band of scholars devoted to free market environmentalism was destined to grow and flourish.

Back then, debates about environmental policy in the larger world focused on ways that markets can fail to provide environmental protection and how to regulate polluters. But at PERC the discourse broadened and recognized how regulation might be designed—or how property rights to environmental resources might be established—so that market forces could *help* improve how environmental assets were managed and protected. Over time, the relevance of various ideas from PERC scholars began to be recognized, and we started to be included in national policy conversations. Fast forward to today, and PERC has become central to the worldwide discussion about how property rights and incentives can be powerful allies for those who wish to protect and enhance environmental quality.

COMPETING VIEWPOINTS

In the early 1980s, it did not require a very large room to contain the disciples of free market environmentalism. We even joked that our tribe could meet in a phone booth. But what we lacked in numbers, we made up for with an enthusiastic dedication for showing that the environment, like any other scarce and valuable resource, could be examined through the lens of economics, and that doing so could yield useful insights into how to enhance or conserve it. Specifically, the PERC faithful have always focused on institutions—the formal and informal economic, political, and social rules and customs that govern human behavior. Yes, there was an unrelenting commitment to analyzing environmental issues with economic theory, but PERC's foundational purpose was to help identify sustainable institutions that would allocate and conserve environmental assets.

With rare exceptions, most academics, policy analysts, politicians, and informed members of the public thought economic institutions such as markets and property rights were anathema to conservation and environmental protection. When facing growing concern about the apparent disregard for wildlife, natural resources, and air and water quality, most people condemned markets and the private pursuit of profits and instead called for stout government control and regulation as the only way to ensure environmental protection and conservation.

What we lacked in numbers, we made up for with an enthusiastic dedication for showing that the environment, like any other scarce and valuable resource, could be examined through the lens of economics.

Relatedly, powerful voices in the national environmental movement supported more government and often opposed market approaches. Established long before the 1970 Earth Day, American environmental organizations had for years been primarily regional entities. With Earth Day's revelations, and the establishment of the Environmental Protection Agency in 1970, environmental organizations went national. Highly organized and deeply committed environmentalists gave strong lobbying support for the agency's expanding role. In doing so, they led meaningful opposition against the use of property rights, economic incentives, and traditional common law as instruments for managing environmental resources. In those early years, PERC scholars were understandably seldom invited to participate in key government-sponsored conferences that addressed natural resource and environmental issues. With the passage of time, and lots of work by PERC scholars, that would change.

THE NATIONAL DEBATE

In 1991, Terry Anderson and Don Leal published the first edition of *Free Market Environmentalism*. In language readily accessible by academics, conservationists, and laypeople alike, the book was a collection of case studies about water, fish, timber, and other natural resources that explained how market institutions, sometimes in small community settings, were effectively enhancing environmental quality. Later editions of the book and a growing array of other PERC publications helped lay a strong foundation for bringing economic thought to bear on serious environmental issues.

Soon, PERC launched several major outreach initiatives and educational programs that gave legs to these ideas and helped communicate them to wider audiences. The efforts included a quarterly magazine, programs for public school teachers nationwide, a series of programs that involved journalists and media representatives, research workshops, programs for undergraduate and graduate students, and much more. These contributed mightily to a growing environmental policy conversation that included PERC-inspired content. As a result of these efforts, PERC's ideas about how property rights, incentives, and legal institutions intersect with environmental quality began to move from the shadows into the spotlight. By the late 1990s, leading environmental organizations such as Environmental Defense Fund and the Nature Conservancy were pushing for the use of marketable permits to manage air pollution and marine fisheries

and for expanding the use of property rights to maintain and preserve natural resources.

The tilt toward relevance and acceptance of these ideas accelerated even more in early 2001, when PERC established a six-week long institute on the Montana State University campus for environmental entrepreneurs and other conservation leaders. The Enviropreneur Institute, as it became known, evolved into a summer program that presented practical lectures, field trips, and case studies to promising leaders from environmental organizations, think tanks, and government agencies from around the world. Laying the groundwork for free market environmentalism was an integral part of the program, but applying such concepts to solve specific, tangible environmental problems was the program's central theme. Through this program and other efforts, PERC became the nation's leading center for the design and implementation of market solutions to real-world environmental problems.

DECADES OF EXPERIENCE

Now, 40 years since its founding, PERC has played a vital role in putting the words environment and economics in the same sentence. PERC's scholars and associates have also built a veritable library of books, academic studies, articles, and case studies that show how economic considerations can make environmental policy more effective and less costly—from water markets and wildlife recovery to fisheries management and pollution mitigation.

In retrospect, however, I can see that at the beginning we may have failed to appreciate two things. First, the process by which property rights typically develop is a slow and tortuous one. For example, just as markets for land could not exist until land could be measured accurately, which took centuries to evolve, tradable emission permits could not emerge until emissions themselves could be defined, measured, and monitored—a process that is still evolving and advancing today, albeit sometimes slowly.

Second, we did not fully recognize that even when well-identified markets are not present—say, for wolves to live in the Greater Yellowstone Ecosystem—market forces can still come into play, and sometimes in unexpected ways. While there is no formal market where buyers and sellers can exchange protection rights for wolves to roam freely, years ago organizations like Defenders of Wildlife established programs to indemnify ranchers' livestock losses from wolf depredation to support the species' existence in the Yellowstone region. Put another way, we had to learn to appreciate the difference between hidden markets and outright markets. As another example, consider the current flurry of activities by managers of large mutual and bond funds that are conditioning their holdings on the basis of corporate environmental enhancement policies. If investors favor such funds more than others, then capital costs will fall for favored firms, and environmental quality will be enhanced. And if investors are not so persuaded, the green funds will shrink in size—all a reflection of hidden markets for environmental quality.

While many PERC studies may focus on theoretical considerations that spring from applying free markets to environmental assets, just as many, if not more, address practical challenges within the context of legislative constraints and policies. And quite often, PERC proposals for improving environmental outcomes are addressed to government agencies themselves, demonstrating how market-based solutions can be encouraged even within the existing confines of regulatory institutions. All the while, after four decades of experience, there is a deep recognition that hidden yet real market forces can be present and functioning even where formal markets do not exist.

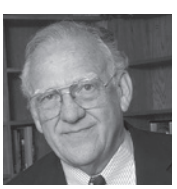
And now, today, should one seek to hold a meeting of those who embrace the usefulness of PERC thinking, one will need far more than a phone booth. PERC's ideas have now spread worldwide. And yet, in another sense, thanks to the work of a new generation of leaders, scholars, and conservationists at PERC, the conversation has just begun.

© Barnaby_S

The Wolf at the Rancher's Door

From 1987 to 2010, Defenders of Wildlife, a private nonprofit, paid out more than $1.4 million to compensate ranchers in the West for verified livestock kills by gray wolves. The compensation program was crucial for supporting ranchers' financial stability and increasing their tolerance of rebounding wolf populations. It also provided an innovative model for cooperative conservation that supports those who bear the costs of living alongside wildlife.

"It's time to move past the stage of conflict," Hank Fischer, the creator of Defenders' wolf compensation plan, said at the time. "The people who support wolves need to take economic responsibility for them. But this program is about a lot more than money. It's about respecting what the ranchers do." Fischer's market-based approach has inspired similar strategies to resolve wildlife conflicts in the western United States.



Bruce Yandle is a senior fellow emeritus at PERC and professor of economics emeritus at Clemson University.

The Property Species

Mine, Yours, and the Human Mind

Bart J. Wilson

What is property, and why does our species have it? In *The Property Species*, PERC senior fellow Bart Wilson explores how humans acquire, perceive, and know the custom of property, and why this might be relevant to understanding how property works in the twenty-first century. Written by an economist who marvels at the natural history of humankind, the book is essential reading for experts and any reader who has wondered why people claim things as "Mine!", and what that means for our humanity.

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"This book is a tour de force and will surely be a landmark in thought. The way Wilson weaves together law and economics, psychology and history, experiment and theory, to make a fresh argument about a very old subject is remarkable. It's a worthy successor to Locke." --Matt Ridley, author of *The Evolution of Everything*

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PERC's founding members (left to right) John Baden, Terry Anderson, PJ Hill, and Richard Stroup

Economists in the Garden

The historical roots of free market environmentalism

BY WALKER ASSERSON

Modern practitioners of free market environmentalism trace their origins to Bozeman, Montana, where a few scholars gathered in the early 1970s and began publishing papers and books advocating their approach to solving environmental problems. Richard Stroup and John Baden first outlined several basic principles of free market environmentalism in "Externality, Property Rights, and the Management of our National Forests," an article published in the reputable *Journal of Law and Economics* in 1973. The authors identified problems in the management of national forests and recommended several ideas to solve them. By the time Baden and Stroup opened their first think tank, the Center for Political Economy and Natural Resources, at Montana State University in 1978, Terry Anderson and P.J. Hill joined them to complete the foursome most responsible for the genesis of free market environmentalism, a movement that crossed ideological boundaries to combine the environmental ethic of the left with the economic tools of the right.

Their intellectual "toolbox" consisted of principles to guide public policy rather than particular policies themselves, and these principles were based upon classical liberal political philosophy and four approaches to economics: the Austrian School, the Chicago School, property rights theory, and public choice theory. They honed their beliefs and applied them to a variety of environmental problems in dozens of publications during their first decade, and their activities during this period illuminate the mission that occupied the bulk of their professional

lives. Not to be confused with the short-lived Sagebrush Rebellion and Wise Use movement, the work of these scholars percolated under the radar for years and continues today. At the heart of the paradigm lay the audacious claim that the principles undergirding capitalism can be used to remedy the excesses of capitalism to help the environment. This approach turned traditional thinking upside down, and the scholars who advocated it have found policy successes around the world.

Despite this success, the literature on the history of environmentalism has largely ignored free market environmentalism. This is a mistake. Their absence is perplexing given how much they have in common with two scholars widely held in esteem by environmental historians, James C. Scott and Karl Jacoby. Scott described "institutional hegemony" as the attempt by experts and their institutions to replace the practical local knowledge of the citizenry with their superior scientific knowledge to plan society. In contrast to the "myth" underlying this hegemony, Jacoby described a simple, rural citizenry *that is* capable of "understand[ing] the local ecology" and "stewarding local resources." The entire free market environmentalism enterprise can be understood as an attempt to alleviate the hegemony described by Scott by empowering Jacoby's rural citizenry. In this respect, free market environmentalism deserves serious attention from environmental historians and modern environmentalists alike because it represents an important and controversial new way of thinking about how humanity strives to understand and find solutions to environmental problems.


Monica Lane Guenther

THE ZEITGEIST OF HUBRIS

The failures of Progressive-era conservation in the West motivated the Bozeman foursome. In his 1998 book *Seeing Like a State*, James C. Scott offered two reasons that explain why scientific management by centralized experts in the 20th century often had environmentally tragic local results. First, the visionary intellectuals and planners of the time "were guilty of hubris," Scott notes, "forgetting that they were mortals and acting as if they were gods." Second, "their actions, far from being cynical grabs for power and wealth, were animated by a genuine desire to improve the human condition." But this was "a desire with a fatal flaw," according to Scott—despite good intentions, such schemes too often failed their intended beneficiaries.

Scholars of free market environmentalism could not have said it better. One of their intellectual heroes, Friedrich Hayek, articulated a similar sentiment when he contrasted the "individualism" of classical liberal philosophy with the collectivist ideologies he witnessed in Europe during the 1930s and 1940s: "Individualism," Hayek wrote, is "an attitude of humility before the social process and of tolerance toward other opinions and is the exact opposite of that intellectual *hubris* which is at the root of the demand for comprehensive direction of the social process." Though following different ideological traditions, the foursome in Bozeman shared Scott's assessment that a similar form of hubris permeated Progressive-era environmental policies.

The group's early research revealed several lessons that demonstrated the problems with centralized control of environmental and natural resources: First, the incentives driving government officials were not always aligned with the public interest, and second, the good intentions embodied in Progressive institutions were often not sufficient to protect the environment.

This was especially evident when it came to federal land management. Though they accepted some degree of development as inevitable, the Bozeman scholars' early publications expressed clear disapproval of the status quo that favored extractive industries in public land management decisions. Mandated by the Multiple-Use Sustained-Yield Act of 1960, federal bureaus were supposed to manage public lands to reflect society's evolving values for recreational activities, viewsheds, and unspoiled ecosystems. Yet, in the eyes of the free market environmentalists, agencies

such as the Forest Service, the Bureau of Land Management, and the Bureau of Reclamation often failed to reflect the burgeoning environmental ethic. Instead, extractive industries such as mining and logging appeared to have "captured" the agencies, dominating agency decision-making processes and resulting in policies favorable to extractive industries. The scholars' research led them to become "increasingly convinced that both the environmental and the economic costs of bureaucratic management of natural resources are excessively and unnecessarily high," as Baden and Stroup put it in one publication.

Mainstream historical interpretation corroborates their interpretation. Historian Samuel Hays first noted that shortly after the creation of the federal land bureaus, business interests "exerted their power over the new agencies" and shaped "the character of development in a manner contrary to the aims of Conservationists." This was precisely what the Bozeman scholars meant when they expressed concern that the federal land agencies had been "captured" by extractive industries.

Environmental historian Donald Worster provided a further example when he condemned the Bureau of Reclamation. In 1986, Worster concluded that federal bureaucracies in the West "tend[ed] to impose their outlook and their demands on nature, as they do on the individual and the small human community, and they do so with great destructiveness." Nancy Langston examined the Forest Service in the Blue Mountains of eastern Washington and Oregon and reached a similar conclusion in *Forest Dreams, Forest Nightmares: The Paradox of Old Growth in the Inland West.* Though generally well meaning, scientific management of the forests was an ecological disaster, she argued. The case studies by Worster and Langston, motivated by different ideologies than the Bozeman scholars, nonetheless corroborate the predominant theme running through the free market environmentalism publications during their first decade: that the nation needed new land management policies because Progressive-era conservation was not caring for the environment as well as it should.

> The group's early research revealed several lessons that demonstrated the problems with centralized control of environmental and natural resources.

Contributors to free market environmentalism scholarship express this sentiment in nearly all of their publications during these early years. In "Externality," Stroup and Baden argued that management decisions often reflect the effectiveness of self-interested lobbying groups to get what they want, rather than an impartial assessment by public servants of myriad public demands. Subsequently, they concluded that both the "public" and the environment may lose out to special interests under bureaucratic management. Published eight years later, the title of the first comprehensive free market environmentalism book, *Bureaucracy vs. Environment: The Environmental Cost of Bureaucratic Governance*, displayed the centrality of this sentiment to the movement at this time. The collection of essays elaborated on the means by which extractive industries dominated certain bureaucracies and the undesirable ecological outcomes of these institutional arrangements. One representative paper noted that environmentalists attempting to inculcate "new social, cultural, and political values" into the Bureau of Reclamation were repeatedly thwarted by "powerful governmental bureaucracies, pork barrel Congressional committees, and [economic] interests." In the concluding essay, economist M. Bruce Johnson, reflecting the main theme of the book, lamented, "As well-intentioned as it may have been, the transfer of resource control from private ownership and markets to public ownership and governmental bureaucratic control has not been the panacea some expected."

ECONOMICS TO THE RESCUE

Having thus diagnosed the problems, the Bozeman scholars drew on several rich intellectual traditions to create policies they believed would solve the problems produced by Progressive conservation. Their political philosophies significantly informed the development of their policies and are critical to understanding them as a movement. The founders saw themselves as classical liberals, aiming to uphold, as Anderson and Hill put it, the "integrity of the individual and the right to freedom from coercion." These

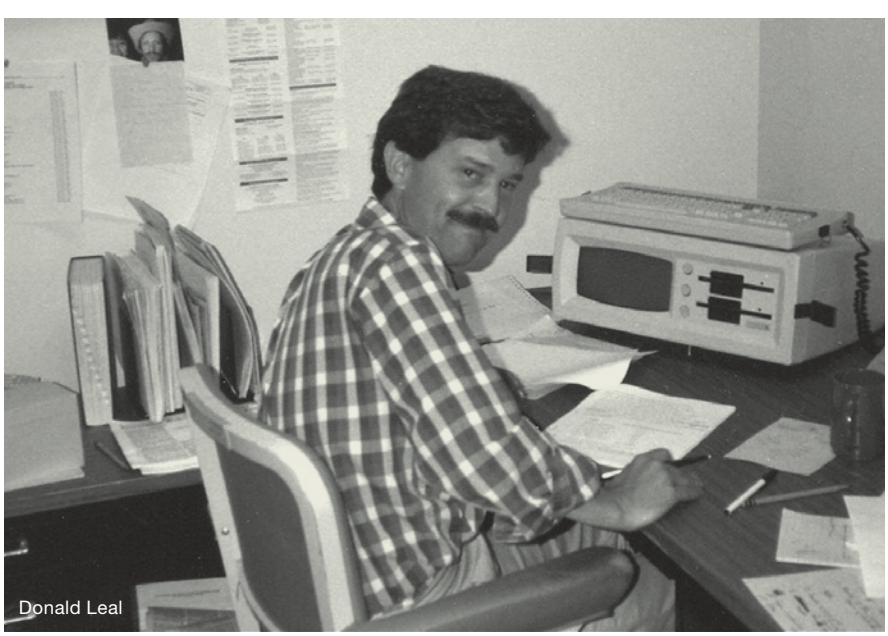
continue to be manifest today in the movement's desire for a limited constitutional government, the rule of law, support for private property rights, and a free-market economy. Two ideas from the classical liberal tradition deserve particular attention for their prevalence to free market environmentalism scholarship, and also because of their similarity to some of the ideas of environmental historians Scott and Jacoby.

The first idea is "spontaneous order," first articulated by Bernard Mandeville in 1714. Mandeville argued that when individuals are free to pursue the "vice" of self interest to improve their material well being, they end up benefiting society at large by creating a sophisticated social order that nobody could have foreseen or planned. Thus, the right of individuals to engage in voluntary exchange—socially, economically, or otherwise (and without harming anybody)—is critical to healthy, free societies. Advocates of spontaneous order embrace societies formed by bottom-up processes and warn of those imposed upon the people from the top down. In contrast with centralized bureaucracies, the Bozeman scholars believe spontaneously ordered societies are the antidote to institutional hegemony and are likely to be more just, equitable, and environmentally friendly.

The second idea is "legal plunder." Frédéric Bastiat, a French statesman of the mid-19th century, warned that the law could be perverted and, instead of protecting all people, it could be used to enrich some members of society at the expense of others. He claimed that there were only three ways to organize society: (1) "The few plunder the many," (2) "Everybody plunders everybody," or (3) "Nobody plunders anybody." (In Bastiat's construction, the "few" referred to a powerful elite that controlled society's wealth and government.) Endorsing Bastiat's preference for the latter, free market environmental policies strive to limit the use of state coercion to prevent elite groups—for instance, extractive industries—from trampling individual rights.

To apply these ideals to the environment, free market environmentalists turned to the notion of the "tragedy of the commons," described in a famous 1968 paper by ecologist Garrett Hardin. Among other things, Hardin identified open range land in the West as a commons—an unowned and open-access resource that, absent regulation by either custom or law, will result in overconsumption and, ultimately, depletion. The Bozeman foursome expanded upon this insight to posit that solving the tragedy of the commons required the creation of new institutions that generated better information for decision makers and incorporated incentives to promote sound stewardship.

To find alternative institutional arrangements, Anderson, Baden, Hill, and Stroup turned to several strains of economic theory: the Chicago School, Austrian School, emerging property rights theory, and the burgeoning subfield of economics known as "public choice." The Bozeman connection to Chicago was often personal. P.J. Hill earned his Ph.D. in economics at the University of Chicago in 1970, and several notable Chicago economists took interest in free market environmentalism, participating in conferences and contributing to publications. Among other things, the school emphasized the role of positive incentives acting on self-interested individuals, an aspect of human nature that the Bozeman scholars


Donald Leal

believed contributed to the destruction of the commons but could also play a part in solving the tragedy. On the one hand, government subsidies to extractive industries amounted to an incentive to log and mine more than they otherwise would. These perverse incentives amounted to taxpayer-funded destruction of the environment.

In contrast, the Bozeman scholars asserted that ownership of a resource creates incentives for individuals to consider the long term and conserve. As one contributing author wrote, "Whether it is organized around a profit seeking or non-profit undertaking, there are incentives for the owner to preserve the resource… [because they] capture the full capital value of the resource." To promote salutary incentives, the scholars contemplated the merits of various alternative ownership schemes—nonprofit, communal, private—as well as considered creative new institutional arrangements that maintained government ownership of resources. Tribal ownership of elephant herds in Zimbabwe to curb poaching is just one example of the implementation of their work in this area.

As Scott noted, bureaucracies often suffered from the inability to collect the dispersed information needed to carry out their plans successfully. A strikingly similar argument was made by scholars in the Austrian School of economics. Friedrich Hayek, in his 1945 article, "The Use of Knowledge in Society," articulated an idea that won him a Nobel Prize in 1974: Economic information is time and place specific, thus centrally planning an entire economy was impossible to do well. The Bozeman scholars applied this to the environment, noting that ecological knowledge varies widely, constantly changes, and is imperfectly understood. To be effective, they argued, policies must harness the creative energies of dispersed parties that hold unique knowledge of particular ecosystems and empower them to act. Nonprofit environmental groups and local stewards met these criteria. Generating new institutional arrangements that shaped their behavior in an environmentally friendly direction became the next task.

> Their approach was purposefully long term, and they hoped their influence would percolate throughout society—a sort of trickle-down environmentalism.

The scholars believed that well-defined and transferable property rights help remedy the tragedy of the commons by producing information and creating positive incentives for individuals to act in environmentally friendly ways. Economists Ronald Coase and Harold Demsetz played critical roles in advancing their field's understanding of property rights. Coase used examples of grazing and air pollution to illustrate the importance of property rights and the ways in which property law could hold polluters liable for their effects on neighboring property. Demsetz expanded on Coase's insights, claiming that property rights were not absolute and evolved over time as circumstances changed.

The founders of free market environmentalism applied these insights to the environment, noting that property rights could be defined to create incentives for stewardship, as long as common law and nuisance liability law were similarly enhanced. This would enable environmental resources to become assets for their owners, extending the decision-making calculus to include long-term effects. The extension of property rights to ocean fisheries via individual transferable quotas, also known as catch shares—a policy that has since been adopted by various countries around the world—provides one example. The Bozeman scholars also held that, as long as such rights could be transferred, the price system would provide information about their worth, thus approximating the subjective values of society. Therefore, they often sought to make non-transferable property rights, such as grazing rights on public lands, transferable so that environmental groups may purchase and retire them. Finally, the scholars believed that property rights could be defined in a way that circumscribed the behavior of the title holder, as with conservation easements, for example.

The final intellectual influence on the Bozeman scholars was public choice theory, which scrutinized "government failure," an analog to market failure that applies when the *political process* rather than the *market process* produces negative externalities. The pioneers of public choice, James Buchanan and Gordon Tullock, posited the unthinkable in 1962: Perhaps those in the public sphere—such

as politicians and bureaucrats—are motivated by self-interest just like most other people. This was a radical proposal at the time, as conventional wisdom treated bureaucracies as if they were benign institutions that served the public good with objectivity and omniscience.

All of the major intellectual contributions to the free market environmentalism paradigm were new or resurgent in the 1970s. Further, the four economic theories used by the scholars of free market environmentalism represented major theoretical breakthroughs in the understanding of human behavior: The pioneers of each won Nobel Prizes in economics between 1974 and 1991. By combining these disparate intellectual strands into an internally consistent theory, the Bozeman scholars broke new ground. Particular economic principles had been applied to the environment, but these applications had been piecemeal. Never had the principles driving market forces been applied so thoroughly to the task of analyzing and solving environmental problems.

TREE-TOP ACTIVISTS

In the fall of 1979, two dozen economists descended upon Bozeman to attend the first conference hosted by the nascent free market environmentalism movement. The topic was "The Environmental Cost of Bureaucratic Governance." This seminal event—a sort of Earth Day for economists—inaugurated a new paradigm that represented a radical break from traditional environmental economists. It was the first of 17 colloquia to be held over the next three years, and one of hundreds of such events that the Bozeman scholars would host during the next four decades.

PERC seminar participants

Guests at their conferences included academics, influential journalists, businesspeople, policy specialists, government bureaucrats, federal judges, and environmentalists. Academics comprised most of the 28 participants at the first conference, but representatives from the Wilderness Society, Environmental Defense Fund, and Western Timber Association also attended. Representatives from national public policy institutes such as the Heritage Foundation and Center for the Study of Public Choice joined as well, demonstrating the group's remarkable networking prowess. The main focus at these conferences was to read and discuss free market environmentalism scholarship and related work. In addition to seminars, the Bozeman scholars sought to publish as much as possible, wherever possible. This included academic journals, books, policy reports, and opinion pieces in national and local newspapers. Their approach was purposefully long term, one that Baden claims "was designed to help my grandchildren." They primarily targeted influential elites, and they hoped their influence would percolate throughout society—a sort of trickle-down environmentalism.

Though they eventually coalesced into a single movement, the backgrounds of the primary foursome did not portend the genesis of a "new" brand of environmentalism. Baden studied anthropology, Anderson and Hill economic history, and only Stroup's dissertation, "The Economics of Air Pollution Control," was an explicit study of environmental issues. Yet despite their disparate prior interests, these individuals advanced what became their common goal of free market environmentalism. First, the Center of Political Economy and Natural Resources (CPENR) was established in 1978 in partnership with Montana State University. The center's mission was "to provide an institutional setting that fosters the study of political economy and natural resource issues" in order to "examine how a property rights and market approach can be applied to critical issues of resource policy." Its closure a few years later facilitated the creation in

1980 of PERC, which took up CPENR's mission and activities but was purposefully independent of the university.

In pursuing seminars, the Bozeman scholars acted upon their belief in the impact that powerful ideas can exert on public policy. The seminars were formulaic: Invite about 20 people, send out readings to participants before the seminar, gather for a few days to discuss the readings, and enjoy meals, leisure activities, and polite conversation between sessions. The first goal was that people would read, think about, and discuss ideas. The second goal was that good ideas would emerge from the process, and participants would gradually disseminate them throughout society. Participants need not agree with each other, but they had to follow the protocol of civil discourse. By encouraging the open exchange of ideas, the scholars aspired to generate a better understanding of the environmental issues facing society.

Over the years, the Bozeman group created a stable base of operations from which the free market environmentalism movement could expand, and they successfully leveraged their comparative advantage—the natural splendor of Montana—to host hundreds of conferences, which at the time was their primary outreach mechanism. Their ability to associate with elite intellectuals, including five winners of the Nobel Prize in economics and two future secretaries of the U.S. Department of the Interior, is a testament to the respect others had for the quality of their scholarship. Targeting journalists proved fruitful as well; many subsequently invited the Bozeman scholars to pen editorials or wrote their own articles on the movement's ideas. In sum, their long-term approach to activism worked, policymakers in the United States and around the world now recognize free market environmentalism as a viable tool for solving environmental problems.

CONTENTION OR COMPREHENSION?

Now, four decades later, as concern about environmental issues continues to grow, the movement that Anderson, Baden, Hill, and Stroup built now receives widespread national and international attention. The group from Bozeman identified environmental problems generated by markets and those endemic to government management and then developed a broad set of principles necessary to overcome them. Their paradigm challenged the widely held perception that environmental problems were unique and could only be solved through government intervention to mitigate market failure. This flawed belief, they posited, too often resulted in a one-size-fits-all approach to environmental legislation that neglected important differences among diverse ecosystems and ignored local knowledge. The scholars also warned that trusting a powerful centralized government to be the primary steward of the environment was a dangerous pursuit subject to the whims of politicians and bureaucrats. To ameliorate these problems, free market environmentalists strove to align individuals' self-interest with society's environmental interests, thus harmonizing environmental goals with responsible economic growth and an appreciation for the ideals of a free society.

Their paradigm challenged the widely held perception that environmental problems were unique and could only be solved through government intervention to mitigate market failure.

Anderson, Baden, Hill, and Stroup deserve recognition as the originators of a comprehensive new approach to environmental issues. The idea of using the principles powering capitalism to remedy the excesses of capitalism had not previously been advocated in such a sustained manner. But after 40 years, free market environmentalism has certainly arrived. Its influence on domestic environmental policy already extends deep into federal and state policymaking circles, and several nations, such as South Africa, have turned to PERC for answers to their environmental problems. While some of their ideas may provoke debate and disagreement, their achievement lies in expanding the set of possible solutions from which environmentalists and environmental policymakers can choose. For too long, many responded reflexively to free market environmentalism with contention. Now, it is time for measured comprehension.

Walker Asserson is a teacher at Bozeman High School. This essay is adapted from a paper he published at Montana State University in 2007.

Are Property Rights a Solution to Pollution?

Environmental markets have revolutionized the way economists and environmentalists address pollution problems

BY TIMOTHY TAYLOR

Three decades ago, Eugene McCarthy, once a prominent Democratic presidential candidate, argued in *The New Republic* that a provision in the Clean Air Act of 1990 that would grant tradable permits to companies to emit a certain amount of sulfur dioxide was the modern equivalent of "indulgences" once sold by the Catholic Church. The comparison was not a compliment. The long-ago notion of indulgences was that those who made sufficient payments to the Church could be absolved of past sins or released from purgatory after death. In other words, the rich could literally buy their way into heaven. The practice was widespread and repellent enough by the early 1500s that it led to Martin Luther's break from the Catholic Church and thus to the Protestant Reformation.

Today, not only do economists routinely consider pollution as an issue of tradable rights, but many environmental regulators—and environmentalists, too—have come around to a similar view.

McCarthy drew a direct connection from indulgences to pollution permits. He noted that "the anticipation of credits for forgiveness of sin" had motivated William of Aquitaine to establish the monastery at Cluny in 910 so that monks could pray for the salvation of his army as it went about its work of "war, pillage, rapine, and other activities." This same sentiment, McCarthy wrote, "perfectly echoed" the Clean Air Act's stipulations that allowed a company to pollute in excess of its allotment, so long as it purchased credits from another that had reduced pollution elsewhere.

By equating pollution permits with war and plunder, McCarthy surely captured the views of a broader group of critics concerning market approaches to environmental protection. After all, the Democrat from Minnesota was a grand old man of American politics. Before running for president in 1968 and 1972, he served five terms in the House of Representatives and two in the Senate. (Perhaps unexpectedly, before the start of McCarthy's political career, he was an instructor in economics at two Minnesota colleges in the 1940s.)

But economists have long held an alternative view of pollution. In 1890, the economist Alfred Marshall formulated the concept of "externalities," in which pollution was not a sin akin to pillage and plunder, but instead was an undesirable result inflicted on others in the process of producing an otherwise desirable good or service. In 1920, A.C. Pigou—Marshall's student and later his successor at Cambridge University—argued that an appropriate policy response to the externality of pollution was to impose a tax on the quantity of pollution emitted. The amount of this "Pigouvian tax," as it came to be known, would depend on the level of harm from the pollution.

Thus, by the time of McCarthy's 1990 essay, economists had for many decades readily accepted that pollution needed to be addressed, not as a sin to be denounced, but rather as a practical problem to be ameliorated in cost-effective ways. In keeping with this pragmatism, the amendments to the Clean Air Act critiqued by McCarthy became law in 1990 with the support of roughly 90 percent of Democrats and Republicans in Congress before being signed into law by President George H.W. Bush.

Today, not only do economists routinely consider pollution as an issue of tradable rights, but many environmental regulators—and environmentalists, too—have come around to a similar view. The property rights approach to pollution has led to prominent successes in many areas, and economists and policymakers continue to explore ways to implement these ideas to address a variety of environmental challenges.

POLLUTION IN TERMS OF PROPERTY RIGHTS

Throughout the 20th century, economists continued to refine how they thought about environmental protection. A classic 1960 essay by Ronald Coase, "The Problem of Social Cost," further recast how economists thought about addressing pollution. In one famous example, Coase discussed the hypothetical situation of a railroad running beside a farmer's field. Sparks from the train would sometimes start fires in the crops. How should this external cost—a kind of pollution "externality"—be addressed?

For non-economists, an obvious answer is for the government to pass a law. For example, the government might require that the railroad company install spark arrestors on the smokestacks of its locomotives, use a different blend of fuel or a new engine, leave a buffer zone beside the field, or relocate the rails altogether. Alternatively, the government might declare that the farmer should build a fence to protect the field, install a sprinkler system, change crops, leave a buffer zone, or perhaps even relocate the farm.

Rather than viewing anti-pollution efforts in terms of how governments should choose which rule to impose, Coase took an altogether different approach. He pointed out that the problem could be rephrased in terms of property rights—in other words, who has what rights? For example, the government could say that the railroad company had a right to emit sparks, in which case the farmer would have to figure out the most cost-effective way of protecting the fields. Alternatively, the government could say that the farmer had a property right not to have sparks land among his crops, in which case the railroad would have to figure out an answer—which might include installing spark arrestors or other technology to prevent fires from occurring, or even just paying the farmer to put up with the annoyance.

In Coase's approach, the question of how to respond to problems of pollution such as unwelcome railroad sparks did not need to be delegated to a government vote or board of experts. Nor did the problem of pollution, in Coase's view, need to be solved by regulators imposing a Pigouvian tax to account for the "externality" imposed. After all, governments or any outside groups will inevitably possess much less detailed and hands-on information about the range of possible options—and how those options might be tweaked or combined—than railroads and farmers. Moreover, any choice of specific government regulations will be affected by politics and lobbying. Instead, Coase argued that once property rights were clearly defined, then one party or the other would have an incentive to seek out the most cost-effective way of reducing this form of "pollution."

Of course, it is not readily apparent how to take this example with two parties—a railroad and a farmer—and transfer the key insights into, say, environmental problems involving air pollution emitted by many companies and affecting the broader public. As Coase acknowledged, the workability of this solution hinges on whether the costs of negotiating these pollution-reducing transactions are sufficiently low. Also, as Coase pointed out, although either party would have an incentive to seek out a cost-effective solution, how the property right was assigned would determine who paid the costs; in this example, it would determine whether the railroad or the farmer ended up paying.

But Coase's essay planted a seed: His work emphasized that problems of pollution could be rephrased as questions of property rights. He also highlighted how efforts to reduce pollution might usefully focus on institutions that can reduce transaction costs to coordinate agreements between affected parties, as well as on the incentives created for individual actors in the economy to address environmental problems in flexible and creative ways.

REGULATORS CHOOSE FLEXIBILITY

The non-economists and politicians who wrote the first major federal anti-pollution laws, such as the Clean Air Act of 1970 and the Federal Water Pollution Control Act of 1972, had a straightforward notion of how to proceed: They sought to give the newly created Environmental Protection Agency (EPA) the power to limit emissions of designated air and water pollutants. Economists refer to this as the "command-and-control" approach; for those who viewed pollution as a sin, such rules might be called "thou shalt nots."

This original wave of environmental laws was clearly effective at reducing air and water pollution in the 1970s and 1980s. But as environmental regulators began to exercise their new powers, they soon recognized the value of flexibility in regulating the precise source of emissions in ways that reflected the key insights of economists concerning a rights-based approach to dealing with pollution.

For example, imagine a large manufacturing plant with many smokestacks at different points in the production process. Should environmental regulators place inflexible limits on emissions from each smokestack? Or should regulators focus on the total emissions from the plant? After all, within a large company, it may be much cheaper and more effective to reduce emissions from one point source rather than others.

By 1974, the EPA began experimenting with "bubbles," which focused on total emissions from each individual company. In effect, a company could carry out an internal trade. If a firm reduced emissions from some smokestacks by more than legally required, it could then reduce pollution from other smokestacks by less than would otherwise have been required—as long as total emissions from the firm met the legal limit.

An obvious follow-up question loomed: Should environmental laws place inflexible limits on emissions from a single firm? Or should the focus be on the overall quality of air or water in a certain geographic area? The 1977 amendments to the Clean Air Act allowed "netting," in which firms that found ways to reduce emissions by more than the legally required

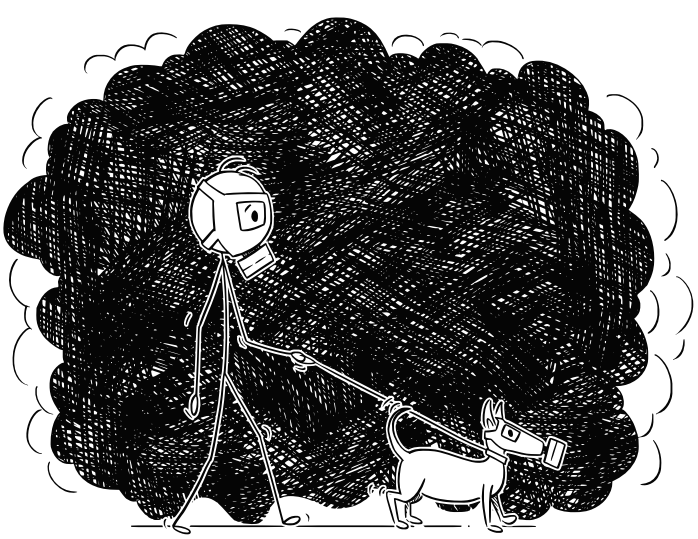
amount received credits that could be sold to other firms in the same area—as long as the overall exposure to air pollutants for people in that area was reduced as planned.

Under these arrangements, firms that found ways to reduce pollution faster and further benefited internally from greater flexibility in adjusting to stricter environmental standards and externally by being able to sell excess pollution credits. Moreover, firms had strong incentives to discover innovative methods and new technologies to reduce pollution, which in turn often demonstrated how other firms could reduce pollution too.

The combination of flexibility from environmental regulators and Coasean insights from economists resulted in a number of success stories that demonstrate the benefits of using tradable pollution permits to address environmental concerns.

In one prominent example, the EPA began setting command-and-control rules in 1979 that required oil refineries to reduce the amount of lead in gasoline. Political finagling meant that the rules were less stringent for small oil refineries than they were for bigger ones—even though the health effects of lead in the air don't vary based on its source. However, even with special allowances, the smaller refineries were struggling to comply.

The EPA sought to meet the overall goal of reducing lead pollution without driving many small oil refineries out of business. In 1982, the agency allowed oil refineries to earn credits if they could reduce lead emissions by more than was required. These credits could then be traded to refineries that were lagging behind. In 1985, the EPA further allowed refineries to "bank" credits, so they could save them for their own future use. By the mid-1980s, about 60 percent of the lead in gasoline was associated with these traded credits. Unsurprisingly—at least in retrospect—the induced innovations allowed lead to be phased out of gasoline more quickly and at a cost estimated to be 20 percent lower than would have occurred with an approach that did not allow for banking and trading.



Eugene McCarthy seemed to view his particular bugaboo—the sulfur dioxide trading program established by the 1990 revisions to the Clean Air Act—as simply a method for big companies to buy their way out of complying with environmental rules. Actually, the program facilitated a sharp decline in sulfur dioxide emissions, as economists Richard Schmalensee and Robert N. Stavins recently reported. "The program performed well," they wrote in 2019, "with SO2 emissions from electric power plants decreasing 36 percent between 1990 and 2004, even though electricity generation from coal-fired power plants increased 25 percent over the same period." They noted that the program also reduced emissions more cheaply than expected: "[C]ost savings overall were eventually at least 15 percent and perhaps as great as 90 percent of the costs of various alternative command-and-control policies."

Emissions trading programs are now being used to reduce water pollution as well. In the Long Island Sound Nitrogen Credit Exchange, for example, about 80 local sewage-treatment plants in Connecticut and New York trade permits for reducing nitrogen emissions. There are three active trading programs being run across the six states in the Chesapeake Bay region to reduce emission of nitrogen, phosphorus, and sediment to rivers and streams. A trading program for reducing phosphorus emissions in the Minnesota River Basin program involves about four dozen sewage treatment plants and industrial sources.

CHALLENGES AND OPPORTUNITIES

Once you begin thinking about property rights approaches to mitigating environmental harms, other applications leap readily to mind. From marine fisheries and rivers to public U.S. rangelands and endangered African species, rights-based approaches to managing environmental and natural resources have proliferated in recent decades.

Yet in any current discussion of environmental issues, finding ways to limit emissions of carbon dioxide and other greenhouse gases is the elephant in the room. Among economists, there has been an ongoing debate over whether marketable permits or a Pigouvian tax on carbon emissions is a more effective approach. For example, one advantage of issuing

marketable permits is that they set a total quantity of emissions that can be scaled down over time.

But a working system of tradable carbon permits raises difficult questions, too. Would it allow trades across different greenhouse gases, between, say, carbon dioxide, methane, and perfluorocarbons? Would the market include carbon "offsets," like planting additional trees or investing in renewable energy? Would pollution permits be granted to existing emitters at no cost, auctioned off, or some mixture of the two? Would a carbon-trading plan allow international trades, which might imply large payments from U.S. and European firms to reduce carbon emissions in China and India? Is it possible to apply Coasean insights to address carbon emissions across national boundaries, where property rights are often ill-defined and the transaction costs of negotiating among affected parties can be too high?

Our limited experience with tradable pollution permits for carbon has highlighted these and other political and practical hurdles. In June 2009, lest we forget, the U.S. House of Representatives passed the American Clean Energy and Security Act, which included a trading system to cut carbon dioxide emissions. The plan was to phase down the quantity of permits for carbon emissions over time, which likely would have meant higher prices for carbon-intensive sources of energy. Yet the legislation faced strong opposition from coal-producing states and those who characterized it as a backdoor energy tax, and it never came to a vote in the Senate.

Both the European Union (in 2005) and California (in 2006) have set up carbon trading markets, but with limited success. In California, a variety of challenges hindered the effort: Other regulations sought to reduce carbon emissions, and electrical utilities responded by increasing the amount of power they purchased from outside the state, where the emissions would not count against the California limit. Furthermore, a couple of years after the market was established, carbon emissions slumped when the Great Recession hit. The result was a large quantity of carbon permits relative to demand, causing the price of permits to fall so low that the market had little to no effect on reducing emissions.

Similar issues arose in Europe. Again, other regulatory policies simultaneously sought to reduce carbon emissions. Firms could cut their European carbon emissions by importing energy-intensive goods from outside the region, and they were also allowed to pay for carbon "offsets" that occurred outside Europe. For political reasons, E.U. carbon trading included the energy industry but not the transportation, commercial, or residential sectors. The E.U. policy has evolved through three main phases and many more rule changes. From 2013 to 2017, the price of buying E.U. carbon permits was so low that it had no significant effect in reducing emissions.

The property rights embodied in pollution permits provide an incentive for firms closest to the source of the pollution to think carefully and innovatively about how to reduce it.

The practical questions of how to design pollution permit markets for carbon and other greenhouse emissions are not unanswerable, but they are clearly challenging. They offer a reminder that the Coasean vision of addressing pollution through an allocation of property rights relies on establishing stable markets with clear rules and reasonably low transaction costs.

FROM INDULGENCES TO INCENTIVES

Attitudes toward tradable pollution permits have evolved considerably in the three decades since McCarthy likened them to religious indulgences. Many environmental groups who were once skeptical about such proposals have since become firm supporters. Countries around the world with a range of ideological predispositions have been experimenting with this approach. As one recent example, China plans to have a carbon emissions trading system up and running by the end of 2020.

Marketable pollution permits have attracted broad support for good reason: In many contexts, the policy has demonstrably worked. The property rights embodied in pollution permits provide an incentive for firms closest to the source of the pollution to think carefully and innovatively about how to reduce it. Trading these pollution permits in markets creates a flexible institution that improves environmental quality more quickly and at lower cost.

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A DIFFERENT SHADE of GREEN

Markets and property rights are working to solve a variety of environmental problems

BY SHAWN REGAN AND TATE WATKINS

When Terry Anderson and Donald Leal published the first edition of their book *Free Market Environmentalism* in 1991, the idea was met with mixed reviews. "Free market environmentalism is an oxymoron," wrote one reviewer, "and the authors are the moron part."

The dominant belief at the time was that markets are the cause of environmental degradation, not the solution. And the idea that property rights could be harnessed to improve environmental quality was counter to the popular notion that conserving natural landscapes required regulation and management by government agencies.

But not anymore. Today, the ideas of free market environmentalism are being applied in a variety of creative ways. Conservationists are increasingly using markets, contracts, and property rights to turn environmental resources into assets instead of liabilities. And policymakers are recognizing that markets are not the enemy of the environment but instead can provide strong incentives for resource stewardship.

So how are these ideas being applied today to change the way people approach conservation? **Here are a few examples.**

Markets and property rights are solving the tragedy of the commons In marine fisheries …

Ocean fisheries are a classic example of the tragedy of the commons. Since no one owns the ocean, no one has a clear incentive to conserve its resources, making the oceans prone to overfishing.

For decades, governments have imposed command-and-control regulations to combat overfishing, but such restrictions have rarely worked. Shortened seasons and early closures created a dangerous, zero-sum "race to fish." The outcome was a wasteful—and often deadly—derby that was bad for both fish and fishermen, who tried to catch as much as possible before the closures set in. Despite these regulations, overfishing persisted, and many fish stocks were at risk of collapsing.

That changed with the development of a rights-based alternative known as individual transferable quotas, sometimes called "catch shares." The quotas give fishermen the right to catch a share of a total catch limit, set at a sustainable level each season by fishery managers. Fishermen can buy, sell, or lease quotas to each other, and they no longer have to race to fish. There is also more accountability for harvests and an incentive for stewardship.

The results have been impressive. Rights-based fishing reforms have reduced overfishing, helped stem the global trend toward fisheries collapse, and led to higher incomes for fishers. According to one study that examined data on more than 11,000 fisheries around the world, catch shares have helped halt and even reverse the collapse of fisheries. They have also slowed the "race to fish," improving fishing safety and allowing consumers to buy fresh seafood throughout the year. Today, there are nearly 200 catch-share programs worldwide, including more than a dozen in the United States.

Catch shares are also being used to reduce "bycatch," which are species that fishermen unintentionally catch in their trawlers. After previous efforts to regulate bycatch failed, managers of a fishery off the West Coast of the United States demonstrated how markets and property rights can help tackle the problem.

In 2011, the West Coast groundfish fishery instituted a program that gave each fisherman a portfolio of rights to catch various species, including those caught as bycatch. If a fisherman exceeded his allotment for a given type of fish, he had to purchase more quota—and when it came to overfished species, the price was steep. This gave each vessel in the fleet ample incentive to avoid overfished species that previously ended up as bycatch, a crucial aspect of the program that former regulations on fishing seasons lacked.

After catch shares were introduced, the proportion of overfished species caught by trawlers fell by about half. "Before catch shares, large proportions of the catch of many non-target species were discarded as bycatch," reads a 2015 government report. "Now, whether in a fishing net or in the ocean, they are treated as the valuable resource they are." As a result, populations of overfished species have begun to rebound thanks to clearly defined property rights and markets that overcome the tragedy of the commons.

… and helping cooperatively resolve conflicts over the use of scarce water resources.

Dwindling streams throughout the American West threaten fish and wildlife habitat and recreation opportunities. As development expands and water becomes scarcer, the challenge is to protect instream flows while still meeting growing demand for out-of-stream uses that are critical to local economies. Often, the result is legal and political conflict over water allocation.

The Not So Deadliest Catch

The popular reality television show *The Deadliest Catch* chronicled the efforts of fishermen in the Bering Sea's Alaskan King Crab fishery. Catch shares were implemented in the fishery after the show's first season, eliminating the dramatic race to fish and significantly improving the safety of the fishery. "Now we have a stake in protecting crab populations for the future," one boat captain explained at the time. "There's no way I'd choose to go back to the old derby days." The new rules forced the show's producers to find other ways to add excitement to the series.

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Water markets are one solution to resolve such disputes. Where water rights are clearly defined, enforceable, and transferable, markets provide a viable alternative to legal or political fighting over water. By allowing users to capture gains from trade, markets can encourage conservation practices and mutually beneficial water transfers.

Water markets connect willing buyers and sellers of water rights to resolve competing demands for a variety of uses, including to enhance stream flows for recreation and improve habitat for fish and wildlife. Thanks to state-level reforms in recent decades, water rights can now be bought, leased, or donated for environmental purposes throughout much of the West—meaning that conflicting demands over water can be resolved cooperatively through market exchange, rather than fought over in political or legal battles.

That wasn't always the case. The prior appropriation doctrine, which governs how water rights are allocated in the western United States, requires that water must be put to a "beneficial use," which has typically meant diverting it for agriculture, mining, or municipalities. Such requirements made it difficult for water rights holders to leave water instream without losing their rights and also prohibited transfers for conservation purposes.

Today, however, many western states have begun to recognize instream flows as a beneficial use and allow voluntary trading of water rights to improve flows—although each state varies in the degree to which such trades are allowed.

Where water rights are clearly defined, enforceable, and transferable, markets provide a viable alternative to legal or political fighting over water.

Nevertheless, these changes have paved the way for conservationists to pursue a free-market approach to restoring streams through market exchange.

In California, the nonprofit Scott River Water Trust pays farmers not to divert water during certain low-flow periods to protect salmon and steelhead. In Montana, Trout Unlimited has negotiated water leases with farmers and ranchers to protect native fish populations while maintaining viable agricultural operations. And in Oregon, the Freshwater Trust—formerly the Oregon Water Trust—has contracted with more than 200 landowners to restore streamflows using a variety of creative strategies, including permanent water-right acquisitions and short-term leases.

Still, in many states, regulations and other legal and political barriers hinder more widespread use of water markets. In 2019, for instance, the Audubon Society completed the first-ever lease of an agricultural water right in New Mexico for instream-flow purposes, a process that took several years to finalize. Now, it provides a blueprint for similar transactions in the state, which other groups, including Trout Unlimited, are pursuing. While obstacles remain, water markets are proving they can encourage competing users to cooperate rather than fight, promote conservation, and help alleviate the economic and environmental effects of water scarcity now and in the future.

There is growing recognition that private lands play an important role in providing public conservation benefits.

Private lands play an important but often-overlooked role in sustaining many of the public environmental benefits we cherish, whether they're healthy wildlife populations, clean water, or open spaces. The ways these public resources are connected to private lands, however, are not always obvious.

Consider a few examples. In the Greater Yellowstone region, recent research has revealed the extent to which publicly managed elk, deer, and other species use private lands for habitat—particularly large ranches and farms. Using GPS collars, scientists have found that Yellowstone's elk herds spend nearly

Insuring Conservation

Montana's wildlife heritage doesn't simply fall from its big sky; it is often the result of actions by private landowners who steward habitat. But conserving habitat can be costly, especially when it comes along with risks from diseases such as brucellosis, which elk can transmit to cattle. As one rancher told PERC researchers, "If we improve habitat, we're basically shooting ourselves in the foot because of the increased brucellosis risk." That could change, however. PERC is exploring the development of a "brucellosis bond" or similar insurance mechanism that would transfer some of the risks associated with brucellosis—which can compel ranchers to slaughter their entire cattle herds—to those who benefit from elk conservation. "The project seeks to help private working ranches be profitable while also providing habitat," says PERC research fellow Ben Foster.

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half of their time on private lands, relying almost entirely on lower-elevation ranches during the harsh winter months.

This research underscores a crucial fact: The elk and other migratory ungulates that attract millions of visitors to the region each year—and fill many hunters' freezers each fall—depend on the actions of private landowners for survival. "If you're a tourist that sees elk in Yellowstone, there's a good chance those elk rely on someone's private property for habitat in the winter," says Arthur Middleton, a U.C. Berkeley ecologist who studies Yellowstone's elk migrations.

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All across the United States, private landowners provide habitat for other game and non-game species. Altogether, private lands are home to more than 75 percent of the nation's wetlands and more than 80 percent of its grasslands. Two-thirds of all threatened and endangered species are also found on private land.

These examples illustrate an important reality that is gaining broader recognition: Conservation benefits the public, but landowners often bear the costs of providing it—whether it's the direct losses associated with living with wildlife such as lost forage, damaged crops, or disease transmission or the indirect costs in terms of other foregone productive uses of their land. When these costs are high, landowners' willingness and ability to continue providing those public benefits can be diminished.

The famous conservationist Aldo Leopold understood this well. In 1934, he wrote that "the thing to be encouraged is the use of private land in such a way as to combine the public and the private interest to the greatest degree possible."

Today, many conservationists are following Leopold's advice by working with private landowners to find solutions that benefit both people and wildlife. In Montana, PERC is exploring ways to help cattle ranchers in the Greater Yellowstone Ecosystem address the problem of brucellosis, a disease that elk transmit to livestock that causes them to abort their young. The project aims to develop an insurance mechanism to better manage the financial risks associated with brucellosis, which

can be devastating for ranchers and undermine their support for conservation efforts. The tool would transfer some of the risks of elk-to-livestock brucellosis transmission to other parties willing to bear some of the costs, including conservation organizations, sportsmen groups, and conservation-minded investors.

PERC is also working with landowners in Montana's Paradise Valley to devise market-based solutions that better enable them to provide habitat for elk, deer, and other species. The project is exploring the feasibility of several innovative tools, including short-term elk occupancy agreements and forage-loss compensation programs. Other partners, including the Western Landowners Alliance and an interdisciplinary group of researchers from PERC and several universities, are collaborating to develop new approaches and policy solutions that help private landowners conserve habitat for elk and other migratory ungulates.

Such efforts can't come soon enough. Pressures to develop and subdivide large private working lands loom large in the region. And as wildlife populations such as elk and grizzlies continue to expand, landowners are being asked to shoulder even greater burdens. Disease risks from brucellosis are also increasing. New solutions that help private landowners are needed.

"Conservation," Leopold wrote, "will ultimately boil down to rewarding the private landowner who conserves the public interest." With 70 percent of the United States privately owned, conservation needs to make economic sense for landowners, and fortunately, property rights and markets are helping to get those incentives right.

Creative conservationists are harnessing markets to provide habitat for wildlife.

Ask any ecologist and they will tell you that, when it comes to conserving wildlife, habitat is the crucial ingredient. Increasingly, conservationists are finding innovative ways to restore or create habitat—not by litigating or regulating land use, but sometimes by simply paying people to provide it.

After years of drought began to take its toll on wetlands habitat in California's Central Valley, the Nature Conservancy devised a creative approach to do just that. The group established a program to pay rice farmers to keep their fields flooded longer than usual to serve as habitat for waterfowl migrating along the Pacific Flyway, a 4,000-mile route from the Bering Strait to Patagonia. Rice farmers in the valley usually drain their fields in January, several months before birds arrive on their annual migration, but a dry field is of little use to migratory geese or other waterfowl.

Conservation needs to make economic sense for landowners, and fortunately, property rights and markets are helping to get those incentives right.

The program, dubbed BirdReturns, creates temporary "pop-up" wetlands to ensure migrating flocks have habitat during a crucial part of their journey. "If birds come here and there aren't any flooded fields, they may not have enough habitat to survive," said Brian Stranko, director of the Nature Conservancy's water program. "But if we pay farmers to flood their fields when the birds want to be here, then we can create the habitat that these birds need." Since the program began in 2014, more than 100 farmers have participated to create 50,000 acres of short-term habitat.

Elsewhere, other groups are finding creative ways to contract for conservation. In Montana, the Wild Sky program run by the nonprofit American Prairie Reserve makes direct payments to ranchers who implement wildlife-friendly practices that foster habitat for elk, pronghorn, bears, and other species. "Many ranchers are already doing conservation work, but very few are actually getting compensated for it," says Daniel Kinka, a wildlife ecologist with Wild Sky. "We think that by paying people for the conservation work they are already doing, they are more likely to continue to do that

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Backward incentives present major obstacles for recovering species—and the results show it.

work and are more likely to find new and better ways to do conservation in the future."

Other examples abound. The Vermont Audubon Society has developed a bird-friendly label that maple syrup producers can use to market their products in exchange for diversifying their forests to enhance bird habitat. The National Wildlife Federation negotiates grazing-permit buyouts in the Yellowstone region to reduce conflicts with carnivores such as grizzly bears and wolves and limit the spread of disease from domestic sheep to wild bighorn sheep herds. And in Uganda, conservationists have paid farmers to keep forests intact to preserve habitat for endangered chimpanzees and sequester carbon dioxide, which has proven to be a cost-effective way to combat deforestation in the country.

Regulations often harm, rather than help, endangered species recovery—but that's beginning to change.

Most endangered species rely at least in part on private lands for habitat. Yet under the Endangered Species Act, landowners who provide habitat for listed species generally receive no benefit—in fact, the presence of endangered species may even become a liability. As a former Fish and Wildlife Service administrator once noted, "The incentives are wrong here. If I have a rare metal on my property, its value goes up. But if a rare bird occupies the land, its value disappears."

The red-cockaded woodpecker provides a classic example. After the species was listed as endangered in 1970, several studies found that timber owners in North Carolina began harvesting trees earlier, or even clear-cutting forests entirely, to avoid the costly land-use restrictions that would arise if woodpeckers began to inhabit their land. Rather than encouraging landowners to provide much-needed habitat, the law encouraged them to preemptively destroy it.

These backward incentives present major obstacles for recovering species—and the results show it. Since the Endangered Species Act was enacted, less than 3 percent of listed species have recovered to the point of being delisted.

In recent decades, conservation groups, landowners, and policymakers have sought to improve the implementation of the act to address these perverse incentives. Various policy tools such as safe harbor agreements, candidate conservation agreements, and habitat credit trading programs have been created in an attempt to provide incentives that promote species recovery instead of undermining it. Safe harbor and candidate conservation agreements provide regulatory relief for landowners who conserve or recover imperiled species. Credit trading schemes provide incentives for property owners to supply habitat; their conservation work generates credits, which can be sold to developers who have agreed to buy credits to mitigate impacts of their projects.

A Golden Opportunity

In the hills of Central Texas, habitat credit trading programs have turned areas that support the endangered golden-cheeked warbler into an asset, increasing landowners' desire to preserve the species. The warbler, named for a flash of yellow plumage around its eyes, is the only bird that nests exclusively in Texas. Since 95 percent of the state's land is privately owned, incentives for landowners to conserve the warbler are crucial for its survival and recovery. The first credit exchanges for the species permitted the Department of Defense to offset the impact of its military exercises around Fort Hood by paying nearby landowners to provide habitat. But the credit market has since grown to include developers, spurring an expansion in habitat that has raised the possibility of delisting the bird in the near future.

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Most recently, the Fish and Wildlife Service in 2019 adopted new rules that will allow the agency to tailor protections to match the needs of listed species. In particular, the rules would establish a regulatory distinction between species that are listed as endangered (those currently at risk of extinction) and those that are threatened (those that could become endangered in the foreseeable future).

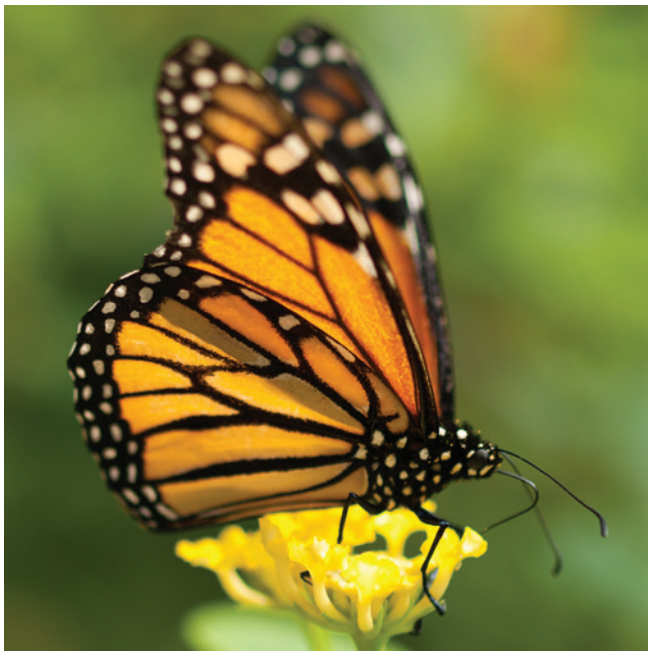
This change could provide better incentives to recover species. Now, instead of applying the same strict regulations to both endangered and threatened species, the agency can craft flexible protections for threatened species that are suited to the particular recovery challenges of that species. For example, the agency can issue baseline protections that do not unduly restrict land-use activities that pose little threat to a species and can encourage management actions that improve habitat conditions. And because landowners can be rewarded with regulatory relief as a species' status improves, or face increased regulatory burdens if its status declines, landowners will have a significant stake in species recovery.

The new rule may prove critical for the monarch butterfly, which is under consideration for federal listing later this year. The migratory butterfly's main habitat requirement is milkweed—the monarch caterpillar's only food source—but today the plant is in short supply due to increased herbicide use. As a result of this and other factors, monarch populations have drastically declined in recent decades.

Under the old rules, in which all listed species receive full protections by default, listing the butterfly under the Endangered Species Act would likely deter many landowners from helping recover the species. Its mere presence could trigger costly land-use restrictions, making it unlikely that farmers or ranchers would restore milkweed habitat.

The new rules would allow the Fish and Wildlife Service to tailor threatened-species protections for the monarch in a way that encourages efforts to conserve the butterfly. For instance, rules could be issued that allow landowners enrolled in a voluntary habitat conservation program to be exempt from certain regulations. In practice, that could mean that as long as a farmer makes good-faith efforts to maintain habitat that helps the butterfly, they would not be subject to restrictions or punishments for engaging in routine farming activities, even if they incidentally harmed a small portion of monarch habitat.

These policy tools are far from perfect—safe harbor agreements, for instance, are costly and time consuming for a landowner to hammer out with the government, and even then, an endangered species could still become a liability for neighbors



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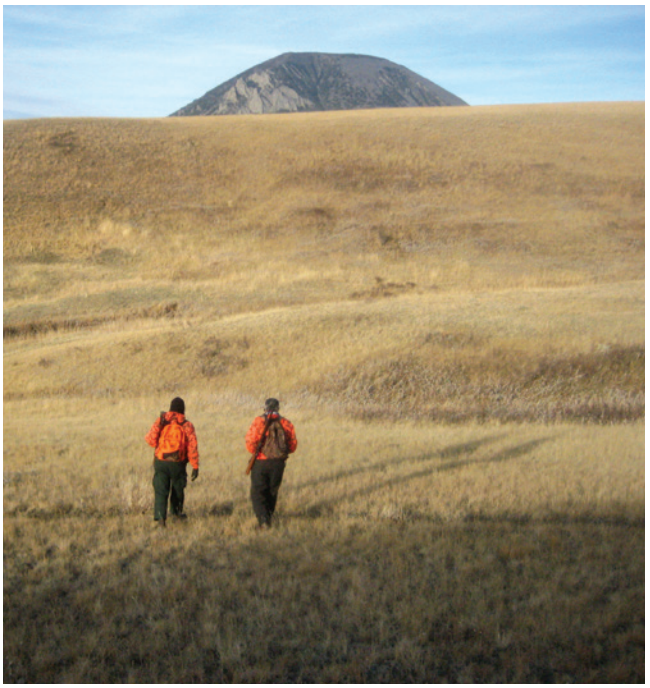
once it crosses property boundaries—but the trend is clear: Conservationists are finding innovative ways to affect policy so that incentives can be more closely aligned for landowners and imperiled species.

Environmental entrepreneurs are finding ways to better define property rights and reduce transaction costs to address new challenges.

If property rights and markets are the keys to free market environmentalism, then environmental entrepreneurs are the people applying them to solve real-world problems. At PERC, we have our own word for them: "enviropreneurs."

Simply put, enviropreneurs use property rights, contracts, and market incentives to improve the environment. They see environmental problems through a different lens. Where others see "market failures" and a need for regulation, enviropreneurs see opportunities to forge innovative contracts that define unclear property rights and reduce the transaction costs of coordinating exchanges. The result is a cooperative alternative to zero-sum political environmentalism.

Hank Fischer is a quintessential example. In the 1990s, while working with the nonprofit Defenders of Wildlife, Fischer helped reduce conflicts over the reintroduction of wolves to the Yellowstone ecosystem with a unique approach: Instead of pursuing regulation or litigation, he sought to compensate ranchers for the costs of living with wolves. His group raised



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money from wolf lovers to create a fund for reimbursing ranchers whose livestock were killed by wolves.

It was classic enviropreneurship. Rather than trying to take away ranchers' grazing rights or questioning whether they should have the right to graze livestock in the region at all, Fischer asserted that ranchers had such rights and worked to compensate them for their losses. The scheme didn't completely solve the controversy—wolves were still contentious, and remain so today—but his approach significantly defused the conflict.

"My view is that people who support wolf recovery should help pay the costs," Fischer wrote in *PERC Reports* in 2001. "I'm trying to bridge the gap between people who may not want wolves and my organization, which is committed to wolf restoration." Since then, similar approaches have been used to negotiate grazing permit retirements in areas with chronic wildlife conflicts and to help sheep ranchers convert their herds to cattle to reduce the spread of disease from domestic sheep to nearby wild bighorn sheep populations.

New technologies are also reducing the transaction costs of using environmental markets. The sharing economy, for example, is revolutionizing the way entrepreneurs connect suppliers and demanders to share underused assets, such as vehicles in the case of Uber and spare bedrooms in the case of Airbnb. The same principles are being harnessed to address conservation challenges.

LandTrust, a company based in Bozeman, Montana, is using an Airbnb-style marketplace to provide public hunting and other recreational opportunities on private lands—and, in the process, giving landowners incentives to conserve fish and wildlife habitat. Landowners can list their property, set prices, and establish rules for access. Hunters and anglers can then request daily bookings. Users are pre-verified, and dual rating systems build trust and ensure accountability.

Whether led by nonprofit groups or for-profit firms, enviropreneurs use property rights to promote conservation, sometimes even by creating new forms of property rights. Short-term habitat leases, fishing quotas, access agreements, livestock compensation schemes, conservation easements, and payments for ecosystem services are essentially enviropreneurial efforts to forge new property rights that lower the transaction costs of environmental markets—all while helping to protect species, preserve open spaces, or increase recreational opportunities.

Free market environmentalism is anything but an oxymoron.

Far from being an oxymoron, free market environmentalism is working to end overfishing, increase stream flows, recover wildlife, and encourage resource stewardship—and the environmental community is beginning to recognize it. Today, market approaches are no longer taboo. As the examples above suggest, they are often the most practical way to resolve conflicting demands over natural resources and the environment.

Of course, markets and property rights are no silver bullet. They won't solve every environmental problem. But for many issues, they offer a viable and attractive alternative to political environmentalism. And in cases where market solutions don't emerge, it's often because political or legal obstacles prevent them from flourishing—whether through unclear rights or restrictions on market exchanges. When property rights can be defined and secured and markets can function, free market environmentalism can thrive.

Free market environmentalism is a proven concept that is promoting conservation around the globe. It may be a different shade of green, but it's proving to be a critical part of the future of environmentalism.

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The Rights-Based Revolutions Beneath the Surface

With clearly defined rights to their shared and invisible natural assets, fishermen and irrigators alike reverse a race to the bottom

BY JAMES WORKMAN

You could argue our species needs freedom as much as we need food. The ocean provides both. It offers wide-open access to its salt spray, crashing waves, and vast mysteries beneath the surface. Far from the surf, its bounty fills our supermarkets with everything from halibut and hake, to crab and cod, salmon and shrimp, and snapper and grouper—a taste of the sea's raw wildness.

Alas, seafood has become a victim of freedom. Open access means nearly 100 million men and women around the world can and do cast a hook or net—or, in some cases, even a homemade bomb—to capture the ocean's bounty, whether for recreation, to harvest protein, or to earn a living. What's more, the ocean's "vast mysteries" are receding as innovations above its surface—including repurposed wartime technologies such as monofilament line, hydraulics, spotter planes, GPS, SONAR, LORAN, and RADAR—now allow us to penetrate its depths with pinpoint accuracy.

Year after year, fishing fleets ranging in size from outboard skiffs to floating factories extract more than 90 million metric tons of seafood, catching too much too fast for the ocean to renew itself. Such overfishing has human consequences as well. Compounded by global heating and acidification, two-thirds of all fisheries could be depleted by 2050, erasing fishing jobs and depriving billions of the nutritious animal protein.

The depletion of ocean fisheries is a classic case of the "tragedy of the commons." Each seafood harvester understands that his actions impact his fishery and pose risks to the sustainability of it. Yet each devotes ever more time, energy, and money to his pursuit, eroding the source of his sustenance. Understandably, fishermen explain the vicious cycle with an existential shrug: "If I don't take the last fish, someone else will."

The standard response is to crack down. Impose abstinence. Force a kind of maritime gastric bypass surgery on human appetites. Push seafood off menus and fishermen off the sea. Even if it were possible (spoiler alert: it isn't), shuttering the sea would diminish the health of our body and spirit—and our wildness.

Fortunately, the tragedy is not inevitable. Over several decades working in conservation, from the African desert to tropical rainforest to offshore seas, I have seen communities sustain their wild harvest by securing clearly defined rights to the natural resource on which they depend. I have watched men and women agree on rules over access to and use of the water, pasture, forest, or fishing grounds they share. Accountable rights and responsibilities foster trust and cooperation and turn scarcity into relative abundance. In recent years, such customary peer-to-peer governance systems have been adapted, formalized, and scaled with advanced technology, and commercial fishermen have led the way.

Fishing rights that are clearly defined, enforceable, and transferable give fishermen "skin in the game" and motivate them to leave more fish in the water today to ensure there's an abundant and valuable harvest available tomorrow.

REVERSING COLLAPSE

Amid grim and noisy headlines of oceanic seafood loss, waste, and ruin comes a quiet and equally accurate story of human agency. Fishermen and policymakers are uniting to replenish the resources on which we all depend. The catalyst behind this sea change is a policy innovation known as rights-based management, or "catch shares" in the United States.

Under negotiated contracts, a government agency sets science-based limits on an overall harvest, then clearly defines for fishermen and coastal communities a portion of the catch—either as a percentage of the total harvest or a spatial share of traditional fishing grounds—in exchange for their adhering to strict accountability. These shares can often be purchased, leased, or handed down to family members, which gives them enduring value. Fishing rights that are clearly defined, enforceable, and transferable give fishermen "skin in the game" and motivate them to leave more fish in the water today to ensure there's an abundant and valuable harvest available tomorrow.

The roots of this institutional innovation spread deep and wide. Customary rules provided a foundation for rights-based fishing in numerous societies over centuries, from Fiji to Turkey. In recent years, formal versions have been enshrined in constitutions from Iceland to South Africa to New Zealand. Today, fishermen and governments have together forged more than 200 such rights-based systems, co-managing 500 different species back to health across 40 nations.

Fishermen with these secure rights now enjoy longer seasons, safer fishing, lower costs, and higher earnings; meanwhile, the public enjoys healthier ocean biodiversity and fresher food.

While there's still room for improvement, this rapid, widespread, and bipartisan recovery marks the single greatest conservation triumph that almost no one has heard of.

Catch shares offer a pragmatic blueprint that could trigger a global ocean recovery.

Too good to be true? PERC senior fellow Christopher Costello, along with his colleagues at the University of California, Santa Barbara, crunched the numbers from a global database of catch statistics that encompassed 11,135 fisheries from 1950 to 2003. They set out to "test whether catch share fishery reforms achieve these hypothetical benefits." The data revealed that catch shares not only halt but even pull back the global trend of open-access fisheries heading toward collapse.

To Costello, this was akin to going from a monthly apartment rental to ownership of a home, even—or especially—a fixer-upper. "You take care of it—you protect your investment," he said. "When you allocate shares of the catch, then there is an incentive to protect the stock. We saw this across the globe. It's human nature."

UNDER THE SEA

From coast to coast to coast, America's catch shares have begun to transform some of the world's largest and smallest fisheries in both fresh and salty waters, motivating stewardship by commercial and recreational fishing vessels alike.

In just two decades, the results have been dramatic. Thanks to reforms such as catch shares, America's fishermen have rebuilt more than 45 depleted fish stocks. Today, 91 percent of U.S. fishing stocks are either sustainable or on the path to being so, boosting the nation's 1.7 million fishing-related jobs and $212 billion in sales that depend on coastlines teeming with life. While there's still room for improvement, this rapid, widespread, and bipartisan recovery marks the single greatest conservation triumph that almost no one has heard of.

How did it happen? Progress has been incremental and messy. Yet if success has a thousand fathers, most of them work the ocean from the Gulf of Maine to the Gulf of Mexico to the Gulf of Alaska. Fishermen helped drive initial reforms in places such as Port Judith, Rhode Island; Galveston, Texas; Tampa, Florida; and Fort Bragg, California. Along the way, they found unorthodox allies among a handful of innovative and open-minded marine policy officials, environmental groups, and even some renegade scholars in far-away Bozeman, Montana, nearly a mile above sea level.

Fifteen years ago, I pitched up at PERC in Bozeman as a Prius-driving, Left Coast political appointee of the Clinton White House and introduced myself to a friendly gang of small-government, libertarian-minded economists who, at the time, seemed to me a bit crazy. My favorite ones still do.

I came as a participant in PERC's Kinship Conservation Institute, which later became the PERC Enviropreneur Institute. I grew instantly immersed in vibrant—and sometimes contentious—exchanges of ideas about applying property rights and markets to environmental challenges. The intellectual friction felt wonderfully bracing, yet our clash of ideas often felt too theoretical.

Then one day Donald Leal, a PERC senior fellow, flipped on a projector and introduced us to "individual transferable quotas," now better known as catch shares or fishing rights. I still vividly remember that lecture. It wasn't abstract or hypothetical. It was happening. And it was as if someone threw a rock through a double-pane window.

"Rather than fight officials over how much fish they can catch, with what gear, on which days," he explained, "fishermen now look ahead to the future value of their quota and demand lower catch limits to rebuild populations faster." My jaw dropped. Fishermen were making more money by catching fewer fish. Rewilding the ocean was not just possible, but profitable.

Rights to wild fish made economic and ecological sense yet raised interesting political questions. Should fishermen be awarded shares based on their historic—and sometimes unsustainable—catch levels? How can new entrants break into the market? Are rights allocated by weight or percentage? Is anyone sure how fast species reproduce? Where do recreational anglers fit in? How do officials ensure compliance when hundreds of fishing boats sail in rough seas that are sometimes 200 nautical miles offshore?

Such questions often transcend peer-reviewed scholarship to engage practitioners. And, indeed, through its various programs and fellowships, many of these issues have since been raised and addressed by PERC and its associated fellows working in the field.

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America's Bipartisan 'Sharesmen'

The legal framework for fishing rights was redefined in America and has a long history of bipartisanship. Catch shares were embraced by Presidents George W. Bush and Barack Obama. One can trace the bipartisan political DNA of fishing rights back to an unlikely collaboration between rival Founding Fathers.

During the Revolutionary War, British troops annihilated the American colonies' vital fishing industry. Fearing stagnation and debt in the wake of the war, newly inaugurated President George Washington urgently dispatched his trusted advisors—Secretary of State Thomas Jefferson and Treasury Secretary Alexander Hamilton—to rebuild wild cod, herring, and shad fisheries.

The feuding geniuses typically quarreled about everything. And, true to form, Jefferson first envisioned small-scale yeoman fishing families working part time to harvest cod "to be salted by their wives and children." In contrast, Hamilton proposed ambitious economies of scale, recognizing how a national fishery could catalyze enterprises from timber suppliers and tar producers, to coopers and cobblers, to shipbuilders and waterfront developers. But what united the two political rivals was an informal rights-based system of incentives known as "cod sharing."

This system allocated every fishing crew member a portion of the fish their vessel brought to dock on a basis agreed before they set sail. Rather than wages, each man's earnings were tied to fish landed. Deckhands found it equitable; owners felt it eliminated "loafers." Hamilton and Jefferson scaled up the "sharesmen" principle into a national policy that awarded tax credits to incentivize financiers and fishermen with a clearly defined stake in the fishery, and vessels had to document their "cod-sharing" agreements before leaving port.

Thanks to this and other work, catch-share fishing rights can now be traced to an influential network that spans the ocean, rebuilding life and boosting resilience offshore. The rights-based principles I encountered in Bozeman all those years ago have begun to transform the way fisheries are managed offshore—and, as I'm discovering today, have the potential to remake the way resources are managed onshore as well.

BENEATH THE GROUND

Humans cannot live on fish alone. Most of our drinking water and half of our irrigated food comes from groundwater. Humble, earthy, and hidden from view, groundwater feels emphatically unsexy. It lacks the romance of fishing, the jolt of energy, and the scale of climate change. Except when millions of wells run dry.

That's not a hypothetical; it's happening in my home state of California. Drought's impacts are well known on the surface, as the state dammed, diked, diverted, dried, and silenced rivers in an unprecedented replumbing operation over the past century. Less appreciated, until recently, is how much urban, rural, and natural life depends on functioning aquifers.

Offshore fishing and inland farming may seem worlds apart. Yet both activities, in their own arenas, are susceptible to the tragedy of the commons. In both, cheap energy and new technologies lower the barriers to extract wealth from an invisible common pool. To slow, stop, and reverse depletion, both must find ways to share and steward this precious and literally "price-less" asset beneath the surface.

As with ocean fisheries, the typical response to groundwater depletion is to call for coercive regulations that force all users to pump less. Aside from the political obstacles, there are as many legal and practical challenges to this approach as there are wells. Without bottom-up collaboration, it will remain difficult to even figure out whose wells are pumping how much and from where, let alone force people to cut their water use.

As an alternative, today my partners and I have begun to apply the same rights-based approach to groundwater that has worked so well in fisheries. Our company, AquaShares,

The Catch-Shares Revolution

Today, more than 200 rights-based fishery management programs exist worldwide, affecting more than 500 species in 40 countries.

Source: Environmental Defense Fund Fishery Solutions Center

helps water users design and operate water savings markets in groundwater basins ranging from Sonoma County, California, to Marrakesh, Morocco. We work with communities to set collaborative goals that are fair, inclusive, and build resilience. To achieve these outcomes, we design accountable, yet flexible credit trading systems that limit market power, integrate the human right to water, ensure efficient trading, and protect groundwater-dependent ecosystems from deeply rooted forests to shallow ephemeral wetlands.

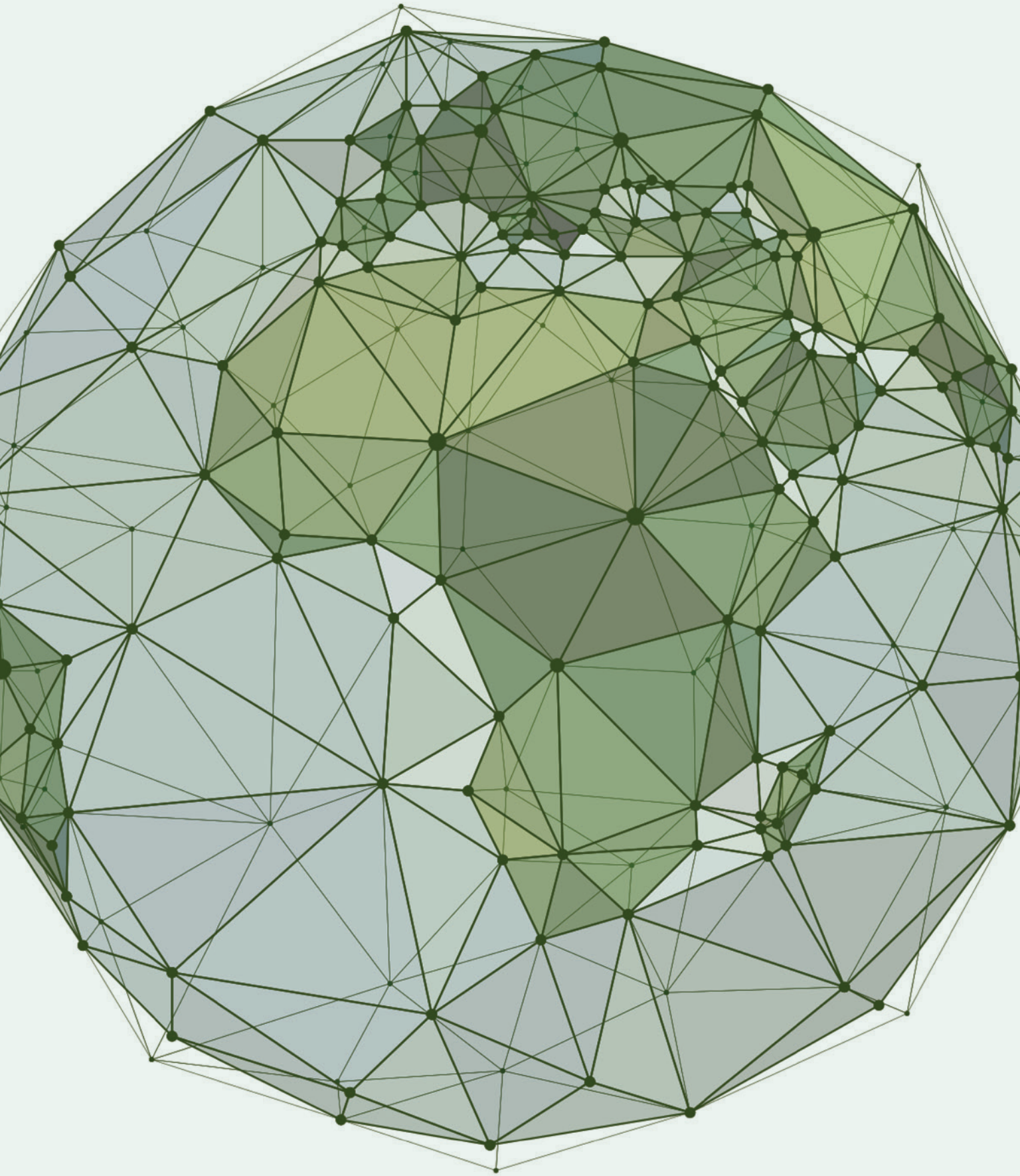
Each groundwater market platform is a blueprint, no better or worse than the values of the people who shape and adapt it to their desired outcomes. Since goals vary within and between basins, no two markets are the same. Given so many variables, and the novelty of the rights-based platform, some participants ask us: How can we be confident collaboration will work here?

One answer is that past is prologue. Those centuries-old traditional fishing systems from Fiji to Turkey laid a foundation for PERC and others to help improve the design and performance of formal catch shares. In addition to those lessons, wisdom passed down through 10,000 years of experiences in customary water allocation systems—which span cultures around the globe and whose local names include *!xaro* (Kalahari), *aflaj* (Arabian), *qanat* (Persian), *karez* (Chinese), *khettara* (Moroccan), and *subak* (Balinese)—informed the mission, work, and business model of AquaShares.

Yet in the end, the rights-based approach can only illuminate risks and rewards, like an old lighthouse or modern GPS helps vessels avoid treacherous rocks to reach safe harbor. The navigation itself remains a collaborative, iterative process. Stakeholders must still hash out details with each other in the open. With food and freedom at stake, people invariably fight with each other. They may stand up, bang the table, storm from the room. But they will come back. The ordeal is slow, messy, aggravating—and exciting.

Over the years, I've seen how a well-designed program of secure rights and market incentives can turn the tide at sea and beneath the ground to replenish invisible natural resources. Turning rights-based principles into policy and practice requires time, care, and energy. The transition is hard. Change always will be. But I have no doubt that it's worth the effort. For it brings meaning and responsibility to our relationship with the wild, our ethical link that remains, as Aldo Leopold described it, "an evolutionary possibility and an ecological necessity."

James Workman is a writer and entrepreneur working in natural resource conservation markets. He is an alum of PERC's Enviropreneur Institute.



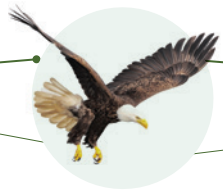
Against Environmental Pessimism

Doomsday thinking about the environment has been popular for decades. A rational optimist lays out the many reasons we can be hopeful about the future of the planet.

BY MATT RIDLEY

In 1980, the year that PERC was founded, I spent three months in the Himalayas working on a wildlife conservation project. The purpose was to do wildlife surveys on behalf of the Indian government in the stunningly beautiful valleys of the Kulu region in northern India, among forests of deodar cedar and evergreen oak. One species of particular interest was a bird called the western tragopan, a large, spotted gray forest pheasant with red plumage around the neck and bright blue skin on the male's throat. The bird was found only in a few places and thought to be teetering on the brink of extinction.

Though we saw other pheasant species, we never saw a tragopan that year, but some of the people we met knew of the bird, and one even handed me the remains of a tragopan that had been shot for food. I feared it might be the last one. I wanted to come back in the spring when the birds' mating calls might give them away in the deep bamboo thickets they preferred, but work prevented me.



If you had asked me in 1980 to predict what would happen to that bird and its forest ecosystem, I would have been very pessimistic. I could see the effect on the forests of growing human populations, with their guns and flocks of sheep. More generally, I was marinated in gloom by almost everything I read about the environment. The human population explosion was unstoppable; billions were going to die of famine; malaria and other diseases were going to increase; oil, gas, and metals would soon run out, forcing us to return to burning wood; most forests would then be felled; deserts were expanding; half of all species were heading for extinction; the great whales would soon be gone from the oil-stained oceans; sprawling cities and modern farms were going to swallow up the last wild places; and pollution of the air, rivers, sea, and earth was beginning to threaten a planetary ecological breakdown. I don't remember reading anything remotely optimistic about the future of the planet.

Today, the valleys we worked in are part of the Great Himalayan National Park, a protected area that gained prestigious World Heritage status in 2014. The logo of the park is an image of the western tragopan, a bird you can now go on a trekking holiday specifically to watch. It has not gone extinct, and although it is still rare and hard to spot, the latest population estimate is considerably higher than anybody expected back then. The area remains mostly a wilderness accessible largely on foot, and the forests and alpine meadows have partly recovered from too much grazing, hunting, and logging. Ecotourism is flourishing.

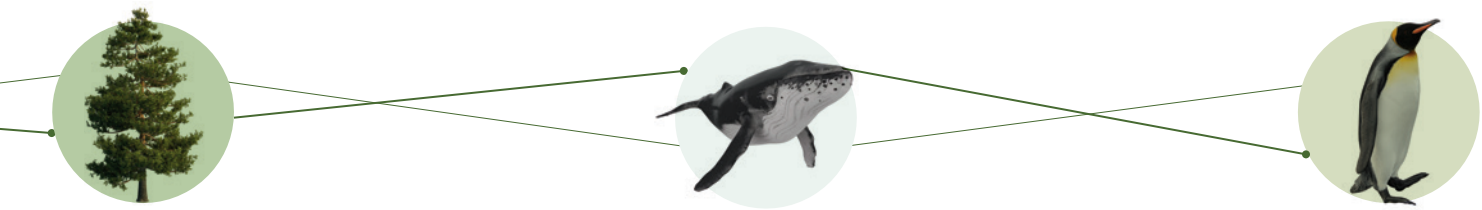
If you had asked me in 1980 to predict what would happen, I would have been very pessimistic. I don't remember reading anything remotely optimistic about the future of the planet.

This is just one small example of things going right in the environment. Let me give some bigger ones. Far from starving, the seven billion people who now inhabit the planet are far better fed than the four billion of 1980. Famine has pretty much gone extinct in recent decades. In the 1960s, about two million people died of famine; in the decade that just ended, tens of thousands died—and those were in countries run by callous tyrants. Paul Ehrlich, the ecologist and best-selling author who declared in 1968 that "[t]he battle to feed all of humanity is over" and forecast that "hundreds of millions of people will starve to death"—and was given a genius award for it—proved to be very badly wrong.

Remarkably, this feeding of seven billion people has happened without taking much new land under the plow and the cow. Instead, in many places farmland has reverted to wilderness. In 2009, Jesse Ausubel of Rockefeller University calculated that thanks to more farmers getting access to better fertilizers, pesticides, and biotechnology, the area of land needed to produce a given quantity of food—averaged for all crops—was 65 percent less than in 1961. As a result, an area the size of India will be freed up by mid-century. That is an enormous boost for wildlife. National parks and other protected areas have expanded steadily as well.

Nor have these agricultural improvements on the whole brought new problems of pollution in their wake. Quite the reverse. The replacement of pesticides like DDT with much less harmful ones that do not persist in the environment and accumulate up the food chain, in addition to advances in biotechnology, has allowed wildlife to begin to recover. In the part of northern England where I live, otters have returned to the rivers, and hawks, kites, ospreys, and falcons to the skies, largely thanks to the elimination of organochlorine pesticides. Where genetically modified crops are grown—not in the European Union—there has been a 37 percent reduction in the use of insecticides, as shown by a recent study done at Gottingen University.

One of the extraordinary features of the past 40 years has been the reappearance of wildlife that was once seemingly headed for extinction. Bald eagles have bounced back so spectacularly that they have been taken off the endangered list. Deer and beavers have spread into the suburbs of cities, followed by coyotes, bears, and even wolves. The wolf has now recolonized much of Germany, France, and even parts of the heavily populated Netherlands. Estuaries have been cleaned up so that fish and birds have recolonized rivers like the Thames.



GLOBAL GREENING

Here's a question I put to school children when I get the chance: Why is the wolf population increasing, the lion decreasing, and the tiger now holding its own? The answer is simple: Wolves live in rich countries, lions in poor countries, and tigers in middle-income countries. It turns out that we conservationists were wrong to fear economic development in the 1980s. Prosperity is the best thing that can happen to a country's wildlife. As people get richer, they can afford to buy electricity rather than cut wood, buy chicken rather than hunt bushmeat, or get a job in a town rather than try to scratch a living from a patch of land. They can also stop worrying that their children will starve and start to care about the environment. In country after country, first in Asia, then in Latin America, and now increasingly in Africa, that process of development leading to environmental gains has swiftly delivered a turning point in the fortunes of wild ecosystems.

One way of measuring such progress is to look at forests. Forests are still being cut down in poor countries, but they are expanding in rich ones. It turns out that when a country reaches a certain level of income, around $5,000 per person per year, it starts reforesting. This is because people become wealthy enough to stop relying on wood fires for cooking and to use electricity or gas instead. Bangladesh, for example, was desperately poor in 1980 but is now rich enough to be significantly increasing its forest cover today.

Overall, therefore, the number of trees in the world is steadily increasing. A study published by NASA and the University of Maryland in 2018 examined satellite data and found that global increases in tree cover have more than offset losses in tree cover over the past 35 years. This is not just because of growing plantations of timber crops; most of it is natural regeneration. Nor is this happening only in the cold woods of the North; tropical countries are reforesting as well. If you had told me in 1980 that this would happen, I would not have believed you.

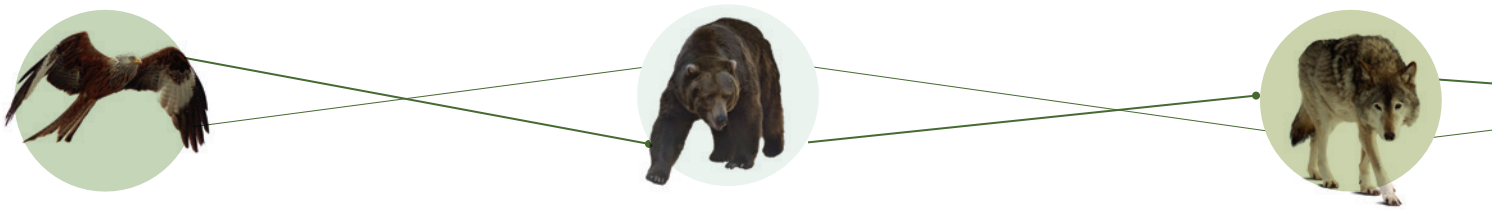
In 2013, I caught wind of an interesting study being done by NASA in conjunction with Boston and Beijing Universities. A team of researchers had found a way of measuring the quantity of green vegetation on the surface of the planet using satellite data. It was increasing: There were more green leaves each year. I published an article on this phenomenon of "global greening" and was immediately vilified for my impertinence in departing from the pessimistic script. But in fact it had been clear for some years that the carbon dioxide levels measured on top of a mountain in Hawaii, though increasing year over year, were also rising and falling with the seasons more than they once did, implying there was more growth of green leaves in the northern hemisphere summers.

In 2016, the same team published a paper confirming that global greening was occurring and speculating about the cause. Although the press release that accompanied the paper preemptively admonished me—by name!—for taking any comfort from this fact, it quoted the lead author, Zaichin Zhu of Beijing University, saying that the greening over the past 30 years was equivalent to adding a new continent covered in green vegetation twice the size of the United States. Global greening is occurring in all ecosystems, including rainforests, tundras, and croplands, and it is particularly strong in the arid areas of the planet.

By analyzing the patterns of this greening, Zhu and his colleagues were able to tease out why it was happening. Some of it was due to the use of fertilizer, some to increased rainfall caused by the slight warming of the seas, and some to reforestation. But the greatest cause, responsible for 70 percent of the greening, was the increase in carbon dioxide in the atmosphere as a result of burning fossil fuels. Carbon dioxide is the raw food that plants use, with water, to make carbohydrates and thence proteins and fats.

This CO2-fertilization effect was well known in principle, thanks to thousands of experiments in laboratories, greenhouses, and the open air over many years. Indeed, commercial greenhouses purchase carbon dioxide to pump over tomato plants to encourage them to grow faster. But this was the first time it had been measured on a global scale. Another study published this year confirmed "the rising atmospheric CO2 concentration as the dominant driver" of a 31 percent increase in global terrestrial gross primary production since 1900.

Global greening means that there is more food every year for caterpillars, antelopes, woodpeckers, and countless other species. It also means we need less land to feed ourselves than we would otherwise have needed by now. Of all the things that I did not expect in 1980, this is surely one of the most remarkable.



MORE FROM LESS

In the ocean, too, though a lot is still going wrong, my younger self in 1980 would be amazed by what has happened. The amount of oil spilled in the seas has fallen by 80 percent since 1980. This is because shipowners got together and agreed to use double-hulled tankers, and GPS navigation soon made shipwrecks less likely. At the same time, the populations of whales have increased in spectacular fashion. Humpback whales, for example, numbered less than 5,000 in the 1960s. Today there are at least 80,000.

The subantarctic island of South Georgia, which I was fortunate to visit in 2016, now has millions of king penguins, millions of fur seals, and almost a million elephant seals crowding its beaches. These species were vanishingly rare in the middle of the 20th century, after whalers and sealers had devastated the island's wildlife. In the Arctic, the numbers of walrus and polar bear have similarly rebounded to high levels. This is partly because of regulatory protection, but also partly due a change in economic incentives. Just like an African subsistence farmer who gets a job in a town and starts to buy chicken in the shop instead of relying on bushmeat, so we in the West have decided that killing wild seals and whales for their meat or their blubber now makes less economic sense than rearing chickens, growing canola, or drilling for oil.

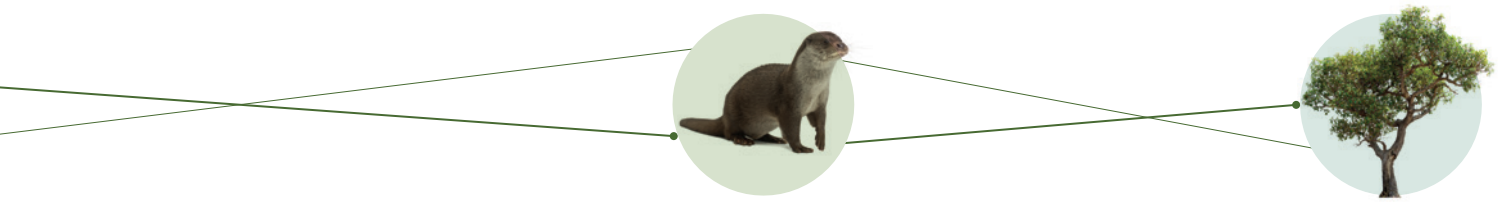
Indeed, in areas where wildlife populations are declining, it is now often caused by competition from recovering species. Fin whales are gathering in such huge aggregations off Elephant Island near the Antarctic Peninsula that they are eating the krill relied on by chinstrap penguins, causing a fall in the numbers of the latter. Humpback whales are eating the prey of puffins off the coast of Iceland, contributing to breeding failures. Killer whales have driven away great white sharks in South Africa. Hedgehogs have disappeared from much of the British countryside because of predation by badgers, whose populations have blossomed.

If only we could stop relying on wild caught fish, they too could recover to fill the seas again. Fortunately, we are making progress here as well. Today, about half of our seafood now comes from farmed fish and shrimp. But to feed these farmed animals, we still need to catch wild fish, and if we can alter that, perhaps with biotech crops, then maybe we can go back to a time when vast shoals of huge tuna and swordfish roamed the oceans.

Some worry that reporting good news about the environment makes people complacent. I disagree. It makes people realize that declines are not inevitable, that improvements are possible, and that it is worth trying. Take the case of New Zealand's determination to rid itself of all mammalian predators by 2050. (Apart from bats and seals, no mammals are native to New Zealand, and introduced alien mammals such as stoats and foxes have devastated native wildlife.) This ludicrously ambitious plan is only being contemplated because of the remarkable achievements of New Zealand conservationists on offshore islands, such as Stewart Island and South Georgia, where poisoned rat bait spread by helicopters has rid large, mountainous islands of rodents altogether.

Despite such efforts, the perils presented by alien species are an example of a trend that is not yet going in the right direction, and it is a reminder not to be Panglossian. Invasive species are the biggest cause of extinction of mammals and birds on islands. The brown tree snake, for example, has caused the extinction of 12 bird species on Guam. One innovation that could help in this fight is gene drive, a technology in which a genetic sequence that makes all offspring male spreads through a population for a set number of generations, driving a local population extinct. This could soon be used, for example, to wipe out the alien mosquitoes that have spread the avian malaria that has caused the decline of native honeyeaters in Hawaii, many species of which have gone extinct.

I therefore venture to predict that in 40 years we will have rid the world's islands of many of the invasive species that have done such harm, using biotechnology. Indeed, we will have gone further and revived several extinct species. Under the banner of Revive and Restore, Ryan Phelan and Stewart Brand have begun exploring how this could be done. First you need to read the full genome of an extinct species from a museum specimen. In some cases this has already been done. The passenger pigeon, which went extinct in 1914, and the great auk, which went extinct in 1844, have been sequenced in this way. Second you need to make precise edits to the genome of a closely related species. The new base-editing and prime-editing techniques that are being developed promise to make this possible fairly soon. Third, you need to introduce this genome into embryos to grow a population of individuals, and then you need to reintroduce them to the wild. I expect this will happen in my children's lifetime.



THE NEXT 40

What else might we achieve by the year 2060, when I shall be 102? Even though there will then be more than nine billion people, it is almost certain there will be larger forests, more wildlife, cleaner rivers, and richer seas, because that is what is currently happening. Most people who deny this, and insist things are getting worse, are simply wrong. The latest example is the "insect apocalypse," a scare that has been widely reported by the media but is based on inadequate data and ridiculous exaggerations from one or two small-scale studies of dubious value.

There is, however, one thing that worries me, and it is this: Some environmentalists, as steeped in pessimism today as I was 40 years ago, are determined to push policies that actually harm the environment. They want us to farm organically, even though that uses more land and does more harm to the soil than farming with chemicals and biotechnology. They want us to get all of the energy we need from the sun or the wind, even if it means covering the landscape in industrial structures to try to extract energy from extremely low-density sources. They want us to turn crops into fuel, via ethanol from corn or diesel from palm oil, even though this means pinching land from wildlife. They want us to reject biotechnology and nuclear power, two practices that reduce humans' environmental footprint. They want us to recycle plastic, rather than incinerate it, which has resulted in an industry of exporting plastic to Asia where much of it ends up dumped in the ocean. In short, their policies are in many cases actually worse for the environment.

What else might we achieve by the year 2060? Even though there will then be more than nine billion people, it is almost certain there will be larger forests, more wildlife, cleaner rivers, and richer seas. Most people who deny this, and insist things are getting worse, are simply wrong.

I will end with one further prediction. While climate change is real and man-made, it will not cause catastrophe by 2060. The current rate of warming over the past three decades is about half what scientists predicted in 1990: 0.17°C per decade compared with 0.30°C. And, as predicted, the warming is happening more at night, in cold areas, and in winter than in the daytime, in warm areas, and in summer. The effect on the frequency and intensity of storms, droughts, floods, blizzards, and other weather events is still so small that it is hard to detect. These continue to happen, of course. There has probably been a slight decline in droughts, but a slight increase in heat waves. There is less snow cover in the northern hemisphere in spring, more in fall, and no change in winter. Glaciers are retreating, as they have been since the mid-1800s. Most important, deaths from weather events continue to fall steeply as more countries get access to the technology, infrastructure, and information needed to prevent large-scale loss of life in a hurricane, drought, or flood.

Moreover, if warming continues like this, by 2060 we will still not have reached the sort of temperatures that were standard in the early part of the current interglacial period, when the Arctic Ocean regularly lost all of its ice during the summer. So we are not heading into unprecedented territory. And I suspect that we will ultimately solve the problem by substituting nuclear fusion for fossil fuels long before its consequences turn catastrophic.

I was wrong to be pessimistic about the environment in 1980, and it would be wrong to give young people a counsel of despair today. Much has improved since then, and as PERC's work has demonstrated for four decades and counting, much improvement from here is not only possible, but likely.

Matt Ridley is the author of several popular books on evolution, genetics, and society, including *The Rational Optimist* (2010) and *The Evolution of Everything* (2015). His new book *How Innovation Works: And Why It Flourishes in Freedom* (2020) is available now.

Free Markets Meet Public Lands

How PERC's ideas are improving federal land management

BY HANNAH DOWNEY

For 40 years, PERC has demonstrated how to improve environmental quality using property rights and markets. During that time, we have applied our research to a variety of environmental policy issues such as water markets, endangered species conservation, and marine fisheries. In recent years, much of our policy work has focused on public land management, where private property rights and markets are typically nonexistent.

What does free market environmentalism have to do with public lands? At its core, free market environmentalism is based on the idea that incentives matter. It focuses not only on the incentives that motivate private actors in the marketplace, but also the incentives facing government agencies and policymakers and asks how those incentives can be better aligned to promote good management.

The reality is that many natural resources are owned or managed in some way by governments. The National Park Service operates more than 400 park units covering more than 85 million acres across the United States. The Bureau of Land Management, the nation's largest landowner, manages 245 million acres and oversees everything from wild horses and burros to oil and gas leases. Congress writes laws pertaining to wilderness areas, wildfire management, and everything in between, in addition to appropriating the budgets of the federal land management agencies. The president can even designate national monuments with the stroke of a pen.

With such far-reaching government control, most decisions about public land use are not based on markets, or even science, but rather on politics. That means that short-term priorities driven by election cycles, political whims, and special interest groups often prevail over longer-term considerations that could produce more reliable and sustainable conservation outcomes. The challenge for groups like PERC, then, is to find solutions that account for these realities and provide better incentives to conserve publicly managed resources.

Consider the backlog of deferred maintenance on our public lands. Today, federal land agencies are saddled with almost $20 billion in overdue maintenance projects, including leaky wastewater systems, crumbling roads and trails, and dilapidated visitor facilities. The National Park Service alone faces nearly $12 billion in deferred maintenance, an amount that is more than four times the agency's annual budget.

Why such neglect? The problem boils down to incentives. Parks and other public lands rely on Congress for the vast majority of their funding, but politicians are often more interested in acquiring new lands or creating new parks than funding basic maintenance on existing public lands. After all, no one runs for reelection on a promise to fix leaky roofs and keep toilets clean, but flashy ribbon-cutting ceremonies for new parks draw good press and public praise.

For decades, PERC scholars have emphasized the need to "get the incentives right" to better address deferred maintenance needs in our national parks and other public lands. In particular, that means making parks less reliant on the political appropriations process and empowering local managers to tackle routine maintenance issues to prevent the backlog from growing.

Thanks in large part to PERC's efforts on this topic, deferred maintenance has become a focus of national discussions about public land policy. In fact, a bill that is now before Congress—the Great American Outdoors Act—would create a dedicated fund to help tackle the problem. The fund, derived from energy development on federal lands and waters, would generate up to $9.5 billion over five years and could be spent by public land managers without additional authorization from Congress. It would provide immediate money for high-priority deferred maintenance projects, and it would also incorporate market mechanisms to provide funding for longer-term needs. A portion of the fund could be invested, and the interest earned would be available to address future maintenance projects. Importantly, the fund could not be spent on land acquisition, ensuring it doesn't further thin the management resources of federal agencies.

While the creation of such a fund is an important step, it won't completely solve the problem. User fees help provide additional funding that can further insulate parks from the uncertainties of political appropriations. PERC has long supported the Federal Lands Recreation Enhancement Act, which allows federal land agencies to charge visitor fees at developed sites and retain and spend most of the revenue where it is collected. The revenues can be spent by local managers free from political influences and are used to enhance visitors' experiences, including maintenance projects. Much of PERC's current policy work explores how to expand such user-pays models to give managers flexibility while encouraging sound management.

PERC is also addressing the wild horse crisis on our public lands. Nearly 100,000 wild horses and burros roam on public lands in the American West, about four times the capacity designated by the Bureau of Land Management. This skyrocketing population degrades rangeland ecosystems and costs hundreds of millions of dollars to manage each year, which includes housing nearly 50,000 excess horses in long-term, off-range, taxpayer-funded holding facilities. For years, the BLM tried to gather and adopt some of these excess horses to private homes, charging $125 per animal, but the approach made little sense—it required payment for a wild horse, even though the horse was a public liability—and it largely failed. Taxpayers ended up footing the bill for unadopted horses that remained in expensive off-range holding facilities.

> At its core, free market environmentalism is based on the idea that incentives matter. It focuses not only on the incentives that motivate private actors in the marketplace, but also the incentives facing government agencies and policymakers.

Research by PERC scholars found that if the BLM paid people to adopt wild horses—rather than requiring people to pay to do so—more horses would be adopted, and the agency would save a great deal of money by reducing its holding facility costs. Prompted by this research, last year the BLM started to pay $1,000 for each wild horse adoption. With a financial incentive to help people cover the costs associated with taking in a horse, such as training and feed, wild horse and burro adoptions increased 91 percent in the first year of the payment program, saving taxpayers $170 million.

Incentives matter. Whether on public or private lands, effective conservation policy requires getting the incentives right. For decades, we have sought to educate policymakers on policies and institutions that motivate long-term environmental success. We aim to do the same in the decades to come.

Hannah Downey is the policy director at PERC.

Free Market Environmentalism Elucidated

Liberty, environmental quality, and the quest for the frontier

© Colter Olmstead

PERC is the home of free market environmentalism. But what is free market environmentalism? A statement of principle? An economic theory? A political rallying cry? As someone with long-standing ties to PERC, I have learned to embrace the phrase, and in so doing have arrived at the interpretation I present here. It describes what I think binds together those who find an intellectual home at PERC.

My version of free market environmentalism involves a standard economic analysis of two goods: environmental quality and liberty. It describes someone who views increases in environmental quality as unambiguously good. The same person also views increases in liberty, or autonomy, as unambiguously good.

Some may find these assertions to be bland and unexceptionable, but counterexamples abound. Plenty of libertarians place a premium on liberty but are largely indifferent to the state of the natural world. Many environmentalists are passionate about endangered species and wilderness but are largely indifferent to the regulation of human activity imposed by collective coercion—in fact, may welcome the sense of community that can come with submitting to social order.

Using common economic assumptions, a free market environmentalist's preferences for environmental quality and liberty are shown in Figure 1, which can be interpreted as follows. Vertical movements in the diagram represent improved environmental quality for a fixed level of liberty. Horizontal movements represent greater liberty for a fixed level of environmental quality. Both directions, and all combined movements in a northeastern direction, represent improvements in the state of the world.

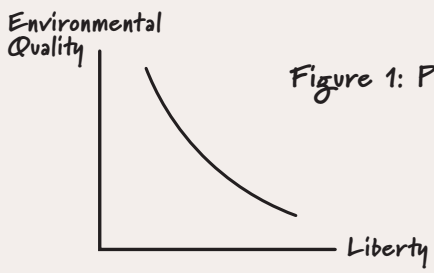


Figure 1: Preferences

Further, the figure represents a willingness to accept trade-offs as shown in the slope of the curve, which economists call an indifference curve. A southeast movement along the

indifference curve represents the terms of trade the individual is willing to accept to increase liberty at the expense of environmental quality. The curve is convex because as the free market environmentalist gives up more and more environmental quality, he must be rewarded with a relatively greater amount of liberty to be equally satisfied—and vice versa. In other words, both environmental quality and liberty are like steak—the first bite is tastier than the last.

Adherents to free market environmentalism certainly differ in the degrees to which they prefer environmental quality and liberty, absolutely and at the margin: from staunch libertarians with a mild taste for greenery to hardcore environmentalists who would rather not be told what to do.

But free market environmentalism doesn't rest on preferences alone. It involves the belief that the physical and policy worlds often offer trade-offs between liberty and the environment. A standard economic principle asserts that an economy faces a trade-off between guns and butter. The economy can devote all of its resources to the production of guns, all to the production of butter, or to combinations in between. Just as with guns and butter, the trade-offs between environmental quality and liberty can be represented with what economists call a production possibilities frontier, as shown in Figure 2.

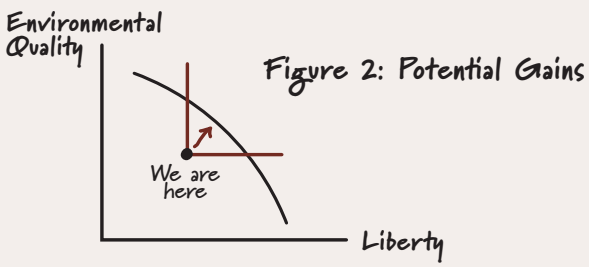


Figure 2: Potential Gains

An important point to understand is that the trade-offs happen on the frontier, represented by the concave curve, from which no northeast movements are possible. There may be situations inside the frontier where both liberty and environmental quality can be improved. But if the economy is operating on the frontier, then increasing environmental quality requires a reduction in the freedom of individuals to choose their own actions—a northwest movement along the curve. The trade-off here is perhaps less obvious than in the production of guns and butter. But the trade-off is implicit in every discussion of environmental regulation where it is proposed that firms or individuals be restricted from exercising their otherwise profit- or utility-maximizing choices to achieve a given environmental aim, whether lower atmospheric particulate count or higher grizzly bear population.

The tie that binds one to the mast of free market environmentalism is the observation that we live in an imperfect

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world—in other words, we are not on the frontier. Because our regulatory and legal structures and levels of environmental quality are to a great extent shared and publicly determined, there is no reason to think that we are at the optimum, or even that the optimum is well defined given a diversity of personal preferences and no unique way to aggregate them.

Adherents of free market environmentalism and fellow travelers at PERC subscribe to the view that we often find ourselves at a point like the one labeled "We are here" in Figure 2. From this point, it is possible to increase both environmental quality and liberty. We are not on the frontier, but we can and should try to move closer to it.

That's it. The majority of the intellectual effort at PERC appears to me to be motivated by situations where northeast movements are possible. Some represent increases in liberty alone, some increases in environmental quality alone. The solutions most likely to attract broad interest are those that represent increases in both. It is the analysis of the details of individual cases that occupy economists, legal scholars, philosophers, political scientists, biologists, and ecologists at PERC.

Why, finally, is it "free *market* environmentalism?" Because markets are key. Markets are the central metaphor in economics to represent voluntary exchange. Free market environmentalism encourages environmental policy inspired by markets, thus promoting liberty and autonomy. In some cases, this involves using existing markets. In other cases, it requires attempting to design markets—with due respect for the law of unintended consequences and Hayekian insights into knowledge of "the particular circumstances of time and place." In some cases, it means mimicking markets when designing non-market regulation.

And that is why PERC is the home of free market environmentalism.

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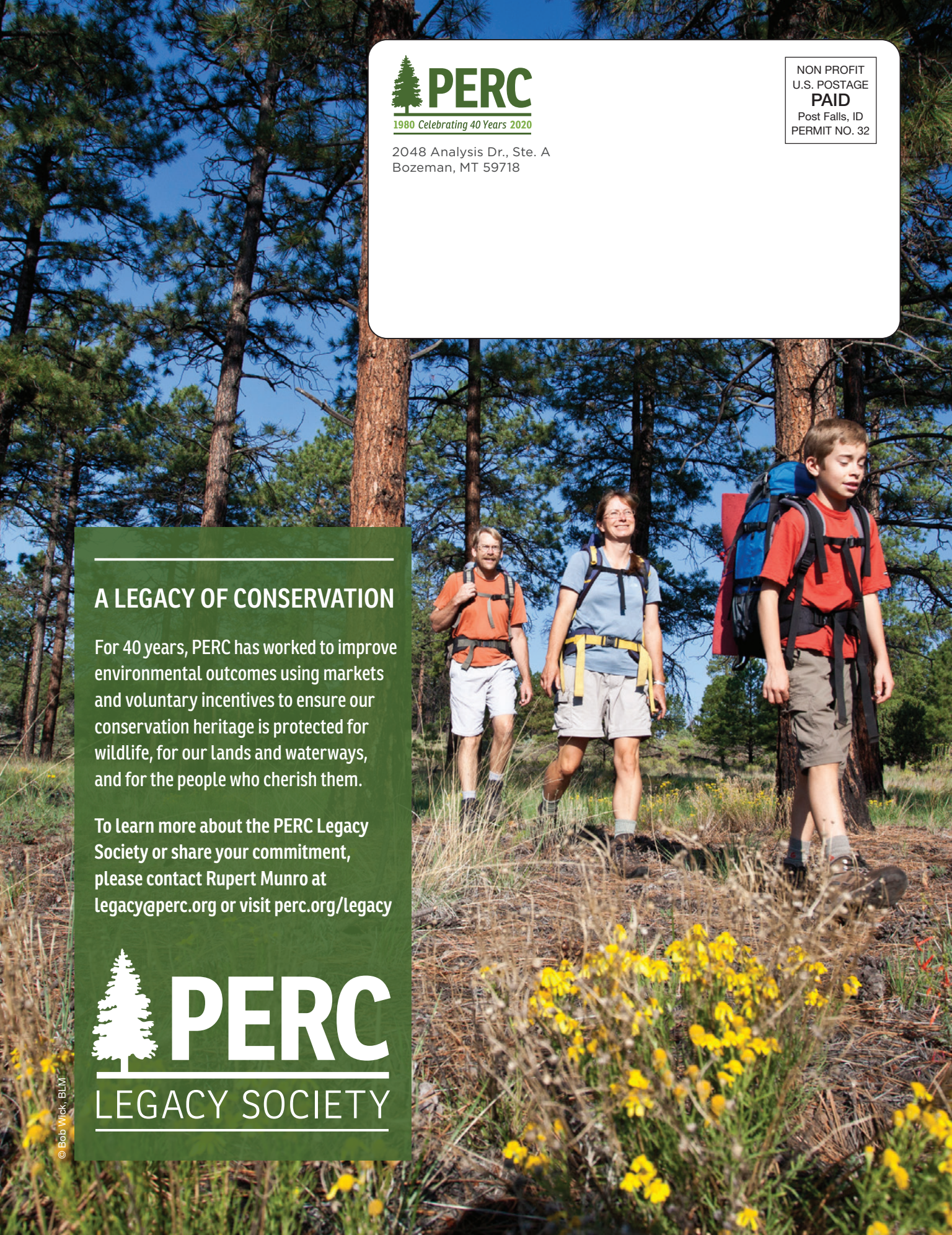

A LEGACY OF CONSERVATION

For 40 years, PERC has worked to improve environmental outcomes using markets and voluntary incentives to ensure our conservation heritage is protected for wildlife, for our lands and waterways, and for the people who cherish them.

To learn more about the PERC Legacy Society or share your commitment, please contact Rupert Munro at legacy@perc.org or visit perc.org/legacy

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