ESSAY

Paradoxical Conservation and the Tragedy of Multiple Commons

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I. INTRODUCTION

There is a risk that the ideas advanced here may be regarded as contrarian, radical, counterintuitive, or otherwise anathema to the land conservation and environmental communities for whom this Essay is written (including advocates of the principle of "sustainable use"). It is perhaps because of this that there has been little written and published on this subject, making references difficult to find. Accordingly, this Essay is kept brief for the purpose of intellectually "testing the waters" of

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several novel ideas. It is left to the experience and prescience of the reader to respond in some fashion to the ideas introduced here and to indicate if these ideas merit further action, even if that action is strenuous rebuttal.

There is one more important consideration that the reader must note. All of the observations, analyses, and conclusions contained herein will be played out in a world that is already struggling to understand and adapt to global warming and climate change. While most of this Essay can be related to issues associated with global warming, discussions that relate to air pollution and emissions of greenhouse gases are particularly relevant. Because it is safe to assume that most readers of this Essay will be familiar with the multiple, complex, and interactive aspects of global warming, there will be little discussion of this subject.[1]

II. THE TRAGEDY OF THE COMMONS

Anyone reading this Essay is likely familiar with the concept popularly known as the "tragedy of the commons." The concept can be traced back to Aristotle and, more recently, to an 1833 tract by William Lloyd.[2] However, it was the 1968 *Science* essay by Garrett Hardin that introduced the tragedy of the commons into the mainstream.[3] The tragedy of the commons refers to the social and economic consequences of allowing individuals free and unlimited access to some form of

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1. For those readers who seek a convenient and easily accessible list of the most authoritative and the most circulated works on global warming to date and the most comprehensive and influential compilations of global climate change related data and analysis, see generally INTERGOVERNMENTAL PANEL ON CLIMATE CHANGE, CLIMATE CHANGE 2007: THE PHYSICAL SCIENCE BASIS (Susan Solomon et al. eds., 2007), *available at* http://www.ipcc.ch/ipccreports/ar4-wg1.htm; INTERGOVERNMENTAL PANEL ON CLIMATE CHANGE, CLIMATE CHANGE 2007: IMPACTS, ADAPTATION AND VULNERABILITY (Martin Parry et al. eds., 2007), *available at* http://www.ipcc.ch/ipccreports/ar4-wg2.htm; INTERGOVERNMENTAL PANEL ON CLIMATE CHANGE, CLIMATE CHANGE 2007: MITIGATION OF CLIMATE CHANGE (Bert Metz et al. eds., 2007), *available at* http://www.ipcc.ch/ipccreports/ar4-wg3.htm; SIR NICHOLAS STERN, THE ECONOMICS OF CLIMATE CHANGE: THE STERN REVIEW (2006). For extended research works on global climate change effects on biodiversity, see IDENTIFICATION AND GAP ANALYSIS OF KEY BIODIVERSITY AREAS: TARGETS FOR COMPREHENSIVE PROTECTED AREA SYSTEMS (Peter Valentine ed., 2007); ECOSYSTEMS AND HUMAN WELL-BEING: BIODIVERSITY SYNTHESIS (José Sarukhan & Anne White eds., 2005); A GLOBAL SPECIES ASSESSMENT: 2004 IUCN RED LIST OF THREATENED SPECIES (Jonathan E.M. Baillie, Craig Hilton-Taylor & Simon N. Stuart eds., 2004); NAT'L ASSESSMENT SYNTHESIS TEAM, U.S. GLOBAL CHANGE RESEARCH PROGRAM, CLIMATE CHANGE IMPACTS ON THE UNITED STATES: THE POTENTIAL CONSEQUENCES OF CLIMATE VARIABILITY AND CHANGE (2001), *available at* http://www.usgcrp.gov/usgcrp/Library/nationalassessment/00intro.pdf.

2. Bonnie J. McCay & James M. Acheson, *Human Ecology of the Commons*, *in* THE QUESTION OF THE COMMONS: THE CULTURE AND ECOLOGY OF COMMUNAL RESOURCES 1 (Bonnie J. McCay & James M. Acheson eds., The University of Arizona Press, 1990) (1987).

3. Garrett Hardin, *the Tragedy of the Commons*, SCIENCE, Dec. 13, 1968, at 1243.

commons. Such commons might include areas for animal grazing, water sources, and forests. In a tragedy-of-the-commons scenario, individuals will maximize their proclivity to exploit the commons, because they can benefit directly, while the costs can be distributed across all other resource users.[4] The inevitable consequence of such free access is the complete depletion of the common resource.[5] One can also conceive of a "negative commons." In a negative commons, the impact occurs from the ability to pollute a resource without direct consequence to the polluter. Water and air pollution are obvious examples, with the pollution of the atmosphere by the emission of greenhouse gases as perhaps the ultimate example of the tragedy of the commons.

The following Parts will explain how altruistic behaviors intended to conserve a natural resource in one commons (including those that succeed in doing so) may paradoxically intensify the use, and thereby exacerbate the depletion of, other natural resources in other commons—both negatively and positively. In other words, by limiting our use of a specific natural resource, the portion of that resource thought to have been preserved may, in reality, ultimately be reallocated to other users who then leverage that resource to consume more of other resources in other commons.

III. CONSERVATION FOLLIES

Confronted with an unregulated commons, there will frequently be those who voluntarily, for ethical reasons, constrain themselves to take only their fair share, or even less. There will also be those users of the resource of similar altruistic motives who will urge all the users of the unregulated commons to voluntarily limit their consumption. Because there will often be disagreement as to whom should limit their usage and by how much, the seemingly objective, but inherently ambiguous, standard of "sustainable use"[6] is often urged upon the more profligate users of the commons.

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4. *Id.* at 1243; *see also* PROPERTY RIGHTS: COOPERATION, CONFLICT, AND LAW (Terry L. Anderson & Fred S. McChesney eds., 2003) (noting problems stemming from open access to natural resources and introducing the concept of managing such resources as common property).

5. *Id.*

6. A similarly negative view of the use of the term and/or concept of "sustainability" is reflected in a recent work by Eric T. Freyfogle:

> Sustainability for many implies a life that is stagnant and repetitive. It implies restrictions that keep us from growing, changing and enjoying new experiences. Bureaucrats might find the term useful, given its all-things-to-all-people flexibility. But politicians are well aware of its rhetorical limpness. . . . Even former vice president

Ironically, such limitation may sometimes result in what may be referred to as "paradoxical conservation." The concept of "paradoxical conservation" serves as a useful proxy for the complex and counterintuitive phenomenon that is at the heart of this Essay. Quite simply, altruistic decreases in the use of a scarce natural resource in one commons may result in increases in the uses of other natural resources in other commons. The seeming altruism of conserving one resource may trigger perverse feedback loops that result in a net plunder of multiple resources, thereby creating harms that far exceed those that would have occurred from the exploitation of the single resource ostensibly conserved in the first instance.[7] The brief examples in the following Parts clarify how this phenomenon manifests itself.

IV. PARADOXICAL CONSERVATION: WATER

One of the most subtle examples of paradoxical conservation involves water. As anyone who has stayed in a hotel in the past ten years knows, such establishments aggressively urge their guests to conserve water and energy by using towels and sheets more than once, rather than washing them after each use. This seems harmless enough until one considers who benefits from this behavior. The most immediate beneficiary is the hotel, which saves money on water costs, energy costs, and employee costs. But has the compliant guest actually saved water or energy? Unless there is storage tank for the saved water and a battery for the stored energy, these resources will simply go back into the system to be used by other consumers who may not be so altruistic. Only the hotel's monetary savings are real, measurable, and preservable.

This scenario is still a step or two away from paradoxical conservation. The following example more fully demonstrates how paradoxical conservation might operate. Imagine a developer building a

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> Al Gore, so committed to conservation, came to see that sustainability had no political traction. It drew little public attention, much less voter excitement.

ERIC T. FREYFOGLE, WHY CONSERVATION IS FAILING AND HOW IT CAN REGAIN GROUND 123-24 (2006) (footnotes omitted; formatting altered).

7. One useful description of this condition is that of "overshoot." Overshoot is the result of failures in feedback that result in overexploitation of a natural resource. For purposes of this Essay, failures in feedback occur when ostensibly effective conservation of one natural resource sends signals of resource abundance regarding that resource. These conservation driven signals of abundance—or at least of resource adequacy—mask signals of impending scarcity in interrelated resources, thereby creating a distortion or failure of feedback. DONELLA MEADOWS, JORGEN RANDERS & DENNIS MEADOWS, LIMITS TO GROWTH: THE 30-YEAR UPDATE 174 (2004) ("Humanity is in overshoot when the human ecological footprint is above the sustainable level, but not yet enough to trigger changes that produce a decline in its ecological footprint. . . . Overshoot comes from delays in feedback.").

residential complex. The local planning department requires that all toilets utilize a low flow mechanism to save water. The developer also designs the homes to minimize the amount of grass needing to be watered. One of these already water-efficient homes is purchased by an altruistic and environmentally conscious couple. This couple further reduces its water and energy consumption below the norm by installing front loading washing machines and energy efficient dryers. They also save water by living environmentally responsible lifestyles, making numerous personal sacrifices like short showers, not flushing toilets until necessary, not washing their cars, and so on.

In this example, our couple actually does save water. Presumably, if there are enough conserving households, the municipal or private water purveyor can measure this reduction in usage, perhaps directly from water meters or indirectly through measurements of the aquifer. So, the question becomes, what happens to the saved water? Is it pumped back into the aquifer to be saved for future generations? Is it stored in giant tanks that will hold the water for hundreds of years? If the norm prevails, the answer is "no."[8]

What actually occurs is that this couple's altruism, combined with the collective altruism of others, sends perverse economic and resource availability signals. Such signals have negative impacts, the worst of which may be that the conservation of water will allow the local planning department to attest that there is sufficient water to allow additional development. If water availability was either the sole limitation on development, or even one of a several limits, the conservation will have directly resulted in more homes being built and new demands on other natural resources. This last idea is worth exploring further.

Imagine that a developer puts up a hard-fought battle with the planning department and the public to build a new multiuse, multifamily mega-development. The best argument that project opponents have is the lack of adequate long-term water supply. A hydrologist testifies that because of the success of the local water conservation program, there is adequate water for this new development. The factual arguments of the project's opponents unravel, and the development is approved.[9]

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8. Not only will the "conserved water" not be saved as drinking water for future generations, but it may also be lost for other critical future uses such as food crop irrigation. *Id.* (noting the relationship between water consumption and the resulting reduction in the amount of water dependent crops under cultivation).

9. In a review of the literature addressing the relationship of water supply and urban planning, one finds an unexpectedly wide range of approaches. For example, one might fairly expect that a finite and diminishing aquifer would automatically equate to a limited future growth scenario. *See, e.g.*, PHILIP R. BERKE, DAVID R. GODSCHALK, EDWARD J. KAISER & DANIEL A.

The natural resources exploited in the new development are immense, including fossil fuels, forest products, concrete (which uses tremendous energy to make),[10] various metals, such as copper for the wiring (today at a premium),[11] glass, and so on. The electricity consumed in construction of the new development depletes even more natural resources. Further adding to the increased resource consumption resulting from paradoxical conservation, one also has to remember that each new residence or commercial establishment is a new water consumer, plundering the water others attempted to save.

We have to ask ourselves: Were all those short showers worth it? Was not the putative conservation ultimately consumptive, both positively and negatively? Did the water conservation not circuitously send perverse economic and resource availability signals? Have we not created a pernicious new twist of the tragedy of the commons by creating a tragedy of multiple commons?[12]

RODRIGUEZ, URBAN LAND USE PLANNING 254 (5th ed. 2006) ("[T]here can be no significant development at urban densities without both water and sewer services."); ROBERT BRUEGMANN, SPRAWL: A COMPACT HISTORY 65 (2005) (addressing the limiting effect of water on urban development by noting that in Los Angeles "where the relatively dense subdivisions stop, the desert begins"). Nevertheless, most references addressing this issue assume that if the development is planned for and built, the water will somehow follow. In some instances, the "new" reserves of water may be the result of educating the public about reducing water consumption, installing water meters, or planning water allocations carefully to meet future demands. *See, e.g.*, PLANNING AND URBAN DESIGN STANDARDS: STUDENT EDITION 64 (Frederick R. Steiner & Kent Butler eds., 2007) ("Land-use planners are beginning to try to control growth in sensitive aquifer areas by considering the cumulative inputs of all potential development within a resource area, known as build-out analysis, and allocating water consumption demands accordingly."). In other instances, new infrastructure such as pipelines or canals may be constructed. Humankind has been nothing if not ingenious at finding water in one location and moving it to another. ROBERT GLENNON, WATER FOLLIES: GROUNDWATER PUMPING AND THE FATE OF AMERICA'S FRESH WATERS 210 (2002) ("Americans have shown limitless ingenuity in devising technological fixes for water supply problems by altering the hydrologic cycle to sustain existing usage."). Regardless of which of the above scenarios is in play (and particularly in the first scenario), signals that conservation is effectively saving water will undoubtedly trigger changes in the planning process that will ensure that infrastructure is ready and waiting for new resource-devouring development that, but for the assumption of an adequate water supply, would likely not have made it off the urban planners' drawing boards.

10. GEORGE MONBIOT, HEAT: HOW TO STOP THE PLANET FROM BURNING 198-99 (2007).

11. Heather Walsh, *Chile Power Crunch May Cut Copper Output, Spur Record*, BLOOMBERG TELEVISION (Apr. 9, 2008), http://www.bloomberg.com/apps/news?pid=20601109&sid=a9lkWu0s_TS8&refer=home; *see also* MEADOWS, RANDERS & MEADOWS, *supra* note 7, at 99-102 (explaining the escalating need for resources such as steel concrete, copper, aluminum, and plastic, which correlates with rising population levels).

12. This Essay focuses on the perverse effects of signals of scarcity and of abundance (and everything in between) in cohorts of natural resources. As discussed above, one example of such a perverse effect occurs when water conservation sends the signal of adequate amounts of water for future development. Based on this signal, additional development is planned for and implemented, resulting in ferocious depredations of cohort resources such as wood products and

V. PARADOXICAL CONSERVATION: FOSSIL FUELS

In the previous Part, we discussed paradoxical conservation based on conservation of water. The ostensible benefits stemming from the reduction of fossil fuel use in automobiles is an equally compelling example of paradoxical conservation. It is common knowledge that Americans love automobiles. Worse yet, Americans love big automobiles.[13] To counter the immense fossil fuel consumption of the sport utility vehicles (SUVs) that prowl the roads, new hybrid automobiles (operating on gasoline and electrical energy) are being sold (though in relatively small numbers).[14] In comparison with the gas-sucking SUVs, the hybrids sip a relatively tiny amount of fuel.[15]

To perform another mental experiment on our water conserving couple, let's imagine that after buying their new energy-efficient home, they also bought a hybrid automobile. Not only did they buy an energy-efficient hybrid, they drive it as little as possible and, when they do drive it, they drive it as slowly as possible to save energy. The question is: Where does all that saved gasoline go?

We know that our couple did not keep the saved gasoline in either an underground or aboveground storage tank. The first solution would likely be illegal, and the second solution would be unattractive and a fire hazard. Accordingly, in the absence of a means to permanently store the

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fossil fuels. While this understanding of paradoxical conservation may have somehow avoided discussion in recent literature, it is not entirely novel. In the work *Managing Water as an Economic Resource*, author James Winpenny argues that false price signals stemming from water subsidies result in overexpansion of urban areas, an argument similar to that made in this article. As noted in *Managing Water as an Economic Resource*:

> The failure to treat water as an economic (i.e., scarce) commodity has perverse dynamic effects, through its encouragement of a high rate of growth of water-dependent sectors. . . . Major water-using and polluting industries have been indulged through policies of protection and import substitution; the price of their water and pollution has not been large enough to influence their viability or growth. *Underpricing urban household water can even be said to have encouraged the overexpansion of cities*. Conurbations such as Mexico City, Santiago, Beijing, Delhi, etc. are starting to experience major water shortages, caused in part from the 'subsidy' to their expansion, due to the failure to charge residents and commercial users the full cost of their water.

JAMES WINPENNY, MANAGING WATER AS AN ECONOMIC RESOURCE 17 (1994) (emphasis added).

13. MICHAEL BROWER & WARREN LEON, THE CONSUMER'S GUIDE TO EFFECTIVE ENVIRONMENTAL CHOICES: PRACTICAL ADVICE FROM THE UNION OF CONCERNED SCIENTISTS 90 (1999).

14. Dee-Ann Durbin, *US Hybrid Sales Up 38 Percent in 2007: Prius Leads the Pack*, BOSTON.COM (Apr. 21, 2008), http://www.boston.com/business/articles/2008/04/21/us_hybrid_sales_up_38_percent_in_2007_prius_leads_the_pack/.

15. TIM FLANNERY, THE WEATHER MAKERS: HOW MAN IS CHANGING THE CLIMATE AND WHAT IT MEANS FOR LIFE ON EARTH 280 (2005).

gasoline they saved, it simply stays in the system until it is purchased by other motorists.

The gasoline saved by our couple will send the same perverse economic signal to automobile manufacturers, automobile dealers, urban planners, and politicians as did the conserved water. And, presumably, we will have the same cross-system consumption. That is, the apparent reduction in the use of one resource will paradoxically trigger increased consumption of other resources normally modulated by the scarcity or abundance of a single keystone resource.

Assuming this happens, new automobiles will be manufactured, as well as new roads on which to drive them. Together, the construction of new automobiles and new roads will consume more energy and a vast array of natural resources, including rubber, metals, and petrochemicals.[16] Moreover, these endeavors will spew enormous amounts of carbon into the atmosphere, directly contributing to global warming.[17] Thus, the manufacture of vehicles and construction of roads will further tax our fragile atmospheric reserves. Ultimately, the perverse economic signal sent by individual, altruistic, fuel-saving behavior will result in a grab for those preserved natural resources to be used by armies of new cars, trucks, and SUVs just waiting to burn those "saved" petroresources.[18]

Again, what has our altruistic and self-sacrificing couple saved? Nothing, really. Worse, they have engaged in paradoxical conservation by reducing their use of the one resource that would most limit the manufacture and use of new fossil fuel-powered automobiles.

VI. PARADOXICAL CONSERVATION: ELECTRICITY

More than the usage of water and fossil fuels, the consumption of electrical energy serves as a proxy for many other natural resources. These resources include hydropower from dams, wind power, power from coal and other fossil fuel-fired electrical plants, and nuclear power. The use of any one of these resources can trigger a cascade of

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16. ELIZABETH KOLBERT, FIELDS NOTES FROM A CATASTROPHE: MAN, NATURE, AND CLIMATE CHANGE 133-32 (2006) ("On average, every single person in America generates twelve thousand pounds of carbon per year. . . . The largest single source of carbon emissions in the United States is electricity production, at 39 percent, followed by transportation, at 32 percent.").

17. The United States produces more than one-quarter of all greenhouse gas emissions. ROBERT HENSON, THE ROUGH GUIDE TO CLIMATE CHANGE: THE SYMPTOMS, THE SCIENCE, THE SOLUTIONS 38 (2006). This is despite the fact that Americans constitute five percent of the global population. Most emissions come from burning fossil fuels for energy and transportation. *Id.* Transportation accounts for thirty percent of all U.S. emissions. *Id.* at 303.

18. This is an example of "overshoot." *See* MEADOWS, RANDERS & MEADOWS, *supra* note 7, at 174.

environmentally harmful consequences. To begin with, the use of dams to generate hydropower can devastate anadromous fish species like salmon.[19] The areas flooded by the water held back by the dams can include both irreplaceable natural habitat—habitat that is perhaps home to threatened, and endangered species—and sites of historical, archeological, and paleontological value.[20] Even wind power, which is arguably the cleanest method of energy capture listed here,[21] creates its share of environmental harms. Wind-powered turbines have been described as ugly, a blight on the landscape, noisy, and dangerous to bird species that end up sliced and diced by the enormous blades.[22]

Unfortunately, electrical generating plants also tend to impact the negative commons on a far larger scale than water usage and fossil fuels.[23] Coal-fired power plants are the dirtiest forms of electricity generation in terms of atmospheric pollution, spewing billions of tons of particulates and gases into the atmosphere that contribute to global warming on a large scale.[24] Electricity generation is thus a tempting target for conservation-driven reductions.[25]

When juxtaposed against the harms just described, one might ask what possible harm could result from replacing incandescent light bulbs with energy saving florescent bulbs. Acts of conservation, such as the use of low-wattage lighting, seem consistent with opposition to large-scale power projects by sending market signals that additional electricity generating plants are no longer needed. Likewise, what harm could come of industries developing less energy intensive means of production, say, in the aluminum producing industry?

Unfortunately, there is no great "energy battery" in which all the saved energy can be stored. Voluntary reductions in residential, commercial, or industrial settings just mean more electricity for newcomers, who themselves will consume multiple resources and the

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19. RICHARD B. PRIMACK, ESSENTIALS OF CONSERVATION BIOLOGY 227 (3d ed. 2002) ("The majority of U.S. Pacific salmon stocks face moderate to high extinction rates as the rivers that they use to spawn are damaged and dammed.").

20. *Id.* at 613-18; *Hetch Hetchy: Time To Redeem a Historic Mistake*, SIERRA CLUB, http://www.sierraclub.org/ca/hetchhetchy/photo_gallery.asp (last visited July 14, 2008).

21. HENSON, *supra* note 17, at 298.

22. *Id.*

23. World Nuclear Ass'n, *Global Warming*, GLOBAL WARMING—THE SCIENCE, http://www.world-nuclear.org/info/inf59.html (last visited July 8, 2008) ("Electricity generation is one of the major sources of carbon dioxide emissions, providing about one third of the total. . . . Coal-fired generation gives rise to twice as much carbon dioxide as natural gas per unit of power at the point of use . . . .").

24. *Id.*

25. BROWER & LEON, *supra* note 13, at 66.

"extra" electricity. We arrive again at the conclusion that ostensibly altruistic energy conservation, in the *absence of any absolute limit* on the amount of electricity generated, signals to the regulating bodies that there is more energy available to exploit. Such signals, in turn, trigger the manufacture, sale, and use of more energy hungry products and the upscaling of energy usage overall.

VII. MANIPULATION OF THE LIMITING RESOURCE

A. Depleting the Limiting Resource

The most obvious solution to paradoxical conservation is simply to maintain the consumption status quo until the limiting resource is completely and finally depleted. There are numerous problems with this. For example, if we continue to exploit earth's oil reserves, we will eventually run out of oil,[26] thereby achieving a stable state in which the lack of oil limits the use of other resources. In the meantime we will have emitted into the atmosphere many millions of tons of carbon,[27] exacerbating global warming,[28] and likely pushing us past the tipping point beyond which global warming and its worst consequences become irreversible.[29]

There is also a practical problem related to exhaustion of a resource by individual action or by maintaining the status quo. This problem relates to the depletion of resources for which efficient distribution systems have been put in place. In other words, not only can the depletion of a limiting resource result in unwanted side effects such as pollution (as mentioned above), but it is difficult to deplete the limiting resource by any deliberate, localized use or overuse in the first instance. This is because providers of limiting resources such as water, gasoline, and energy are always either themselves masters at moving their product from the generating location to the consumption location or are working in conjunction with large industries that specialize in transportation of the limiting resources. In fact, the systems of resource transport are such

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26. JEREMY LEGGETT, THE EMPTY TANK: OIL, GAS, HOT AIR, AND THE COMING GLOBAL CATASTROPHE (2005); Ian Sample, *Final Warning*, NEWSCIENTIST, June 25, 2008, at 32-37 ("Price is just the start of it. We need to kick the petroleum habit or we'll soon be in real trouble.").

27. KIRSTIN DOW & THOMAS E. DOWNING, THE ATLAS OF CLIMATE CHANGE 42-48 (2006) (indicating that the United States emitted 1794 million metric tons of carbon from domestic transportation in 2003 and over 1000 million metric tons from the burning of oil, natural gas, and coal in 2002; it would come of no surprise if these numbers are even higher today).

28. IPCC, 2007: Climate Change 2007: Mitigation of Climate Change, *supra* note 1, at 827-31.

29. Bill Blakemore, NASA: Danger Point Closer Than Thought from Warming, ABC News, May 29, 2007, http://abcnews.go.com/Technology/GlobalWarming/story?id=3223473&page=1.

a part of our lives that we hardly notice them any more than we do the background features of nature itself. In our everyday lives, we rely on a complex system of pipes and pumps capable of transporting fresh water to us and transporting waste water away. Likewise, fossil fuels are transported to us from remote areas through massive systems of pipes. The infrastructure of electrical transport is equally massive, to the point of becoming nearly invisible in its ubiquity.

There are two problems we should concern ourselves with here. The first is masking limiting resource scarcity by well-intentioned altruistic abstinence. The second is masking limiting resource scarcity by quickly and covertly delivering limiting resources from areas of abundance to areas of scarcity. In either case, the absence of signals of resource scarcity results in multiresource-consuming industries piggy-backing on the apparent availability of the primary limiting resource and amplifying the net positive and net negative incursions into the commons.

B. Limiting the Limiting Resource

As discussed above, *individual* efforts to conserve natural resources that are needed by natural resource-dependent enterprises in one market may create the perverse result of causing a net increase in resource exploitation over a variety of resources in multiple markets. It is even possible, if not likely, that the preservation of limiting resources at *corporate* or *governmental levels* may also create the same unintended result. Accordingly, as just discussed, one overarching resource preservation strategy is to completely *deplete* the limiting resource so that it cannot be used in unison with other resources, thereby creating net reductions in consumption. One dangerous flaw in this strategy is that by reducing the limiting resources to near zero, we will have done so at the cost of increasing incursions into the negative commons. As explained earlier, ramping up tactical consumption of fossil fuels, for example, could maximize the amount of greenhouse gases we inject into our atmosphere and increase the speed and ferocity of global climate change.

A second resource preservation strategy is to *limit*, rather than *deplete*, the limiting resource. As with depletion of the resource, there are many problems with this strategy, including similar problems to the depletion scenario. The core problem, however, is determining where to place the cut-off point for the availability of the limiting resource. In this sense, the limiting strategy is much like the concept of sustainability. Simply put, it is notoriously difficult to achieve consensus on what level of activity constitutes sustainability for any given resource.

Moreover, as noted in the discussion of resource depletion, limiting the *use* of a limited resource is ultimately a futile enterprise if there are no means to prevent that resource from being diverted to other uses. In the absence of a means of permanently preserving or capping the limiting resource, market forces, and perhaps political forces, will eventually reach the point where peak consumption is again allowed. Once such consumption resumes, so will the environmentally negative downstream effects on secondary resources.

C. Conserving and Storing the Limiting Resource

In the previous Parts, I discussed the two strategies of depleting and limiting "limiting" resources. Of these two strategies, I noted a special problem with further limiting the limiting resources. The problem with limiting the limiting resources is that short of depletion, there is currently no way to achieve an enduring stopping point for the use of the limiting resources. Until such resources are taken off the shelf of the global marketplace, they will be purchased (or stolen) and consumed. Price alone will not be a deterrent, as there will be ways to pass pricing along to consumers or secure governmental subsidies to offset increased procurement costs.

Restating the problem, humanity has a dismal track record when it comes to preserving natural resources at any point short of imminent, complete depletion. It is this nearly universal proclivity that must be overcome to avoid paradoxical conservation. Water, for example, is stored in a variety of natural "treasuries." These treasuries include streams, lakes, oceans, glaciers, clouds, and aquifers.[30] Of these natural treasuries, aquifers are the most likely to be exploited by humans because they provide relatively easy access to fresh water.[31] The problem presented by fresh water aquifers is how to prevent increases in usage when the water is so readily accessible. This raises the questions and answers that undergird the strategies discussed in this Essay: Who "corks the bottle" and how?

VIII. MECHANISMS FOR MANIPULATING THE LIMITING RESOURCE

It is possible to formulate plausible solutions to paradoxical conservation based on exerting control over limiting resources. However, it is fruitless to suggest the usual mechanisms for exerting such control.

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30. *See* MARQ DE VILLIERS, WATER: THE FATE OF OUR MOST PRECIOUS RESOURCE 34-36 (2000) (comparing different water sources within the hydrologic cycle).

31. *Id.*

Given the history of failed state and federal environmental laws, expecting legislative solutions is not an answer. Moreover, expecting any form of agency discretion to solve the problem is equally unlikely. At this moment in U.S. history, and for the foreseeable future, it is a fair generalization that most state and federal agencies are in the business of *permitting* use of the commons, perhaps with some occasional limitations.[32] Specifically, the problem with agencies is that they tend to be highly bureaucratic, slow to act, subject to political winds, and risk averse.[33] The most disillusioning aspect of agencies is that no matter how beneficial a piece of legislation seems, its effects can be thwarted by an agency that is lazy, politically biased, or corrupt.[34] This problem is powerfully stated by Mary C. Wood, Professor at the University of Oregon School of Law:

> Agencies . . . use permit provisions in environmental statutes to allow massive, unending injury to public resources. Claiming "discretion" to issue permits, government uses statutes as a tool to institutionalize damage to natural infrastructure, undermining the protective purposes of such laws[, which] attracts undue influence by private parties seeking to profit from exploiting and destroying the environment. . . .
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> Our . . . leaders can and must reframe government's *discretion* to destroy Nature into an *obligation* to protect Nature . . . . [L]eaders can characterize government as a trustee of the natural resources essential to human survival. . . . [G]overnmental trustees are not at liberty to allow destruction of the property they are charged with managing on behalf of citizens. . . .[35]

Litigation is not the answer either. Litigation is expensive, time consuming, and it presents no guarantee of the desired results. Like legislation, litigation is subject to politically driven jurisdictional line drawing. What may be a legislative or legal victory in one jurisdiction may partially protect a resource while leaving the remaining areas in adjacent jurisdictions unprotected. Even more problematic, political divisions exist at the international level, where we find mega-ecosystems like the northern boreal forests divided by national boundaries, not to mention the internal political boundaries within each nation. Most

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32. Mary Christina Wood, Nature's Trust: A Paradigm for Natural Resources Stewardship 2, *available at* http://www.climateactionproject.com/docs/white_papers/PCAP_NRT_prop_Wood.doc (last visited Oct. 3, 2008).

33. *See id.* at 1-2.

34. *Id.*

35. *Id.* (internal footnotes omitted). Courts have referred to these principles as the "public trust doctrine." *Id.* at 2 n.iv.

problematic are the world's oceans, which represent an immense global commons that various nations have remarkably exploited to the point that our oceans are now replete with "dead zones."[36] Moreover, our oceans are suffering from mass extinctions[37] of oceanic species from overfishing (of both marketable species and "by-catch"), pollution, and global warming.[38]

IX. PUTTING THE CORK IN THE BOTTLE

A. A Brave New World of Absolutes

So, how do we stop lifestyle and regulatory changes that conserve limiting resources in such a way that we consume even more resources, both in terms of absolute amounts and variety? Not surprisingly, given our resource-devouring and pollution-spewing world, there is no simple answer. Nevertheless, there are some directional signs on this journey, leaving us with the challenge of both finding and heeding them.

As discussed, ceasing the use of a limiting resource will have many downstream effects. Hopefully, most of these effects will involve reducing the use of resources that the limiting resource made possible. If one runs out of nails, for example, then one should also cease cutting down trees for lumber. If the nails and wood were for the use of building houses, presumably other, less environmentally harmful materials and methods could be found and developed, and smaller houses could be built. If possible, this state of equilibrium should be preserved legally. One example currently playing out involves the scarcity of oil and gasoline. With gasoline prices reaching heights of over four dollars per gallon, more people are riding motor scooters, and sales of SUVs have decreased dramatically.[39] If gasoline, the limiting resource, can be kept at this price long enough, it might force automobile-based societies to seek alternatives to driving resource-devouring and gas-guzzling SUVs. Such alternatives might include carpooling, using public transit, and bike riding. As a result, the high price of the limiting resource, gasoline, can

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36. *See generally* COLIN WOODARD, OCEAN'S END: TRAVELS THROUGH ENDANGERED SEAS (2000) (providing a comprehensive and compelling discussion of humankind's depredations on the planet's oceans and the resulting consequences). For further in-depth discussion of the present-day global warming-caused extinctions of both ocean and land dwelling organisms, see RICHARD ELLIS, NO TURNING BACK: THE LIFE AND DEATH OF ANIMAL SPECIES (2004).

37. *See* Woodard, *supra* note 36, at 228. For an extended discussion of planetary global warming caused extinctions from both scientific and ethical perspectives, see MARTIN GORKE, DEATH OF OUR PLANET'S SPECIES (2003).

38. GORKE, *supra* note 37, at 3.

39. Associated Press, *High Gas Prices Are Driving Scooter Sales Up*, May 15, 2008, http://www.msnbc.com/id/24620567/.

result in many positive outcomes, including the sale of more fuel-efficient cars and motor bikes, and increased research into cleaner fuels. We can also safely assume that as Americans buy smaller cars and drive less, we are mitigating the impacts of transportation-generated greenhouse gases.

Because we are forced to wean ourselves from unlimited automobile use, and we are surviving well enough under these conditions, *now* is the time to put the cork in the bottle. From now on, we must live in a world of absolutes. Once humanity has reached the point of exploiting a limiting resource to the point of scarcity or depletion, so that exploitation and use of other limited resources are forced downward, the limiting resource must be permanently "capped" at this level. This may require legal preservation of the state of resource equilibrium. One can imagine that legislative actions like gasoline taxes or gasoline rationing might work. As discussed in greater detail below, there is also the chance that privatizing regulation through the use of non-governmental organizations (NGOs) might work.

B. Privatization and NGOs

To really put the cork in the bottle, both the bottle and its contents could be privatized and purchased by a conservation-directed NGO. The problem with purchasing, of course, is that some form of capital is required, but privatization of resource regulation is certainly possible. In the United States, there are currently more than 1500 land trusts,[40] which collectively have found the capital to purchase conservation easements totaling over five million acres as of 2005.[41] Such capital has come in the form of cash donations and from conservation easement donations (which the Internal Revenue Service has facilitated by making such donations tax deductible under I.R.C. 170(h)).[42] The experience of the American land trust community is a sufficient success story and a source of model solutions to inspire our specialized NGOs to form and take action against paradoxical conservation. We can draw hope for the successful reliance on NGOs from the following excerpt from BUILDING THE NEXT ARK, which discusses the role of NGOs in preserving biodiversity:

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40. JEFF PIDOT, LINCOLN INST. OF LAND POLICY, REINVENTING CONSERVATION EASEMENTS: A CRITICAL EXAMINATION AND IDEAS FOR REFORM 5-6 (2005).

41. *Id.* at 6.

42. *Id.* at 5.

> A wealth of academic literature positions NGOs as the best, perhaps only, medium suited to bridge [political boundaries]. NGOs are the most effective vehicles to negotiate the treacherous terrain ahead for a number of reasons. NGOs can broker state sovereignty with global community concerns. NGOs can open up the requisite participation channels. NGOs can sow the seeds for an ecological consciousness that will forever foster future . . . environmental agreements with real enforcement mechanisms.[43]

C. Perpetual Restraints on Use

It is the next step that is the most problematic, the most legalistic, and where the metaphor of putting the cork in the bottle is most apt. Pretend, for a moment, that somehow a nonland trust NGO purchased or otherwise acquired all of the water rights associated with a given aquifer and drainage basin. The actual land serviced by this aquifer is undeveloped, but several large development corporations have purchased land in the area, which has zoning favorable to large-scale residential development. What keeps the cork in the bottle?

Again, borrowing from the land trust movement, the answer is likely a legal document much like a conservation easement that is binding on all landowners in the service area and is effective in perpetuity. One hurdle for such a document is the extent to which it may conflict with existing laws governing the limiting resource in question. For instance, if water is the limiting resource, any document attempting to "cap" this resource must be consistent with the water law of the relevant jurisdictions. Fortunately, we again have a model from land trust and conservation easement practice. Because conservation easements are easements in gross and create perpetual restraints on alienation, they are at odds with the common law.[44] The only reason that conservation easements are legally binding is because of the Uniform Conservation Easement Act (UCEA), which wipes away the common law impediments to conservation easements, and has been adopted in one version or another in most states.[45] Part of the reason there are over 18,000[46] conservation easements in this country is because of a visionary modification to the tax code, I.R.C. 170(h),[47] which provides the donor of

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43. MICHAEL M. GUNTER, JR., BUILDING THE NEXT ARK: HOW NGOS WORK TO PROTECT BIODIVERSITY 9 (2004).

44. Nat'l Conference of Comm'rs on Unif. State Laws, Uniform Conservation Easement Act 1 commissioner's prefatory note (1981) (amended 2007), *available at* http://www.law.upennedu/bll/archives/uic/ucea/2007_final.htm.

45. *Id.*; PIDOT, *supra* note 40, at 5-6.

46. PIDOT, *supra* note 40, at 6.

47. I.R.C. § 170 (2001).

a conservation easement with potentially large tax benefits.[48] To oversimplify, one strategy for creating perpetual restraints on the use of limiting resources may be to advocate for a uniform law that, on a resource-by-resource basis, endows such restraints with legal force. Such advocacy could be extended to changes in the tax code, which would create financial incentives for the affected parties to agree to the restraints.[49]

The underlying principle, as stated above, is that from now on, we must live in a world of absolutes. The use of a limiting resource must be "capped" once it has been exploited to the point of scarcity, forcing a complimentary reduction in the use of other limiting resources. The risk

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48. Land Trust Alliance, New Conservation Options for Heirs to Land, http://landtrust.org/ProtectingLand/NewEstateTaxOptions.htm (last visited Oct. 3, 2008).

49. The "putting the cork in the bottle" problem has been addressed in many contexts, but perhaps in none so frontally or so effectively as in the case of forest carbon—offset practice. Because California's registry for carbon offsets is so advanced in comparison with other states, and because it uses the same lexicon as that found in articles and treatises on the subject, the California "model" is helpful in understanding how permanent conservation can be achieved in the case of forest resources. The source of this information is the CALIFORNIA CLIMATE ACTION REGISTRY, FOREST PROJECT PROTOCOL (Version 2.1 Sept. 2007), *available at* http://www.climateregistry.org/resources/docs/protocols/project/forest/Forest_Project_Protocol_Version_2.1_Sept2007.pdf [hereinafter FOREST PROTOCOL]. Pursuant to the *Forest Protocol*, two conditions must be achieved before a proposed forest-based carbon offset project can be registered with the California Climate Action Registry (CCAR). The first condition is that of "additionality." Additionality exists when the proposed project would not have occurred "but for" the financial assistance from the CCAR program. In other words, the project must not be something that would have occurred regardless of the CCAR or *Forest Protocol*. For an excellent discussion of additionality issues, see RICARDO BAYON, AMANDA HAWN & KATHERINE HAMILTON, VOLUNTARY CARBON MARKETS: AN INTERNATIONAL BUSINESS GUIDE TO WHAT THEY ARE AND HOW THEY WORK 24-25 box 2.1 (2007). The second condition is the avoidance of "activity-shifting leakage." Activity-shifting leakage is defined in the *Forest Protocol* as "the displacement of activities from inside the [offset] project's physical boundaries to locations outside of the [offset] project's boundaries, as a direct result of the project activity, causing an increase in emissions outside of the [offset] project's physical boundaries." FOREST PROTOCOL, *supra*, at 28. One other form of leakage described in the *Forest Protocol* is "market leakage." Restriction of market leakage is not mandatory but is "strongly encouraged" by the *Forest Protocol*. *Id.* at 27. The *Forest Protocol* defines market leakage as occurring "when the project activity affects an established market for goods, thus causing the substitution or replacement elsewhere and causing GHG emissions that, in effect, offset or mitigate the project's GHG reductions." *Id.* at 29; *see also* Sandra Brown, Ian R. Swingland, Robin Hanbury-Tenison, Ghillean T. Prance & Norman Myers, *Changes in the Use and Management of Forests for Abating Carbon Emissions: Issues and Challenges Under the Kyoto Protocol*, *in* CAPTURING CARBON & CONSERVING BIODIVERSITY: THE MARKET APPROACH 48-50 (Ian R. Swingland ed., 2002) (discussing additionality and leakage). *It is interesting to note that many of the scenarios which give rise to activity-shifting leakage or market leakage, as described above, also represent a form of paradoxical conservation as discussed in this Essay.* For example, in cases where the project avoids deforestation, thereby preventing development, the outcome prevented by avoided deforestation in one location may nevertheless occur as the project is moved to another location that is not protected by the project. Accordingly, whether the forest offset program in the *Forest Protocol* will result in net reductions of the harms of global climate change is unclear.

in the examples in this Essay is any chance that the cork will be removed and the limiting resource allowed to be used, resulting in a feeding frenzy in which both the primary limiting resource and the downstream resources will be decimated with an unstoppable ferocity as pent up market forces are released. Imagine that a "cork" has been put in the "bottle" for an aquifer that supplies a residential area. If that cork is somehow removed, inevitably the multitude of profit-seekers whose endeavors had been halted by limitations on water use will rapidly mobilize and resume their consumption of multiple resources as they expand and enlarge the residential area.

X. CONCLUSION

Earlier in this Essay, three limiting resources were briefly discussed: water, fossil fuels, and electricity. I argued that for individuals or institutions or governments, the piecemeal or individual and noncollective limitation on the use of such resources could have the unintended and paradoxical result of increasing the use of other resources. The best example of this is water. When individuals act altruistically and deny themselves the full use of the water they are allotted, they are not actually "saving" water. In fact, the surpluses of a "limiting resource" created by voluntary reduction in use, and even by regulatory restrictions in use, only makes that water available for new developments, which will consume a large variety of natural resources.

The solution suggested by this Essay is to privatize limiting resources and mimic land trusts in their use of conservation easements to create absolute and perpetual restraints on usage. What this Essay leaves unaddressed are the mechanics of effectuating such a system. Because the multitude of limiting resources differ so greatly, it is unlikely that the technical knowledge gained in perpetually restricting any one resource would translate easily to another. Indeed, it would be a monumental undertaking to properly limit the usage of a single particular resource—but not an impossible one.

It is time to give up the *mindless consumption* of certain nonrenewable natural resources. Moreover, it is time to quit the *mindless conservation* of certain resources—in particular, those resources that are conserved only to be reallocated to new users who will leverage them to consume other resources. When any substantial amount of a scarce resource is preserved as a result of altruistic behavior within a system that reallocates those savings to others, the availability of the limited resource will be used to exploit the other resources of a larger whole. Consequently, the only means of protecting the whole is to "cork the

bottle" and ensure that any savings of a limiting resource are protected and maintained at a fixed and *absolute* level. As the disastrous forces brought on by global warming continue to mount behind the multiple tipping points that will release them, we must engage in the conservation of natural resources with greater ardor and finesse than ever before. For this to occur, we must remain cognizant of the interrelatedness of nature and all of its resources. What is new in this Essay is the exhortation to understand and respond effectively to the complex and sometimes counterintuitive relationships of multiple natural resource markets. Once armed with such understanding, we can avoid the tunnel vision of our past conservation efforts and begin to engage in true multiresource conservation.