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If Hayek and Coase Were Environmentalists

by Terry L. Anderson*

Modern environmentalism and neo-classical economics have more in common than one might think. These commonalities include a focus on equilibrium systems and on the inability of humans to manage natural resources. Unfortunately, both are inconsistent with the reality of the way natural and market systems work. Fortunately there is an alternative way of linking environmentalism and markets.¹

There are two premises which underpin modern environmentalism and neo-classical economics and that link the two. Modern environmentalism focuses on natural systems as equilibrium states and on humans as a disruptive force in what would otherwise be nature's equilibrium. Neo-classical economics shares these same two foci. It is built around equilibrium models and social welfare maximization, and it concludes that social welfare is not maximized when human actions cause a divergence between social costs or benefits from private costs or benefits.

The notion of equilibrium in both natural and economic systems is analytically appealing. It allows us to apply terms such as carrying capacity, sustainable yield, and ecosystem stability to the environment and constrained maximization, full employment, sustainable development,

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and economic stability to the economy. These equilibria are disrupted by individual human action which, in the case of the environment, leads to species extinction, underproduction of ecosystem services, global warming, and reduced biodiversity, and in the case of the economy to underemployment, recession, and economic stagnation. In both cases, collective action is called for to guide individual actions toward equilibrium and social welfare maximization.

The bond between modern environmentalism and neo-classical economics is strengthened through their emphasis on the negative impacts of humans on natural systems. Environmentalism considers humans as alien species in the natural world and therefore a disruptive force in the march toward natural equilibria. When applied to environmental questions, neo-classical economics emphasizes the inefficiency that results when externalities allow actors to ignore costs or benefits—especially costs associated with the use of natural resources.

Environmentalism and neo-classical economics come together under the banner of the “tragedy of the commons,” made famous by biologist Garrett Hardin (1968), who claimed that “Each man is locked into a system that compels him to increase his herd without limit—in a world that is limited. Ruin is the destination toward which all men rush, each pursuing his own best interest” For the environmentalist, nature, like the pasture, is a commons exploited by humans who compete to capture nature’s value and in the process dissipate its value. The tragedy is made worse by the fact that the pieces of ecosystems are interconnected in ways such that exploiting one part reduces the value of the whole. For economists, tragedy results because human institutions do not internalize all of the costs and benefits associated with utilizing nature to meet human ends.

The purpose of this essay is to provide an alternative way of thinking about the interface

between environmentalism and economics, one that builds on the thinking of Nobel laureates Friedrich Hayek and Ronald Coase. The lenses of Hayek's Austrian economics and Coase's property rights economics provide a way of linking environmental and economic systems by focusing our attention on information, feedback mechanisms, and institutions. Just as non-human species fill niches either through adaptation in the short term or evolution in the long term, humans react to economic opportunities by filling market niches either through specialization, gains from trade, or both (see Ridley 2010). The big difference between non-human and human processes is that humans create institutions such as property rights and trade, which in turn generate prices that communicate information about scarcity and value. For purposes here, Hayek's (1945) seminal article on "The Use of Knowledge in Society" might have been entitled "The Use of Knowledge in Ecosystems" in that it provides a framework for thinking about how human values relate to natural resource constraints. Hence, Hayek's thinking about how markets generate information compares with the ways in which Charles Darwin and Aldo Leopold conceived of natural systems as discussed in the next section. Similarly, Coase's (1960) seminal article on "The Problem of Social Cost" could have well been entitled "The Problem of Ecosystem Cost" in that it provides a framework for thinking about how property rights connect one human's use of natural resources with another's. His thinking offers a way of integrating Hayekian markets with natural resources and stands in sharp contrast with naturalists, such as George Perkins Marsh, who see nature standing apart from human action, and with fellow economists such as A. C. Pigou (1920), who see individual human action diverging from the aggregate optimum because of a divergence between private and social costs.

Darwin, Leopold, and Hayek

Having just celebrated the 200th birthday of Charles Darwin and the 150th anniversary of the publication of *The Origin of Species*, I begin by considering how different Darwin's thinking was from modern environmentalism and how consistent it was with the political economy of his time as espoused by Adam Smith and of our time by Fredrich Hayek.² Darwin's notion of evolution is distinctly bottom-up as opposed to top-down, with species emerging as a result of random mutations that prove successful in filling niches to survive and thrive. As Matt Ridley (2009) notes, "Living beings are eddies in the stream of entropy. That is to say, while the universe gradually becomes more homogeneous and disordered, little parts of it can reverse the trend and become briefly more ordered and complex."

Darwin's theory of natural evolution therefore is akin to Adam Smith's economy which is "spontaneously self-ordered through the actions of individuals, rather than ordained by a monarch or a parliament" (Ridley 2009).³ Rather than being an equilibrium system when left untouched by humans, nature is in a process of perpetual change. Biologist Daniel Botkin refutes the view of nature as a "Kodachrome still-life," claiming instead that "nature is a moving picture show," continually changing in a series of complex patterns (Botkin 1990, 6). Similarly, markets have a tendency toward homogeneity, order and even equilibrium, but any equilibrium is a moving target and therefore never reached. Disruptions may result from non-human changes in the physical environment or from continually changing human preferences and ingenuity. Regardless of the disequilibrating force, however, all species including humans, react by filling niches.

Since Darwin's influential treatise on *The Origins of Species*, many scientists, ecologists, conservationists, and environmentalists have written about the appropriate role of humans in nature, and none has been more influential in providing a philosophical basis for

environmentalism than Aldo Leopold. In his collection of essays, *A Sand County Almanac* ([1949] 1966), Leopold lays the foundation for a “land ethic,” which is summarized as “A thing is right when it tends to preserve the integrity, stability, and beauty of the biotic community. It is wrong when it tends otherwise” (262). For Leopold, “Conservation is a state of harmony between men and land” (243). By “a thing,” Leopold is clearly referring to human action regarding the biotic community. What is left to question is what he meant by “integrity, stability, and beauty” and “harmony.”

Setting aside the subjectivity of beauty, Leopold’s use of terms such as integrity, stability, and harmony seems to imply that biotic communities tend toward equilibrium if free from human action or if human action is “right.” As Angermeier and Karr (1994, 692) put it, “integrity is directly associated with evolutionary context. By definition, naturally evolved assemblages possess integrity but random assemblages do not. Adding exotic species or genes from distant populations may increase local diversity but it reduces integrity.” But a further reading of Leopold suggests that he saw integrity to be more dynamic. Indeed, he could not have lived in “the shack” from which he wrote his almanac without observing the ever-changing natural environment. His essay, “Thinking Like a Mountain,” is one of many places where he calls for integrating humans into nature. After participating in the shooting of a wolf, a common activity of the time, Leopold contemplated how the inanimate mountain might feel about wolves, deer and cows.

I now suspect that just as a deer herd lives in mortal fear of its wolves, so does a mountain live in mortal fear of its deer. And perhaps with better cause, for while a buck pulled down by wolves can be replaced in two or three years, a range pulled down by too

many deer may fail of replacement in as many decades. So also the cows. The cowman who cleans his range of wolves does not realize that he is taking over the wolf's job of trimming the herd to fit the range. He has not learned to think like a mountain. Hence we have dustbowls, and rivers washing the future into the sea. (Leopold [1949] 1966, 140)

“Thinking like a mountain” means thinking about the complexity of the responses of deer to wolves, humans to deer, and grasses to cows. In so doing, one realizes that, far from stasis, each reaction has another reaction that may tend toward equilibrium, but the complexity of natural systems combined with their ever-changing parameters means that equilibrium will never be achieved. For Leopold, human action is simply another of the ever-changing parameters on the mountain.

Note that Leopold does not say there is no role for the cowman, but rather that he who “cleans the range of wolves” must realize that “he is taking over the wolf's job.” In other words, human action can be like that of the wolf where that action has implications for what happens to the other resources. Leopold was not sanguine about the prospects of human action substituting for the wolf unless cowmen were educated about ecological relationships which could be interpreted to mean having the right information.

Aldo Leopold understood that creating and living according to a land ethic required the right information and incentives. It was important for the cowman to know what was right with respect to eliminating wolves and becoming their replacement on the mountain, but that knowledge had to be reinforced by incentives. As Leopold stated clearly in an essay on conservation economics, “Conservation will ultimately boil down to rewarding the private landowner who conserves the public interest” (Leopold [1934] 1991, 202).

Here we begin to see the important link between nature and markets, namely that species in ecosystems and actors in markets require recognition of opportunities based on information that is time- and place-specific. For Darwin, this was a random process where species that evolved to take advantage of niches pushed out those that did not. For Hayek, however, human action purposefully seeks out these niches (see von Mises [1949] 2007). Hayek's (1945) focus on "The Use of Knowledge in Society" explains how prices consolidate and condense information about costs of production and values in consumption and use. As he put it, "in a system in which the knowledge of relevant facts is dispersed among many people, prices can act to coordinate the separate actions of different people in the same way as subjective values help the individual to coordinate the parts of his plan." Because "practically every individual has some advantage over all others in that he possesses unique information of which beneficial use might be made, but of which use can be made only if the decisions depending on it are left to him or are made with his active cooperation," (Hayek 1945, 521–522), trade and prices are necessary to coordinate human action. This leads to what Matt Ridley (2010, 47–84) calls the "collective brain," integrated through specialization and trade.

Specialization, trade, and prices are especially important for understanding how humans know what is right, to use Leopold's term, when it comes to using natural resources. It is the unique cognitive ability of humans to specialize and trade that makes us superior to other species and capable of using and managing nature. Of course, the big difference between a Hayekian and a Leopoldian conception of ecosystem management is whether the "right" human actions result in "integrity, stability, and beauty" for a biotic community that includes human beings. Modern environmentalism puts science at the forefront of defining what is meant by integrity and stability and perhaps even beauty, whereas economics integrates human values and human

ingenuity—“taking over the wolf’s job”—into the use of nature. The integration, seen through an economic lens, assumes that individuals maximize their values constrained by the availability of productive inputs including nature. These preferences might be for material goods or for “beauty.”

Philosopher Mark Sagoff, in a paper that “explores the differences between economic and ecological criteria for identifying, measuring, and evaluating ecosystem services,” discusses the disconnect and clash between these two conceptions of ecosystems (Sagoff 2010). Building on Hayek ([1955] 1979) who argued in *The Counter Revolution of Science* that science is incapable of finding objective measures of value to plan human action, Sagoff confronts ecological economists who claim that the “biophysical method does not assume that value is determined by individual preferences, but rather attempts a more ‘objective’ assessment of ecosystem contributions to human welfare” (Liu et al. 2010, 59). As Sagoff (2010) puts it,

A comparison is easy to draw between social and natural scientists today who look for ways to value ecosystem services and scientists who over two centuries have followed the French Physiocrats to seek non-market measures of production in order to plan economic activity. In this tradition, James Boyd (2008, 3) has called for scientific methods to “describe nonmarket environmental commodities in the context of *systems of ecological production* (italics in original).” (11)

Sagoff concludes:

Ecological knowledge, like any kind of empirical knowledge insofar as it is relevant to

economic activity, is too spread out among people to be captured by any one individual or by any group of individuals—even given careful planning and sufficient resources. A science of ecosystem services that captures economic production or value in “final biophysical units” lies beyond our human potential. The “ecosystem services” project is bound to fail in its attempt to substitute an *in natura* calculation of value for the artifice of market price. (15)

In other words, humans are just like any non-human organism in that they are incapable of modeling the system in which they live. As Sagoff (2010) puts it, “the complexity of modern society makes it impossible for scientific managers to organize the staggering amount of information relevant to any particular economic action” (15). Hence, all organisms respond to the special circumstance of time and place, whether *in natura* or *in civilis*, begging the question, how, if at all, is time- and place-specific information communicated.

Of course, Hayek’s answer was prices.

We must look at the price system as such a mechanism for communicating information if we want to understand its real function. . . . The marvel is that in a case like that of a scarcity of one raw material, without an order being issued, without more than perhaps a handful of people knowing the cause, tens of thousands of people whose identity could not be ascertained by months of investigation, are made to use the material or its products more sparingly; *i.e.*, they move in the right direction.” (1945, 526–527)

Pigou vs. Coase

Hayek's reference to the "scarcity of one raw material" could well be applied to the scarcity of environmental amenities, but of course this begs the question of whether prices account for environmental values. For Hayek, a market and the prices it generates is the institution that "brings about a state of affairs in which prices correspond to costs" (Hayek 1948, 50). As noted in the introduction, however, this conclusion is not typical of how environmentalists and economists view the interface between the environment and markets.

Following the reasoning of A. C. Pigou, they generally compare benefits and costs and find that markets do not maximize the net of the two because not all costs (or benefits) are taken into account. In the vernacular of environmental economics, externalities are pervasive thus requiring government regulation, taxes, or subsidies or some combination of all three to correct for market failures. The political economy of devising and implementing those policies and how politics might distort them are often not considered, nor are questions asked as to why property rights do not exist and why, even if imperfect, property rights might be preferable to political solutions imposed in search of a socially optimum nirvana.

Let us start by comparing the externality approach with the property rights approach in the context of an example from a New Zealand fishery. In the midst of economic reforms in the mid-1980s, the New Zealand government included privatization of many of its natural resources as part of the reforms. Under the banner of ITQs—individual transferable quotas—the reform program established property rights to a share of the total allowable catch (TAC) and allocated those shares to individuals or companies. With this allocation, the tragedy of the commons in the form of overfishing was mostly eliminated. Because ITQ owners had a right to their share, they had an incentive to limit their take and to improve the fishery wherever possible.

Roger Beattie was one of the fishermen who received a share of the quota for paua, a shellfish prized for its meat and decorative shell (see Stanford GSB 2000). Because of the paua quota system, fishermen such as Beattie stopped taking smaller paua, allowing them to grow to larger sizes. Moreover, because paua do not migrate, quota holders could invest in habitat improvements to increase paua growth and reproduction and, in turn, increase the TAC. Not surprisingly, quota values rose dramatically and rapidly from NZ\$33,000 per metric ton in 1988 to NZ\$320,000 in 1993.

Beattie is an entrepreneur par excellence. He first saw opportunity in purchasing quota from other fishers who did not see the profit potential available when the “race to fish” was eliminated. As a result, he doubled his quota holdings from 17.5 metric tons in 1986 to 35.33 metric tons in two years. Beyond that, however, he realized that investments in habitat could further increase his profits. By seeding beds, Beattie was able to increase natural reproduction and growth. He even went a step further to assist Mother Nature by developing special barrels into which he planted paua larvae. Not only do these barrels increase paua growth, they help him protect his property rights to the shellfish.

When he placed some of the barrels in a bay on the north end of New Zealand’s South Island, however, he realized that productivity depended on more than his innovative barrels; it depended on the quality of water, too. Agricultural runoff was putting effluent into the water which, in turn, was reducing paua production. Was this a tragedy of the commons? Was it an externality? Was this a case of the social cost of agricultural production (including the reduction in paua production that resulted from agriculture) being higher than the private cost, therefore leading to “too much” agricultural production? Were the farmers imposing a cost on Beattie without his consent? Or, perhaps less obvious, would Beattie be imposing a cost on the farmers

without their consent if he had called on the government to regulate agricultural runoff?

Most environmentalists and natural resource economists would likely say that farmers are imposing an externality on Beattie rather than the other way round. However, Nobel laureate Ronald Coase would not necessarily agree. In his 1960 classic article, “The Problem of Social Cost,” Coase approached such problems in a different way. Rather than assuming a property rights structure implicit in the questions above—i.e., assuming that Beattie had a right to be free from effluent and that the farmers did not have a right to dispose of their effluent into the bay—Coase called for a careful examination of property rights in reality, whether those property rights were imbedded in formal law or evolved from informal customs and culture.

In his discussion, Coase considered an example of a doctor operating in a space adjacent to a confectioner. The doctor, whose practice depended on peace and quiet, and the confectioner, whose machines produced noise, elucidates Coase’s point about property rights. Was the confectioner creating an overuse of the air waves for noise production? Was the confectioner imposing a cost on the doctor? To these obvious questions, Coase added: was there an underuse of the air waves for noise production? Would the doctor be imposing a cost on the confectioner by forcing him to be quiet? For Coase, these questions could not be answered without first determining who had what rights. Did the doctor have a right for his space to be free of sound waves or did the confectioner have a right to produce sound waves? Depending on the answer, Coase then focused on whether the parties could bargain with one another to resolve the conflicting claim for the use of the space.

Return to Mr. Beattie’s paau production in the context of Coase’s framework. Did Mr. Beattie have a right to water free from effluent or did the farmers have a right to dispose of their effluent into the water? If the former, Beattie might have threatened the farmers with a lawsuit if

they did not cease and desist or pay damages. Or, he might have called on the government to regulate agriculture production to reduce effluent. On the other hand, if the farmers had the right to emit, Beattie would have to pay them to reduce their effluent in order to protect his paua from the emissions, or move his barrels to another bay.

Mr. Beattie approached the problem in his typical entrepreneurial way, searching for a way to maximize profits by reducing transaction costs. He simply accepted that the farmers had a right to use the water for effluent disposal and paid them to change their agricultural practices in order to reduce discharges.⁴

Consider a similar story involving bees and pollination services. Many economic discussions use the pollination services of bees as an example of an under-provided public good. This “myth” was first debunked by Steven Cheung (1973) and further examined by other economists (e.g., see Muth et al. 2003). The “fable of the bees” was that apiarists contract with blossom owners; in some cases, the apiarists pay the blossom owners for the use of their flowers and, in others, the blossom owners pay the apiarists for pollination services.

But suppose the bee pollination services have a negative value as they do in the case of seedless varieties of tangerines, clementines, and mandarin oranges. These varieties remain seedless unless they are cross-pollinated, a real possibility if bees get involved. In California’s San Joaquin Valley, bees usually play a positive role in horticulture, especially almond production. Unfortunately, the bees are not discerning and pollinate whatever flowers they land on. When those flowers are for nearby seedless citrus crops, bee pollination can result in fruit with seeds that significantly reduce their value. To complicate matters, when the seedless citrus growers spray for other pests, apiarists are not happy because the spray kills their bees.

Now ask whether there is an externality and, if there is, in which direction it goes. Are the apiarists imposing a cost on seedless citrus growers who have a right to be free from bee pollination services? Apparently the horticulturists think so. One clementine grower, Paramount Citrus, threatened the apiarists with a lawsuit unless it receives “compensation for any and all damages caused to its crops, as well as punitive damages.”⁵ But if Paramount’s spray kills bees, is it imposing an externality on the apiarists? Should Paramount have to pay damages to the apiarist to move their bees out of harm’s way, or “fence” the bees out when it is spraying?⁶ Or is there some other technological solution such as developing new almond varieties that do not require pollination.

The property rights have not been sorted out in the case of bees pollinating seedless citrus crops in the San Joaquin, but it clearly illustrates that traditional Pigouvian analysis based on a divergence between social and private costs misses the reciprocal nature of costs as emphasized by Coase. In other words, costs to one party—bees killed—is a benefit to the other—crop saved, and vice versa. Which way the costs go depends on the property rights. And even if they are not specified, the parties involved at least have an incentive to consider bargaining solutions that will optimize resource use as illustrated by Roger Beattie (see Sagoff 2010).

Indeed, all environmental problems ultimately boil down to whether there are property rights to the commons. Given scarcity, one party’s use of a resource conflicts with another’s. One party’s use of water for effluent disposal conflicts with another’s use for puaa production. One’s use of air wave for transmission of loud music conflicts with another’s use for quiet (see Anderson 2004). One party’s use of land for agricultural production conflicts with another’s use for wilderness.

A call for a Pigouvian tax or a regulation to resolve the conflicting use implicitly asserts

a right for one party over another. Though a tax or regulation can theoretically reduce conflict (theoretically because we must consider public choice issues associated with taxation) and theoretically optimize resource use, policies calling for theoretical taxes and regulations divert our attention from how property rights evolve and how rights holders might bargain to resolve conflicting uses.

An alternative way of marrying environmentalism and economics is to focus on what property rights exist; when incomplete, whether they are worth better defining and enforcing and whether doing so will generate prices that correspond to costs and benefits. Once in place, property rights can align incentives for wise resource use and provide the basis for exchange among the parties with competing uses for scarce resources.

Although this type of Coasean analysis has significant implications for how to think about environmental problems, it has not been a central part of the literature on natural resources and the environment. Since Harold Demsetz's (1967) seminal article, "Toward a Theory of Property Rights," economists have recognized that people invest scarce resources in the production of property rights when the value of the rights produced exceed the costs of defining and enforcing those rights. Though not so at the time, now Demsetz's seemingly obvious point provides a foundation for much of what we understand about the interface between economics and the environment. Whether it is American Indians (Demsetz 1967; Anderson 1995), land and water rights in the American West (Anderson and Hill 1975; Libecap 1981, 2007), mineral rights (Libecap 1999), the electromagnetic spectrum (Coase 1959), wildlife (Lueck 1989) or environmental amenities, people do not assert and defend claims to assets until the net value of doing so is positive. Put differently, if scarcity does not create sufficient conflicting uses to drive up the value of resources, they are rationally left in the commons. Why put up a no trespassing

sign or build a fence if no one is interested in trespassing or if the trespass creates no harm?

Consider the evolution of property rights in the context of the decision by Paramount Citrus to threaten a lawsuit against bee owners.⁷ First, Paramount must decide whether the harm of the reduction in its seedless citrus crops is worth the cost of asserting a claim. If bees only cross-pollinated a few trees or if seedless citrus crops are only a bit more valuable than seeded ones, it might not be worth the assertion of a claim in the first place.

Seen through the lens of property rights, conflicting resource uses are only relevant when someone asserts a right to a use and attempts to exclude others from that use. Therefore there is no tragedy in the use of the commons until one or more users of the common pool resource find it worth their while to attempt to exclude others. To claim there is a tragedy of the commons or a Pigouvian externality before such an assertion implicitly assumes a set of property rights. To say fisher A is creating an externality for fisher B asserts that fisher B has a right to be free from the fishing effort of fisher A, and vice versa.

Coase also used a classic example of a factory's smoke conflicting with a laundry's production of clean clothes. If the factory owner is the first to take possession of the air for effluent disposal,⁸ it could be said that the laundry wants to use air that belongs to the factory. The fact that the factory is emitting smoke into the air suggests that it has a right to do so, otherwise someone would have stopped it from such emissions had it been worth doing so, as Demsetz (1967) explains. Accepting that the factory has a right to emit, the laundry is hanging its clothes in air owned by the factory. As Robert McCormick put it,⁹ "Maybe no constable has written or scribed the factory's right to the air, but by any meaningful definition of the word 'right' it belongs to the factory. That some might wish it belongs to the laundry is of no consequence, nor is it an externality." Similarly, if the apiarists have a right for their bees to fly

wherever they please, it is the seedless citrus blossom owners who want to use the space in a way that conflicts with the flight of bees.

Claiming that there is a Pigouvian externality implies a direction of causality. If the factory owner is creating an externality for the laundry owner, this means that emissions are causing the problem because the laundry owner has a right to air free from smoke. To say that the apiarists are creating an externality for the seedless citrus growers implies that bees are causing the problem because citrus blossom owners have a right to be free from bees. However, if the factory owner has a right to the air for effluent disposal or the apiarists have a right for their bees to produce honey from any blossom, the supposed externality is reversed.

Coase was a “causal agnostic,”¹⁰ meaning he did not assume which party had the right and thereby implicitly assume a direction of causality. Indeed, a search of his seminal article on social cost will not turn up the word “externality.” As Randall ([1983] 1993, 145) puts it more emphatically, “Externality is . . . a vacuous and unhelpful term.” Once we recognize the reciprocal nature of costs as Coase taught us, there is little room for the term. Claiming an externality may be useful as an expository device for claiming a right, but it does not help us understand the economics of conflicting resource uses or how property rights to the commons evolve. Using the Coasean lens, economists long ago should have dropped the Pigouvian externality paradigm which implicitly assumes a structure of property rights and put in its place the Coasean property rights-transaction costs paradigm which focuses on the lack of property rights as the cause of conflict. Doing so would have followed the lead of Alan Randall who recognized the imprecision and confusion caused by the term externality and called for “more precise terminology, based on notions of nonexclusiveness and nonrivalry” (Randall [1983] 1993, 145)

Of course, Coase recognized and emphasized that property rights are not always clear. Before claiming there is an externality or market failure, economists must consider the formal and informal evolution of rights and the transaction costs associated with creating those rights and negotiating over the use of scarce resources. If environmentalists have this same focus, as illustrated by the Beattie example above, they may well resolve conflicting resource claims, i.e., environmental problems, faster and cheaper.

Consider, for example, disputes over whether water in southern California should flow into Mono Lake to maintain salinity levels for aquatic populations or be diverted for municipal uses in Los Angeles (see Libecap 2007). Though it appeared that Los Angeles had prior appropriation water rights to divert water from Owen Valley to the city, thus lowering the level of Mono Lake, environmentalists filed suit to stop the diversion on the grounds that the public had a right to the water for maintaining certain environmental qualities in the lake. After years of legal battles and millions of dollars spent fighting them, the court finally ruled in favor of the environmental argument, but many more years passed before water finally flowed into Mono Lake. Had the environmentalists simply accepted the Los Angeles claim and bargained to purchase the water, time, money, and the environment would have been saved sooner.

Without going into the details of a decision to negotiate or settle as outlined by Cooter and Rubinfeld (1989), suffice it to say that resolution of conflicting claims over resource use will depend on the expected value as assessed by the claimants from bargaining versus fighting. Rather than asserting a right to water free from effluent, Roger Beattie chose to accept a right for farmers to dispose of effluent into the bay and bargain with them to reduce their effluent. When wolves were reintroduced into Yellowstone National Park in the 1990s, Defenders of Wildlife, led by environmental entrepreneur Hank Fischer, implicitly recognized the right of livestock

owners to be free from wolf predation by agreeing to pay compensation for losses from predation out of private funds (see Anderson and Leal 2001). In the case of bees, on the other hand, Paramount chose to assert a claim to have its blossoms free from bee pollination.

Such choices depend on transaction costs, including the costs of delineating boundaries, enforcing trespass across those boundaries, and negotiating, measuring, and monitoring terms of contracts for resource use. Each of these is dependent on the physical characteristics of the resource in question, technology, and institutions—both formal and informal. Consider each in turn.

- *Delineating boundaries:* A first step toward establishing property rights is that the claimant must be able to define the borders and communicate those borders to other would-be claimants. The costs of doing so vary considerably, especially depending on whether the resource in question is stationary (e.g., land) or mobile (e.g., fish and air). Delineation is relatively easy with land rights though even here methods of delineation vary depending on costs and benefits (see Libecap and Lueck 2009; Anderson and Hill 2004). Mineral rights include rights to take minerals from surface areas and claims to follow veins of ore beneath the ground (see Libecap 1999). Rights to domestic animals can be defined by branding, other markings, or imbedded computer chips. Delineation is more difficult with water. In the case of fresh water in the United States, for example, rights are delineated in terms of riparian owners who have rights to flows adjacent to their land and in terms of prior appropriation owners who have rights based on quantities of water diverted and the date when first diversion occurred. Rights to ocean water are harder to define, usually relating to distance from shorelines. Air and space rights are perhaps the most difficult to delineate.

- *Enforcing against trespass:* Enforcement is very dependent on technology. Generally fences can reduce trespass, but the effectiveness of the fence can vary considerably from decorative picket fences around houses to ten-foot high electric fences carrying 7,000 volts used to contain elephants in Africa. Locks can keep people from entering houses or from taking bicycles. Net pens in the ocean can contain fish and prevent non-owners from harvesting them. Satellites can monitor the location of boats in the ocean to keep them from entering territories where they have no entry rights or to monitor the location of vehicles or animals. Chemical tracers can monitor the path of emissions into air and water to determine which emissions might be invading those media claimed by others.
- *Contracting for resource use:* With property rights defined and enforced, there are still the costs of negotiating over and defining the terms of resource use. Land provides a clear example of how these costs can vary. In cases where any use of the land by one party reduces its value to another, complete transfer of rights may be necessary. Full transfer of ownership has high up-front capital costs, but lower subsequent measurement and monitoring costs. Alternatively, in cases where one party can use the land for some purposes without affecting the value of the land for other uses, leasing or contracting may be a lower-cost contractual method. Contrast the protection of sensitive habitat for an endangered species with the provision of open space (see Parker 2002). The former may require complete ownership and control of the land because any use by another party could reduce the value of the habitat. In contrast, whether land is used for wheat or corn production may have little or no effect on the amenity value of open space. Contracting costs for apartment rental may be low unless other factors such as noise or odor emissions from adjacent apartments is important. Measuring and monitoring a transfer of

a prior appropriation water right from one irrigation use to another is relatively easier than transferring it from a diversion use to an instream flow use. This is partly due to the fact that some legal institutions include a “use it or lose it” rule which equates non-diversion to non-use and leads to forfeiture of the water right (see Scarborough and Lund 2007) and due to the difficulty of monitoring flows, especially if the water is to remain instream for a significant distance (see Anderson and Johnson 1986).

Each of these elements of transaction costs creates a potential “fly in the ointment” of property rights solutions to environmental problems but, as Demsetz (2003, 282–300) has noted, such costs are no different from any other costs inherent in production processes. They are simply the property rights costs of producing goods and services. By reducing such costs, it is possible for environmentalists and economists to find common ground for exploring more efficient ways of solving environmental problems.

If Environmentalists were Hayekians and Coaseans

This paper contends that Hayek and Coase offer a better link between economics and the environment than does neoclassical economics focused on equilibrium conditions and social optimum. It suggests that Hayek’s lens is better because it focuses on how disparate knowledge can be assimilated in human systems which interface with nature. Not only are both human and natural systems never in equilibrium, neither scientists nor economists are likely to be able to model the complexity of either in order to manage them. Hayek’s understanding of market prices as a way of condensing and communicating information suggests that prices offer a way of valuing nature’s bounty, today often referred to as ecosystem services.

Given the complexity of human and natural systems, Coase’s lens emphasizes that

property rights hold individuals or groups accountable for costs and reward them for benefits thereby offering a way to resolve conflicting uses of nature. Far from being a panacea, property rights and exchange have transactions costs that limit the prospect of achieving nirvana. Even so, within the constraints of the costs of defining, enforcing, and exchanging property rights to nature's bounty, environmentalists and economists can find ways of resolving conflicting uses without resorting to zero-sum (perhaps even negative-sum) political solutions. To be sure, there is a role for government in lowering these transaction costs, but that role does not require an omniscient government maximizing social welfare.

The title of this paper ponders what if Hayek and Coase were environmentalists, but it is more appropriate to ask what if environmentalists understood and followed the thinking of Hayek and Coase? In Hayek's case, the connection should be easy because, properly conceived, the environment is not a static, Kodachrome moment seeking an equilibrium. Humans, like species in nature, respond to disparate information that is time- and place-specific and ever-changing, never in equilibrium. In Hayek's conception of markets, humans can "think like a mountain" only if they have signals that convey information about interconnections between themselves and nature and information about values that cannot be derived from scientific modeling.

Using a Coasean lens, environmentalists must decide whether they want to resolve conflicts over resource use by accepting the status quo property rights or whether they want to battle over the status quo rights. This is easily seen in the context of livestock grazing on public lands in the western United States. Environmentalists accepting that grazing permits are a property right are successfully bargaining with grazing permittees to reduce or eliminate livestock (see Regan 2010; Fretwell 2009), albeit it at costs that are higher due to bureaucratic

hurdles to such transfers. Those environmentalists questioning the legitimacy of grazing permits continue to battle in Congress and the courts over who has what rights. Admittedly a victory for environmentalists in the latter venue will redistribute wealth (property rights) to them, but the victory will come at a cost, perhaps a substantial one, to the texture of the social fabric and is likely to come at a cost to the land and water resources which remain without an owner.

Like nature herself, markets are a process continually adjusting to the specific circumstances of time and place and continually changing those circumstances. For this reason, neither Hayekian nor Coasean lenses are rose-colored. Though markets, prices, and property rights do not lead to nirvana, environmentalists who dare to don these lenses might find that economics is a closer friend of the environment than they think.

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Endnotes

¹ I am indebted in so many ways to Matt Ridley for shaping my thinking about the relationships between nature and economies. His books, *The Origins of Virtue* (1996) and *The Rational Optimist: How Prosperity Evolves* (2010), are must reads for anyone wishing to understand the nexus between biology and economics.

² See Ridley (2009) for the essay that stimulated my thinking on the connection between Darwin and Smith.

³ Ridley adds, “Neatly, this year [2009] also sees a Smith anniversary, the 250th birthday of his [Smith’s] first book, *The Theory of Moral Sentiments*, a book that is very Darwinian in its insistence that sympathy is what we should today call innate, that people are naturally nice as well as naturally nasty.”

⁴ Of course, if the rights were unclear, a lawsuit or legislative actions would be necessary to clarify them.

⁵ “Tangerine Growers Tell Beekeepers to Buzz Off.” Available at: <http://inform.com/united-states/tangerine-growers-beekeepers-buzz-118926a>.

⁶ See Ellickson (1991) for a discussion of fencing out.

⁷ See Cooter and Rubinfeld (1989) for a thorough discussion of settlement versus litigation.

⁸ See Lueck (2003) for a discussion of first possession rules as a way of defining property rights.

⁹ Personal e-mail to Terry Anderson, 26 February 2010.

¹⁰ I acknowledge Henry Smith for giving me this term.