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## Viewing Land Conservation through Coase-Colored Glasses

### ABSTRACT

*In his seminal article, "The Problem of Social Cost," Ronald Coase emphasized that people have competing demands for resources and that clear assignment of property rights to those resources allows demanders to resolve their competing demands through bargaining and contracting. Of course, the bargaining will be constrained by transaction costs. This article examines how contracting is used to produce land conservation and how transaction costs such as agglomeration costs, joint production costs, unowned input costs, and non-profit agency costs constrain the potential for such contracting. It specifically considers how contracting can be used to produce recreational amenities, open space, and wildlife habitat.*

Ronald Coase's seminal article, "The Problem of Social Cost,"<sup>1</sup> provides a lens through which virtually any natural resource or environmental problem can be viewed. In contrast to thinking strictly about these problems as externalities where costs are not borne by the producer, Coase's approach emphasizes that people have competing demands for the use of resources. He did not specifically apply his theorem to environmental problems, mainly because they were not in vogue in 1960. Nonetheless, Coase did discuss the use of air as a medium for waste disposal, the problem of odors wafting across property boundaries, and the problem of noise produced by one party bouncing off the eardrums of another. In each of these cases, he shifted the focus from externalities where the parties disposing of waste, generating odors, or creating noise are competing for scarce air space to contracting for property rights to the scarce air space where transaction costs will affect the ability of the parties to contract.

Put simply, the Coase theorem argues that demanders competing for a scarce resource will be able to resolve their competing demand through voluntary bargaining or contracting if property rights are well-specified and transaction costs are sufficiently low. More surprisingly, he shows that the allocation of resources will be unaffected by the initial distribution of property rights to the scarce resources if

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1. Ronald Coase, *The Problem of Social Cost*, 3 J.L. & ECON. 1, 44 (1960).

transaction costs are zero. Far from suggesting that bargaining would solve all competing resource questions or that assuming zero transaction costs reflected real world bargaining, Coase was trying to get lawyers and economists to shift away from the concept of externalities and focus on the complex problems of establishing property rights and contracting subject to transaction cost constraints. As Coase noted many years after his seminal publication, the assumption of zero transaction costs "makes clear the fundamental role which transaction costs do, and should, play in the fashioning of the institutions which make up the economic system."<sup>2</sup>

This article emphasizes the paramount importance of transaction costs in land conservation. It starts by recognizing that land conservation is a shorthand term used as a catchall for many different services demanded from land and that producing those services has opportunity costs to the extent that their production precludes other production. For example, land conservation might mean preservation of open space in the form of "amber waves of grain," in which case farming is complementary to conservation, but conversion of farm land into suburban housing developments competes with it. As long as the property rights to land are well-defined, enforced, and transferable and the transaction costs low, the owner will sell the land to the user—farmer, conservationist, or developer—who values it most highly. However, if the property rights are not well-specified or the transaction costs are so high that they dwarf potential gains from trade, contracting between the landowner and the demander will not be possible. For example, the cost of charging people who enjoy open space may be prohibitive so that the free-rider problem makes it impossible to raise sufficient funds through voluntary transactions to pay the landowner to keep the land in farming. Or fragmented landownership may make the transaction costs prohibitive for a person or group trying to aggregate many small parcels into one that is large enough to produce the desired open space.

Interpretation of the Coase theorem and its policy implications vary mainly based on perceptions of how significant transaction costs are. If transaction costs are low, gains from trade will be possible, markets will result in contracts to resolve conflicting uses, and governmental intervention will not be necessary. If transaction costs are prohibitive, on the other hand, markets are said to fail, and governmental intervention may be justified.

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2. RONALD COASE, *THE FIRM, THE LAW, AND THE MARKET* 13 (1988).

Because measuring transaction costs is an empirical matter and quantification is not always easy, people disagree about whether voluntary transactions can resolve competition for resources. Are the transaction costs associated with excluding nonpayers from enjoying the benefits of open space or wildlife habitat so high that those amenities will be under-produced by markets? Is the underproduction severe enough to warrant the taxing power of government as a way of overcoming the free-rider problem? Does the use of the government's taxing power allow demanders of conservation amenities to get a free lunch and hence demand more than the optimal amount of land conservation?

This article will not attempt to specifically answer these questions but will provide insights into their answers by considering the various options that are used to produce land conservation in a Coasean world of positive transaction costs. While governmental intervention may be justified on positive economic grounds, there is abundant evidence that private transactions have grown with the rising demand for land conservation amenities. Consider the exponential growth of land trusts from 52 in 1950 to over 1200 in 2000, controlling more than six million acres. These organizations recognize traditional property rights to land and utilize property law arrangements, including conservation easements, to gain control of land inputs whose alternative uses would compete with the land services they desire. This suggests that transaction costs are low enough to allow a market for some conservation amenities. Of course, the activities of land trusts often are "subsidized" either through direct governmental funding or through the tax deductibility of contributions.<sup>3</sup> This suggests that land conservation demanders have convinced political agents that land conservation is a public good subject to sufficient free-rider problems to warrant governmental support or that those demanders are rent seeking to get their services provided at the expense of others. In either case, understanding the importance of transaction costs for market exchanges or for collective action helps illuminate how competing uses of land resources are resolved.

This article will use the Coasean lens of transaction costs to examine land conservation. Viewed through this lens, land conservation is a matter of demanders of conservation amenities purchasing land or contracting with its owners for land use. Whether trades will take place depends on the value of the conservation values relative to the value of land in alternative uses and on the transaction costs. The article will

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3. See GEOFFREY HEAL, *BUNDLING PUBLIC AND PRIVATE GOODS* (working paper, 2001), available at <http://www-1.gsb.columbia.edu/faculty/gheal/EnvironmentalEconomicsPapers/pubgoodspropvalues.pdf> (last visited Aug. 5, 2004).

consider the costs of charging demanders of land conservation for the amenities they enjoy, the costs of purchasing and managing land for producing conservation amenities, and the costs of renting, leasing, or otherwise obtaining partial rights to land (e.g., through conservation easements) for producing conservation amenities. These transaction costs will be discussed in the context of land conservation contracts that show how transaction costs affect the potential gains from trade.

### TRANSACTION COSTS OF LAND CONSERVATION

Like any market, a market for conservation amenities can be broken down into a demand and supply side. The demand side depends on the willingness to pay for the product and the ability of the producer to collect this willingness to pay from the demanders. The supply side depends on the opportunity costs of inputs and the transaction costs of bringing those inputs together in the production process. If the willingness to pay exceeds the opportunity cost of the inputs, gains from trade will follow provided that the transaction costs do not create a free-rider problem on the demand side or measurement, monitoring, and agglomeration problems associated with input use on the supply side.

Though Coase is perhaps best known for his article "The Problem of Social Cost," his insights into transaction costs predate this seminal piece by decades with his article "The Nature of the Firm."<sup>4</sup> If the social cost article was not directly aimed at natural resource and environmental problems, the firm article was even less so. In the earlier article, Coase argued that the firm is an organization that substitutes decisions about how factors will be allocated within the firm for market exchanges outside the firm. The firm either owns inputs outright or contracts with the owner for the authority to allocate the inputs subject to the constraints of the contract. For example, the firm might own a parcel of land and make all decisions about the use of that land in its production process. Alternatively, the firm might lease the land from another owner who relinquishes some authority over land use to the lessee firm. In the former case, the owner of the firm controls all attributes of the input's use and therefore faces fewer contracting costs than the lessee who will have to bargain with the input owner regarding the attributes up for negotiation. Because the transfer of input attributes is limited in scope and time and because the parties are likely to have different objective functions, each will have to spend time and effort specifying and monitoring the terms of the agreement.

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4. Ronald Coase, *The Nature of the Firm*, 4 *ECONOMICA* 386 (1937).

Steven Cheung elaborated on Coase's description of the firm by emphasizing that contracting costs are a driving force in determining the firm's structure and size.<sup>5</sup> In his view, contracting requires that prices be discovered, that characteristics and attributes of products or services exchanged be specified, and that contributions of the two parties be separable. Cheung argues that, because these contracting costs are eliminated with outright ownership, larger firms owning more assets have lower contracting costs.

One input where outright ownership cannot occur is labor,<sup>6</sup> and because of this the firm that combines labor with other inputs must always measure and monitor labor's contribution. Hence, larger firms owning more physical capital and natural resources to which they must add labor will face higher costs of managing labor. Coase and Cheung both recognized that larger firms could save on certain contracting costs, but larger firms also come with higher agency costs associated with measuring and monitoring human input. Within a firm, owners delegate authority to make production and marketing decisions to managers. This delegation of authority to an agent entails costs of measuring and monitoring the agent to ensure that he is abiding by the contract and making allocation decisions that maximize the net value of the output.

As Cheung puts it, the net result is that "[t]he agency costs of a monitor, a director, or a manager—which are also transaction costs—rise as the costs of discovering prices fall. And the suppression will go no further when at the margin the saving in one type of cost equals the rise in the other."<sup>7</sup> In other words, firms will supplant market exchanges as long as the marginal gains from saving on price discovery costs in market transactions exceed the agency costs of delegation within the firm. To say that a firm is too large is to say that its marginal agency costs are greater than the marginal savings in price discovery costs, and vice versa if the firm is too small.

This nature of the firm helps us think about production of land conservation amenities. An individual desiring a conservation amenity might contract directly with the landowner of the output to supply the amenity. In this case the demander will not own the input, but, instead, will contract with its owner. The parties to the contract will have to discover the price of the amenity and specify a contract for measuring

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5. See generally Steven N.S. Cheung, *The Contractual Nature of the Firm*, 26 J.L. & ECON. 1 (1983).

6. This is true not just because slavery is illegal and immoral, but because individuals with free minds can always adjust the contributions that their bodies are making to the production process.

7. Cheung, *supra* note 5, at 9–10.

and monitoring actions by both parties to the transaction with respect to the enjoyment of that amenity. These contracting costs (or what Cheung calls price discovery costs) might include specifying to what other uses the landowner can put the land that could potentially conflict with the conservation amenity, what actions the conservation demander can take that might interfere with the landowner, how the willingness to pay for the amenity will be measured, how and when the price will be charged, and so on.

As these costs rise, say with the complexity of the desired amenity and, therefore, the costs of measuring and monitoring contractual performance, there is an incentive for the conservation demander to form a firm, purchase the land from the owner, and produce the amenity himself. If the owner of the firm is the consumer of the output, no agency costs result because the owner as the consumer of the output knows what he wants and how to produce it, *i.e.*, the owner knows how to maximize his own wealth.

If amenity demanders join together in a firm to reduce contracting costs associated with purchasing the amenity, they will have to deal with agency costs. In particular, are the managers of the firm producing what the owners of the firm want, are the managers producing at minimum cost, and is the firm able to collect sufficient revenues from demanders to cover the costs of production?

We now turn to these transaction cost questions in the context of the demand and supply of land conservation amenities. For organizational purposes, this article will consider the demand side of contracting for output separate from the supply side of contracting for production, but it is important to recognize that these transaction costs may not be independent. The packaging of a product affects the willingness to pay and the ability to collect, and it affects the cost of production. Optimal production requires that the firm minimize the combined contracting costs.

### **Demand-Side Transaction Costs**

Before any individual or group can really understand the transaction costs of producing and marketing a product or service, the characteristics of the product or service must be carefully specified. It is not sufficient to simply say that land conservation is aimed at sustainable development or ecosystem management. These concepts are too vague to allow private contractors to know what inputs they will require and to whom they will market their product or service.

What are some of the land conservation products of land trusts? According to the Land Trust Alliance's *National Directory of Conservation Land Trusts*,<sup>8</sup> the purposes of land trusts vary tremendously including:

"To protect critical open space in our area and to address environmental issues springing from land use change" (Brunswick-Topsham Land Trust).<sup>9</sup>

"To conserve natural resources for the benefit of the general public" (Cape Elisabeth Land Trust).<sup>10</sup>

"To ensure the future of elk and other wildlife by conserving, restoring, and enhancing natural habitats" (Rocky Mountain Elk Foundation).<sup>11</sup>

"To preserve and enhance for the public, the ecological, natural, scenic, historical, and/or recreational values of land and water" (Great Basin Land and Water Trust).<sup>12</sup>

We can place these land conservation products into three general categories: recreational, open space, and wildlife habitat.<sup>13</sup> Recreational opportunities include walking or biking trails, access to lakes or streams, or access to public lands. Open space focuses on preventing farmland from being converted to urban or suburban development or converting farmland or developed land to more natural conditions such as forests or even wilderness. Wildlife habitat includes preservation of wetlands for species in general or preservation or development of habitat for an endangered species such as the black-footed ferret.

Marketing any of these amenities requires that the producer be able to collect sufficient revenues to cover the opportunity cost of the inputs. Collecting these revenues entails transaction costs associated with the contract between the producer and consumer. In particular, the producer of land conservation amenities must be able to assess the willingness of conservationists to pay for a particular amenity and be able to exclude nonpaying free riders from enjoying the amenity.

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8. LAND TRUST ALLIANCE, 1998 NATIONAL DIRECTORY OF CONSERVATION LAND TRUSTS (1998).

9. *Id.* at 65.

10. *Id.*

11. *Id.* at 113.

12. *Id.* at 174.

13. There is a fourth category, historic preservation, that is also important to many land trusts. Though we will not address it here, historic preservation is subject to the same types of transaction cost issues.



The transaction costs associated with assessing willingness to pay and collecting revenues will vary depending on the nature of the amenity and on the production organization. It will be much easier to assess willingness to pay if the land conservation product is similar to products already on the market, and it will be easier to collect from potential nonpayers if consumption of the land conservation product requires actually being on the land.

### *Recreational Amenities*

Marketing recreation is probably the easiest among the three categories because there are recreational products already on the market and because demanders must combine their time and capital with the land input. If the firm is producing hiking or biking trails, there are substitutes. Some public parks charge fees, ski areas charge for mountain biking, and guest ranches sell hiking, horseback riding, and skiing opportunities. Though these products may not be exactly the same as land conservation amenities provided by land trusts, they offer a starting point for determining willingness to pay.

In each of these recreational examples, the demanders will have to cross a property boundary to enjoy the amenity, at which point it is possible to charge a fee and exclude nonpaying free riders. To be sure, collecting this fee will entail some costs. A toll booth may be erected at campgrounds, a ticket or membership may be sold as with ski areas, and wardens may check users for permits as do river and game keepers on some properties in Canada and England. Because recreation requires crossing property boundaries or using facilities such as trails, it is easier to identify users and charge for access.

While the producer might go to the expense of building a tollbooth and hiring monitors to patrol for free riders, he might simply ask people to voluntarily pay and to monitor other users with friendly moral suasion. Hunting clubs can encourage members to ask those they encounter in the woods to show proof that they are paying members of the club. In a public park in Bozeman, Montana, a ski club grooms trails for cross country skiing and asks users to voluntarily purchase and wear buttons indicating that they have paid an annual fee. The buttons can be purchased at local sport shops and are easily identifiable when people are using the trails. The proceeds from button sales support trail maintenance. Monitoring to avoid the "free skier problem" is accomplished by asking users who have paid to kindly remind others that a fee is requested.

The monitoring costs will vary with technology. The simplest of technology is a fence and trespassing signs. As Anderson and Hill<sup>14</sup> noted, before barbed wire was invented, the costs of defining and enforcing property rights were higher than after its invention. The electronic revolution makes the barbed wire revolution seem primitive. Remote cameras can monitor stop lights to record violators, electronic devices can detect shoplifters, scanners can read bar codes at toll booths, and satellites can monitor ingress and egress on the open oceans if people with the right to enter carry transponders that signal the satellites that they are legitimate entrants.<sup>15</sup>

How much the supplier of the recreational amenity is willing to spend on monitoring access will depend on the value of the recreational amenity and the extent to which it is subject to crowding.<sup>16</sup> Think about how many strands of wire are optimal for a fence. If it is simply a matter of demarcating a boundary, one strand may be sufficient. If it is a matter of keeping in valuable wildlife, twelve strands with electrification may be appropriate. And if it is a matter of excluding nonpayers from viewing a valuable scene such as a baseball game, a high board fence may supplant strands of wire.

Not only is exclusion dependent on an individual's willingness to pay, it will be dependent on the interaction of individuals. If many people can enjoy the amenity at the same time without diminishing the experience of others, there is less incentive to monitor each user as long as sufficient fees can be collected to produce the amenity. In this case, there is no need to restrict the number of entrants at any one time so that a membership fee with no marginal price for each visit may be the best way to maximize revenues. On the other hand, if the value of the recreational experience diminishes with crowding, a higher marginal price may be necessary to limit the number of users and raise the necessary revenues. Hunting clubs that pay for habitat and access recognize the congestion problem and therefore limit the number of people who can hunt on any particular day.

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14. Terry L. Anderson & P.J. Hill. *The Evolution of Property Rights: A Study of the American West*. 18 J.L. & ECON. 163, 172 (1975).

15. Daniel Huppert & Gunnar Knapp, *Technology and Property Right in Fishery Management*, in *THE TECHNOLOGY OF PROPERTY RIGHTS* 79, 92-93 (Terry L. Anderson & Peter J. Hill eds., 2001).

16. This can be thought of in the context of establishing property rights as described by Anderson and Hill, *supra* note 14, at 178.

*Open Space Amenities*

Exclusion of free riders who enjoy other conservation amenities is more difficult if the demander can enjoy the amenities without crossing the property boundary, as may be the case with open space scenery. The cost of collecting from those who enjoy open space will depend on a number of variables. First, it is easier to collect if the open space amenity can be inseparably packaged with a specific asset such as a house. In that case, the amenity value will be incorporated into the asset's value. Hence land developers have an incentive to incorporate open space amenities into housing developments, enabling them to charge a higher price for the houses.

In Boise, Idaho, for example, Peter S. O'Neill recognized the growing demand for conservation amenities in an urban setting and responded by building communities for people as well as fish. He revitalized a river and created one of the nation's first urban spawning streams for trout. O'Neill recognized that visually pleasing and biologically productive surroundings are assets that add to property value. Hence, his housing developments offer free-flowing trout streams, lush streamside vegetation, and biologically diverse lakes and wetlands. Creating or restoring these amenities is expensive, but because they are enjoyed mainly by the homeowners, their value is captured in the price people pay for the homes. If there is some free riding due to the fact that his trout streams produce fish that migrate to publicly accessible waters, enough of the value is internalized by the prices in the housing development that Peter O'Neill can profit from his investment. Add to his profits some philanthropy motivated by O'Neill's fishing passion and the result is privately provided conservation amenities.

If producers of open space cannot capitalize the value of open space into the value of more easily marketed assets, the free-rider problem is more costly to overcome. Public highways, for instance, exacerbate the collection problem because people who drive on such highways can enjoy open space scenery without paying. Getting people to pay a toll for a public highway may not be technologically or politically feasible. Charging tolls for a scenic amenity may be costly because some people may be using the highway strictly for transportation and not be getting much value out of the open space amenity.

If a roadway with scenic value is privately owned, however, there is an incentive for the owner of the asset to find ways of collecting for the scenic amenity. The 17-Mile Drive along Pebble Beach provides an example. This private highway is a popular tourist attraction in California. Developer Samuel Morse bought the land along Pebble Beach

and built houses and golf courses whose prices included some of the value of the open space amenity. To capture the value from non-resident viewers, drivers must enter through guarded gates and pay an \$8-fee for the 17-mile drive, taking all day if they wish.

Where the transaction costs of charging for open space amenities are high, the potential free-rider problem may justify the call for the power of taxation. Just as special improvement districts can be formed to prevent the free-rider problem in the construction of sidewalks or the paving of streets, such districts can tax local residents to provide open space. The geographic scope of the benefits from open space would determine the optimal size of the funding district. If the value of the open space accrues mainly to local homeowners, then the district might be as small as a few land parcels. If the value accrues to a much wider population as would be the case if the open space preserves some larger community values, then the district might be as large as a county or even a state.

Open space bond issues can be explained on these grounds. In recent years local and state governments have presented measures to voters asking for approval of bond issues to provide funds for open space preservation. Table 1<sup>17</sup> shows the number of measures presented to voters between 1998 and 2001, the percentage passed, and the bonding provided. A passage percentage of 70 percent in 2001 suggests that voters are enthusiastic about providing tax support for open space, and the total of more than \$19 billion of potential funding for parks and open space can purchase a significant amount of land or conservation easements. With the public funding overcoming the free-rider problem,<sup>18</sup> the actual provision of the open space can be made through public or private agencies.

**TABLE 1: LAND CONSERVATION  
VOTING RESULTS**

1998	1999	2000	2001
126 measures	92 measures	174 measures	137 measures
passed (84%)	passed (90%)	passed (83%)	passed (70%)
\$8.3 billion	\$1.8 billion	\$7.5 billion	\$1.7 billion
created	created	created	created

17. LAND TRUST ALLIANCE, LAND VOTE 2001: AMERICANS INVEST IN PARKS AND OPEN SPACE (2001).

18. It should be noted that the public choice literature raises questions about whether inefficiencies associated with the potential free rider are not offset by inefficiencies associated with rent seeking. See STEVEN J. EAGLE, CONSERVATION EASEMENTS AND PRIVATE LAND STEWARDSHIP (working paper, 1998), available at <http://www.privateconservation.org/pubs/mono/easements.pdf> (last visited Aug. 5, 2004).

*Wildlife Amenities*

Provision of wildlife habitat can be treated like a recreational amenity if the wildlife is used directly as in hunting or photography or if the provision of wildlife habitat comes in conjunction with other land uses such as camping, hiking, and so on. In such cases, only those who actually physically enjoy and pay for use of the amenity will be allowed to cross the property boundary. As such demands have grown, the market has responded.

In South Africa, a company known as Conscorp, started in 1990, has been a pioneer in capturing amenity values related to wildlife. Conscorp asks people "to invest in conservation, not to donate to it," says co-founder Dave Varty. The company generally owns only small land parcels, enough to accommodate its lodges. For the rest, it contracts with surrounding landowners for conservation services. Rather than tying up capital in vast tracts, Conscorp contracts for access to private lands for game viewing and hunting. The contracts are complex documents that constrain both landowners and Conscorp so as to maximize the wildlife experience. Architecture is regulated to fit the African tradition, hunting is coordinated so that hunters do not interact with photographers and watchers, domestic livestock is limited to certain areas, perimeter fences are maintained by a combined effort of Conscorp and the landowner, interior fences are not allowed, and the list goes on. Though contracting costs are high, the company turned a profit in just four years from its start.

In California there are at least two firms, Golden Ram and Wilderness Unlimited, that contract with private landowners for the provision of outdoor experiences including hunting, fishing, camping, and hiking. Among the many services these firms provide are restricted entry to the land, maintenance of campsites, improvement of wildlife habitat, and provision of insurance. With thousands of acres under contract and hundreds of members, such firms are providing a model for similar firms in other states.<sup>19</sup>

The provision of wildlife habitat may be subject to greater free-rider problems since wildlife are not consumed directly, but instead provide existence values.<sup>20</sup> (Existence values mean that people derive

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19. See generally GOLDEN RAM SPORTSMAN'S CLUB website, at <http://www.goldenramhunting.com> (last visited Aug. 5, 2004); see also WILDERNESS UNLIMITED, HUNTING, FISHING AND CAMPING WILDERNESS UNLIMITED, at <http://www.outdoorjournal.com/wuhome/index.htm> (last visited Aug. 5, 2004).

20. For a more complete discussion of this issue, see Donald J. Boudreaux & Roger E. Meiners, *Existence Value and Other of Life's Ills*, in *WHO OWNS THE ENVIRONMENT?* 153 (Peter J. Hill & Roger E. Meiners eds., 1998).

value from the wildlife and wildlife habitat simply by knowing they exist, but not by actually hunting, photographing, or observing them.) Even where existence values may be significant, however, entrepreneurs may successfully be able to collect some of the value as organizations such as The Nature Conservancy prove. The Nature Conservancy provides many preserves that are seldom visited by members, but the members contribute in return for a magazine with lots of pictures and for other outward badges (bumper and window stickers, pins, ties, etc.) that show they have contributed. Total revenue for the Nature Conservancy in 2001 was over \$546 million, of which \$392 million came from dues and contributions. Though it does not break down the latter two categories, we can infer that with dues of \$25 per year, the one million members contribute \$25 million. The individual dues especially suggest that the Nature Conservancy is finding ways to overcome the free-rider problem by making members part of the club.

In each of these three amenity categories, the extent of the free-rider problem will be determined by the transaction costs and the ability of entrepreneurial producers to find ways for lowering those costs. The more entrepreneurs can reduce the transaction costs, the more they will be able to capture a share of the gains from trade associated with providing the conservation amenity.

### **Supply-Side Transaction Costs**

Transaction costs also play a pivotal role in determining the production process. A typical textbook analysis of production focuses solely on the technical relationship that determines the substitution between inputs that will minimize the cost of production given the relative prices of the inputs. Once transaction costs are introduced, however, the production function is only part of the production calculus; organizers of production must also consider the measurement, monitoring, and agency costs discussed above.

Taking as given the demand for land conservation amenities and the costs of marketing the land conservation amenities, we can ask what contractual arrangements reduce or minimize the transaction costs associated with production. These costs arise from four types of contracting costs: agglomerating land parcels of sufficient size to produce the amenity, producing joint outputs, utilizing unowned inputs, and monitoring managers in a non-profit setting.

#### *Agglomeration Costs*

As with all production, inputs cannot always be divided into sizes that are optimal compared to other inputs. For example, in the case

of farming, a tractor is not infinitesimally divisible so that it can be sized optimally to unite with labor and land in production. In the case of open space, fragmented ownership of land parcels may raise the transaction costs of producing open space.<sup>21</sup> Suppose, for example, that an open space must be at least 100 acres for it to provide a value that can be marketed; anything smaller will either not produce an amenity value for which people are willing to pay or will have prohibitive transaction costs associated with excluding nonpayers. If all land is owned in units of 100 acres or more, the demander of open space who values open space greater than the opportunity costs of 100 acres in its present use will be able to acquire the land by negotiating with one landowner.<sup>22</sup> Of course, there will be negotiation costs, but these costs will be lower than if all land is held in parcels of one acre because then the demanders would have to negotiate with 100 landowners. This would raise the transaction costs, reduce the net gains from trade, and decrease the likelihood that a market exchange will produce the open space. Hence, all else equal, land conservation amenities should be easier to produce through markets where landownership is in larger parcels.

Media mogul, and now land mogul, Ted Turner provides an example of how large, contiguous land parcels can lower transaction costs and encourage private land conservation. His landholding in the United States now totals more than three million acres. These properties are all large and in most cases were that way when he bought them. In other words, he did not have to put together many small parcels to constitute a unit that was viable for his conservation agenda. The Flying D Ranch in southwest Montana is indicative, encompassing more than 100,000 deeded acres that was one cattle ranch until Turner bought it in 1989 from the Shelton Ranches. Because the ranch is so large, it can provide range for thousands of bison and still be managed for wildlife such as elk and deer. In the case of elk, populations have risen from 757 to over 3000 in 1996.<sup>23</sup> The increase was achieved by restricting access and limiting the number of bulls harvested. The transaction costs of

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21. For a formal model of the problems associated with agglomeration costs applied to wildlife, see Dean L. Lueck, *The Economic Organization of Wildlife Institutions*, in *WILDLIFE IN THE MARKETPLACE* (Terry L. Anderson & Peter J. Hill eds., 1995); see generally Dean L. Lueck, *Property Rights and the Economic Logic of Wildlife Institutions*, 35 *NAT. RESOURCES J.* 625 (1995).

22. The transaction costs will rise if the land parcels have differential abilities to produce the amenities. In this case, landowners that produce higher amenity rents will be able to hold out for a larger share of the gains from trade in the bargaining process.

23. TERRY L. ANDERSON & DONALD R. LEAL, *ENVIRO-CAPITALISTS: DOING GOOD WHILE DOING WELL* 75-77 (1997).

restricting access and managing the property as a unit would be much greater if the land had been owned by multiple owners.

### *Joint Production Costs*

When the same inputs can be used to produce different outputs, two types of questions arise. First, how should the two products be priced, and second, what are the tradeoffs (if any) between outputs in the production process?

Meat and hides from cattle illustrate the pricing problem. A cattle producer taking his beef to market will be left with a by-product, the hide. If the price of beef covers the cost of producing the beef, any price for the hide will provide pure profit. With competition among buyers of hides, the price of hides will be bid up to the market value of the hides, and the cattle grower will receive all the profits. However, if the market for hides is not competitive, buyers will negotiate with sellers for a share of those profits.

Land conservation amenities are often produced jointly with some other output such as agricultural crops where the crops cover the opportunity cost of the land. If so, land conservation is a by-product for which any payment generates rents for the landowner. Who captures those rents will depend on the degree of competition by demanders and suppliers. If there are many demanders vying for a unique parcel of land, the owner of the unique land will capture the rents associated with its unique values. In the case where land conservation amenities are readily substitutable, *i.e.*, not unique, competition among landowners jointly producing agricultural crops and amenities will receive no rents and the prices of amenities will be driven down.

In contrast to land uses that are complementary to one another, some land uses may directly compete with one another. For example, suppose that land can be used to produce agricultural output or recreational amenities where recreational activities reduce crop output. If the costs of measuring and monitoring recreational users are zero so that it is easy to determine the crop reduction caused by recreation, the competing use becomes a simple Coasean bargaining problem. Assuming that the crop producer has a right to have her production free from disruption by recreationists, the recreational demanders will have to pay for the foregone crop production.

Suppose, however, that there are measurement and monitoring costs associated with identifying the cause and cost of damage. Is the reduced crop production due to hikers or vagaries in the weather? If it is due to hikers, is it due to those who have contracted with the crop owner or due to those who might have trespassed? These questions imply higher transaction costs and reduced potential net gains from trade.



Again, thinking in terms of Coase's lesson on the logic of transaction costs, we must ask whether transaction costs will be lower if the land is owned by the farmer and leased to recreationists, or if it is owned by the recreationists and leased to the farmer for growing crops. The amenity demander may be in a better position to monitor his own activities that potentially conflict with other production. Hikers can monitor other members of their group, or hunters may agree to a code of ethics and monitor other members of the hunting club, thus reducing irresponsible behavior. If this is the case, it may make sense for the amenity demander to own the land and produce the land conservation amenity while leasing out the crop production. Under this arrangement, the crop producer would pay a lower lease price for production knowing that she would experience some crop reduction.

If the amenity demand is entrepreneurial, *i.e.*, is new and therefore has relatively unknown effects, ownership by the amenity entrepreneur may reduce transaction costs because of the information cost associated with estimating the costs of producing the amenity and reducing crop production. Buchanan and Faith<sup>24</sup> argue that entrepreneurs have more information about their entrepreneurial activities and are more optimistic about potential negative effects of their activities. Similarly, Barzel<sup>25</sup> points out that the owner of the firm will be the entrepreneur who can reduce the measurement and monitoring costs that are inherent in the firm.

In cases where the cost of measuring the production of joint outputs is lower for the amenity demander, we can expect that demander to own land and take action to optimize the joint production. The Nature Conservancy's ownership of the Pine Butte Preserve offers an example. In north-central Montana, The Nature Conservancy (TNC) owns a 13,000-acre preserve that provides the last remaining prairie grizzly bear habitat in the lower 48 states.<sup>26</sup> During certain times of the year, the grizzly bears migrate to the preserve to forage on new sprouts, roots, and berries. The rest of the time the bears live mostly on public wild lands where they seldom interact with livestock. If a cattle rancher owned the land, he would face bear predation if he leased his land to TNC. Of course, TNC could pay the cost of predation, but transaction

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24. See generally James M. Buchanan & Roger L. Faith, *Entrepreneurship and the Internalization of Externalities*, 24 J.L. & ECON. 95 (1981).

25. Yoram Barzel, *Property Rights in the Firm*, in PROPERTY RIGHTS: COOPERATION, CONFLICT AND LAW 48, 49 (Terry L. Anderson & Fred S. McChesney eds., 2003).

26. For additional information, see THE NATURE CONSERVANCY, PINE BUTTE SWAMP PRESERVE, CHOTEAU, MT, at <http://nature.org/wherewework/northamerica/states/montana/preserves/art342.html> (last visited Aug. 5, 2004).

costs would result from the moral hazard problem as the landowner might put his cattle in harm's way. By owning the preserve, TNC monitors cattle and minimizes predation by keeping livestock out when the grizzly bears are in. When the grizzly bears are not there, it leases grazing to livestock owners.

### Unowned Input Costs

If transaction costs rise with joint production even when all the inputs are owned, they will rise even more if any inputs are unowned. For example, if unowned wildlife prey on domestic livestock, it is difficult for the livestock owner to obtain compensation for his losses because there is no wildlife owner responsible for the wildlife.<sup>27</sup> Suppose that existence demanders of wildlife amenities support introduction of a predator and that the state does not accept the responsibility for compensation. Because the existence demanders can enjoy knowing the predator exists without them actually entering the property, transaction costs will make it virtually impossible for the livestock owner to seek and receive compensation from the existence amenity demanders. Thus, they will be able to free ride on the livestock owner. Conflicts between the landowner-livestock owner and the amenity demanders are inevitable. Again, the Pine Butte Preserve example is illustrative because, in effect, TNC internalizes the cost of grizzly bear predation by owning the territory where predation is most likely without actually owning the bears.

The conflict between predators and livestock has higher transaction costs, however, as the territory of the predator increases and overlaps with multiple livestock owners.<sup>28</sup> This is especially true if landownership is fragmented into many parcels that must be agglomerated. The Coase theorem says that resource allocation will be invariant to liability if transaction costs are zero. The corollary to this theorem is that liability will matter with positive transaction costs. In the case of multiple livestock owners and a wide-ranging predator, making the livestock owners liable creates a potential free-rider problem in that efforts by one livestock owner to deal with the problem potentially create benefits for others who do not bear the costs.<sup>29</sup> These transaction costs

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27. In some cases the state may take responsibility for the wildlife and compensate livestock owners.

28. See generally Lueck, *supra* note 21 (discussing the relationship between wildlife territory and the size of land holdings).

29. This provides an explanation for why governmental programs including bounties and government-paid hunters exist to control predators.

fall if the predator is owned by a single entity that is liable for damages.<sup>30</sup> In this case, the demander of predator introduction has an incentive to accept liability or face opposition from livestock owners who may be able to resist predator introduction or who will have an incentive to kill the predators if they do not receive compensation.

The wolf compensation program run by Defenders of Wildlife illustrates how a group can effectively take "ownership" for part of the wolf's behavior. When reintroduction of wolves into Yellowstone National Park was being debated, livestock owners voiced concern that they would bear the costs of predation. The federal government took the position that these were wild animals and that it therefore was not liable if the wolves migrated out of the park and killed domestic stock. To defuse some of the opposition, Defenders of Wildlife became a limited de facto owner of the wolves when it established a privately funded compensation endowment and offered to pay livestock owners for any losses due to wolf predation. Clearly, this insurance-type scheme is not perfect because there are costs of proving whether livestock losses are due to wolves and because it does not compensate owners for costs associated with replacing the animals. Nonetheless, the willingness of wildlife demanders to pay some compensation is a step toward a contract that reduces transaction costs. Between the inception of the fund in 1987 and January 2004, Defenders paid compensation totaling \$359,124 to 295 livestock owners in Idaho and Montana.<sup>31</sup>

### Non-Profit Agency Costs

Agency costs are always an important consideration in contracting, but they are especially important in the case of non-profit firms. For-profit firms are disciplined by the bottom line,<sup>32</sup> but non-profit firms have no such measuring stick. Hence, when the amenity demander contributes to the conservation-producing firm as his agent, he faces higher costs of monitoring the agent to ensure that the firm is doing what he expects. Is the conservation agency producing the right product? Is it producing the product at the minimum cost?

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30. For a more complete discussion of viewing wildlife through Coase-colored glasses, see Terry L. Anderson, *Viewing Wildlife Through Coase-Colored Glasses*, in WHO OWNS THE ENVIRONMENT? 259 (Peter J. Hill & Roger E. Meiners eds., 1998).

31. See Defenders of Wildlife, Payments to Ranchers from the Bailey Wildlife Foundation Wolf Compensation Trust, at <http://www.defenders.org/wildlife/wolf/wcstats.pdf> (last visited Aug. 5, 2004).

32. See Michael C. Jensen & William H. Meckling, *Theory of the Firm: Managerial Behavior, Agency Costs and Ownership Structure*, 3 J. FIN. ECON. 305 (1976) (discussing the principal-agent problem in the context of for-profit firms).

Parker<sup>33</sup> presents evidence that land trusts are taking into account many of the relevant transaction costs associated with whether to own land or hold conservation easements and with the costs of enforcing easements. Though he does not suggest that the decisions of non-profit agents are necessarily optimal as compared to what might occur if agency costs were lower (as they would be with a firm disciplined by profits), his data do suggest that disciplinary forces do exist.

These forces may come from Internal Revenue Service reporting requirements necessary to maintain 501(c)(3) charitable contribution status, but they are also buttressed by the importance of reputation capital. To reduce agency costs, non-profit firms have an incentive to provide independent audits of their actions. These audits give donors some assurance that funds are being used properly. Similarly, brand names acquire value among donors who display a conservation group's logo on their car, tie, or shirt. If agents violate donor expectations, the value of reputation capital will fall and donations will drop with the fall in reputation.

The sale of land for development by the National Wildlife Federation (NWF) illustrates agency costs. Philanthropist Claude Moore deeded a 357-acre property to the NWF to protect wildlife. The federation, however, against Moore's wishes, sold the property, including the Claude Moore Conservation Center, to developers in 1986 for \$8.5 million and used the money for other purposes. Dr. Moore sued trying to stop the development, but lost.<sup>34</sup> As former NWF president Ray Arnett put it, "NWF was known as the largest conservation education association in the world. Now they have moved to more advocacy, lobbying."<sup>35</sup>

## CONCLUSION

When Ronald Coase wrote his seminal article, "The Problem of Social Cost," many of the environmental problems that we face today and many of the solutions did not exist. He discussed the air pollution issue in the context of hypothetical steel mills and laundries and presented evidence of how the common law of trespass and nuisance

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33. Dominic P. Parker, *Land Trusts and the Choice to Conserve Land with Full Ownership or Conservation Easements*, 44 NAT. RESOURCES J. 483 (2004).

34. RICHARD POMBO & JOSEPH FARAH, THIS LAND IS OUR LAND: HOW TO END THE WAR ON PRIVATE PROPERTY 142-43 (1996).

35. AUSTIN FULK ET AL., A GUIDE TO NONPROFIT ADVOCACY AND POLICY GROUPS (1997), available at <http://www.capitalresearch.org/publications/advocacyguide/Groups/nwf.html> (last visited May 5, 2004).

had dealt with such problems. Coase's approach has been fleshed out in the environmental context by Meiners and Yandle<sup>36</sup> and Yandle,<sup>37</sup> who provide more evidence that common law liability rules can handle many conflicting resource uses.

Because property rights to land are easier to define and enforce than property rights to air and water, it is not surprising that contractual arrangements of the type Coase described are more prevalent with land conservation. As the demand for conservation amenities has grown with rising incomes, the market has responded as evidenced by the huge increase in the number of land trusts and other conservation organizations. Coase's insights into the potential for property rights and contracts to resolve conflicting resource uses and into the costs of organizing firms to produce conservation help us understand how and why conservationists have organized the way they have. For-profit housing developers have incorporated open space into their developments and captured the benefits in property values; non-profit land trusts have devised innovative easements to reduce transaction costs; local governments have passed open-space bond issues that overcome the free-rider problem potentially inherent in purchasing land or easements to provide open space; and a wildlife group's willingness to pay for wolf predation has provided a liability mechanism that lowers transaction costs. Using the Coasean lens helps explain a myriad of innovative approaches that have evolved.

The articles in this volume, explicitly or implicitly, fit into the Coasean framework. At the heart of land conservation issues are transaction costs, and Coase's theories help us see how entrepreneurs can reduce them to produce more gains from trade. The contractual approach to conflict resolution is at the heart of free market environmentalism. The Coase theorem opened an empirical debate regarding the degree to which transaction costs preclude contracting to promote efficient resource use. The examples cited in this article and the following articles suggest that, even though transaction costs are positive, entrepreneurs can reduce them and resolve competing resource demands through contractual arrangements.

Using the Coasean lens helps us focus on transaction costs and contractual terms, but it does not tell us whether an efficient amount of land conservation is being produced. Indeed, Coase's criticism of Pigou was that the simplistic notion of private and social costs leads to the

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36. Roger E. Meiners & Bruce Yandle, *Common Law and the Conceit of Modern Environmental Policy*, 7 GEO. MASON L. REV. 923 (1999).

37. Bruce Yandle, *Coase, Pigou, and Environmental Rights*, in WHO OWNS THE ENVIRONMENT? 119 (Peter J. Hill & Roger E. Meiners eds., 1998).

simplistic conclusion that we can know what the efficient amount would be. Once transaction costs are introduced, efficiency is not such a clear concept. In fact as Demsetz<sup>38</sup> points out, if we think of transaction costs just like any other costs, about all that we can say is that the world is efficient subject to transaction costs. To elaborate, he points out that in a world of zero transaction costs, Coase's steel mill owner and laundry owner could integrate their two firms and internalize the costs and benefits of controlling pollution. In the case of land conservation, the farmer and the amenity producer could become the same firm. Why does this integration not take place? The answer is that it would be inefficient due to transaction costs. But, Demsetz asks, how does this differ from the case where integration is thwarted due to diseconomies of scale? In short, Demsetz's conclusion is that costs are costs. In this sense, markets may not produce the efficient amount (too little) of land conservation due to transaction costs associated with free riding just as the political sector might not produce the efficient amount (too much) due to transaction costs associated with concentrated benefits and diffuse costs.

So what does the Coasean economist have to offer policy analysis? We can try to quantify the transaction costs associated with various institutional arrangements and suggest ways that those transaction costs can be reduced. This will require detailed analysis of the institutions as Coase did with lighthouses.<sup>39</sup> With this analysis in hand, then we can say how the world would differ with different institutions or technologies that could lower transaction costs. When all is said and done, we should not be too surprised to find that entrepreneurs who lower transaction costs and increase the gains from trade have already done what we policy analysts might predict.

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38. Harold Demsetz, *Ownership and the Externality Problem*, in *PROPERTY RIGHTS: COOPERATION, CONFLICT, AND LAW* 282 (Terry L. Anderson & Fred S. McChesney eds., 2003).

39. See generally Ronald Coase, *The Lighthouse in Economics*, 17 J.L. & ECON. 357 (1974).