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Toward a Rational Exuberance for Ecosystem Services Markets

• Jeffrey D. Kline, Marisa J. Mazzotta, and Trista M. Patterson

ABSTRACT

Ecosystem services markets have become a popular topic among environmental policymakers and ecosystem protection advocates. Their proponents view markets as a promising new way to finance conservation of threatened ecosystems worldwide at a time when the need for additional protection seems especially critical. Their advocates in forestry promise that such markets will soon offer new financial opportunities to forest landowners to augment or even replace income from the sale of timber, thereby increasing financial incentives for landowners to retain land in forests. But what is the real promise in ecosystem services markets and what can realistically be achieved by their implementation? We provide on overview of how environmental markets work in theory and discuss several issues that influence how effective they con be. We conclude that the promise of ecosystem services markets greatly depends on the particular circumstances of program implementation, including what services are to be traded and whether they are amenable to trading, the ability to enact and enforce regulation sufficient to induce trading, and how expected program results compare with those likely to arise from other conservation policy approaches.

Keywords: land-use change, ecosystem protection, open space preservation, forest amenities

Ecosytem services markets lately have become a popular topic among environmental policymakers. Their proponents view markets as a promising new way to finance conservation of threatened ecosystems worldwide at a time when the need for additional protection is especially critical. Their advocates in forestry promise that such markets will soon offer new financial opportunities to forest landowners to augment or even replace income from the sale of timber and other forest commodities, thereby offering financial incentives for landowners to forego development opportunities and retain land in forests. Touting ecosystem services markets is not limited to nongovernmental environmental advocates. It is now policy of the US Forest Service to, among other objectives, enhance protection of private lands that arc important complements to national forests in the production of ecosystem services (e.g., Collins and Larry 2007, US Forest Service 2007, p. 8, Collins et al. 2008). But what is the real promise of ecosystem services markets and how much additional conservation can realistically be achieved by their implementation? In this article, we provide an overview of how environmental markets work in theory and discuss several issues that influence how effective they can be. Our intent is to enrich ongoing discourse about ecosystems services markets by outlining some of the challenges involved in their design and implementation.

Much of the current interest in ecosystem services markets in the United States has arisen from concerns about the degradation of ecosystems resulting from the fragmentation and loss offorestland and open space at the hands of development. Development arises from market forces, such as population and income growth, which increase demands for land for residential, commercial, industrial, and infrastructure uses. Increasing demands, in turn, increase the value of land for development relative to less intensive uses such as forestry, grazing, and agriculture. This provides landowners with a strong financial incentive to sell land tor development. Public polices can influence the development process by regulating where it can occur such as with zoning or influencing the financial decisions oflandowners using a variety of incentives. Common policy approaches for deterring landowners from developing their lands try to increase the financial and other rewards landowners receive for retaining land in forests and other open space. These include reducing property taxes on forest, range, and agricultural lands; providing subsidies for conducting conserva-

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tion-oriented management activites, and purchasing development rights, conservation easements, and land in fee simple (e.g., Bengston et al. 2004). Current enthusiasm for ecosystem services markets arises in part from an interest in providing still another way to fund landowner incentives. Through markets, landowners could be compensated for ecosystem services their lands produce with funding coming either from entities that damage ecosystems or directly benefit from the ecosystem services that are produced.

From the outset, there is no easy way to know whether ecosystem services markets would substitute for or complement existing policy approaches to ecosystem protection. Whether markets might be preferable to other approaches-including simply regulating actions that cause ecosystem damage-depends on how well several practical challenges can be addressed when applying a theoretical model of environmental markets to the real world. Those challenges involve overcoming measurement and monitoring difficulties associated with evaluating the effects of management actions intended to mitigate ecosystem damage or enhance ecosystem health, among others. Questions also arise over whether ecosystem services markets might perform better apart from government regulation and under the sole control of nongovernmental organizations where they can emerge naturally via private enterprise. Despite current enthusiasm for ecosystem services markets, there are few easy answers to such questions. Acknowledging that there are challenges ahead can be a first step in assessing what role ecosystem services markets might play in an overall strategy of ecosystem protection.

Ecosystem Services

Ecosystem services are the products of functioning ecosystems that often are available without direct costs to people who benefit from them (e.g., Constanza et al. 1997). Many typologies have been proposed for describing ecosystem services (e.g., Daily 1997, de Groot et al. 2002, Millennium Ecosystem Assessment 2005, Brown et al. 2007); the typology that is used depends on the purpose it is meant to serve. Interested readers will find discussions about the practical implications of different typologies in Boyd and Banzhaf (2006) and Kline (2006a). Whatever typology is used, ecosystem services provide a framework for describing all the attributes of ecosystems that benefit humans. The desire to describe and evaluate the nonmarket benefits arising from forest landscapes and incorporate them into public and private decision making is not new and early attempts can be found in the work of economists such as Peterson and Randall (1984), Peterson et al. (1988), and Bowes and Krutilla (1989), among others. These works followed even earlier efforts to describe multiple-use forestry on public lands as the joint production of beneficial forest outputs, such as timber, forage, water, recreation, and habitat for species of commercial or recreational interest (e.g., Gregoty 1955). However, the shift toward ecosystem management in recent decades has increased interest among noneconomists in describing similar and other ecosystem benefits, largely to advocate for ecosystem protection (e.g., Daily 1997, Collins and Larry 2007). For most natural resource and environmental economists, the only real difference between the current notion of ecosystem services and their traditional conceptualization of multiple forest benefits is the emphasis on ecosystems as an organizing structure of benefits.

Two economic concepts that are important to understanding ecosystem services are externalities and public goods. Externalities are the side effects of one person's economic activity, e.g., timber production, that influence the well-being of somebody else (e.g., Nicholson 1989, P: 718). An example of a positive externality is the benefit of water flowing from private forestland that provides a municipality with a reliable source of water of sufficient high quality as to require little in the way of treatment. Conversely, an example of a negative externality is the potential cost imposed on that municipality in the form of additional water treatment made necessary by sedimentation resulting from eventual harvest of private forestland. Because neither the benefit of high quality water nor the cost of sedimentation arc reflected in the returns to forest management received by forest landowners, landowners have little financial incentive to consider the external benefits and costs in their forest management and harvest decisions. Externalities are produced along with economic activity, but their positive or negative values generally are not reflected in prices of end products resulting from that activity.

Public goods are things that once produced, benefit everyone and there generally is no way of excluding nonpaying beneficiaries (e.g., Nicholson 1989, p. 729). For example, forest landowners who produce public goods, such as scenic views or clean air, generally are unable to exclude anyone from enjoying these benefits. For this reason, landowners generally are unable to receive compensation for producing public goods through normal market transactions, because it is difficult to "sell" goods when you are unable to restrict would-be purchasers' access to those goods. A feature of public goods is the lack of clearly defined or strongly exercised property rights for them. For example, no individual or entity owns clean air. This feature generally acts as a disincentive for individuals or private entities to act on behalf of public goods, because they are unable to gain financially from producing and selling public goods.

Most ecosystem services have characteristics of both externalities and public goods. The values of ecosystem services produced on private forestland generally are not reflected in prices of forest commodities and land. Landowners thus have little financial incentive to consider ecosystem services in their land-use and land-management decisions. When forest landowners consider seiling land for development, the potential impact to water quality, scenic views, wildlife habitat, or any of the myriad other ecosystem services that forestlands provide typically does not enter their financial decision. As a result, more forestland will be developed than is desired from a social perspective. Such market failures arc a root cause of excessive forestland and open space loss in the United States.

Dealing with externalities and public goods is one of the fundamental rationales for government involvement in environmental protection. Unregulated commodity and land markets generally will not address the issue of whether or not ecosystems are adequately protected and the ecosystem services they provide adequately secured. That is because the costs to the public associated with ecosystem decline and the loss of ecosystem services generally are not considered in market transactions for commodities and land. So, if society finds that there is insufficient ecosystem protection and wants to do something about it, someone must intervene on behalf of society to protect ecosystems and the services they provide. Usually, it is governments that may take on the responsibility of protecting ecosystems by exercising the public's communal property rights to ecosystem benefits. Governments may do this directly through a system of public-

Table 1. Basic policy approaches for addressing ecosystem services.

Regulate behavior that influences services
Tax behavior that reduces services
Subsidize behavior that increases services
Protect and manage lands that supply services
Create markets for desired services

owned and managed lands, such as our national forests and grasslands, or indirectly using various policies and programs that provide incentives to private landowners to protect ecosystems. Nongovernmental organizations, such as conservation organizations (e.g., The Nature Conservancy) and land trusts, also play a role both in the direct purchase of conservation easements and land and by offering their own incentives to private landowners to manage lands to enhance habitat or pursue other ecological objectives. The idea of ecosystem services-as a typology of the benefits that people receive from ecosystems-provides a convenient way to foster intervention on behalf of ecosystems by cleanly defining what is at stake with ecosystem decline and corresponding protection efforts.

Government intervention to protect ecosystems traditionally has involved one or a combination of regulation, taxes, subsidies, and the protection and management of land (Table 1). Althoug most people understand how these more common approaches work, the creation of markets for ecosystem services with the intent of fostering ecosystem protection is more novel. Before we can consider what factors influence the potential effectiveness of ecosystem services markets in practice, we must first consider how such markets work in theory. We will use carbon trading to address climate change as an example, but the principles are similar for other types of ecosystem services markets.

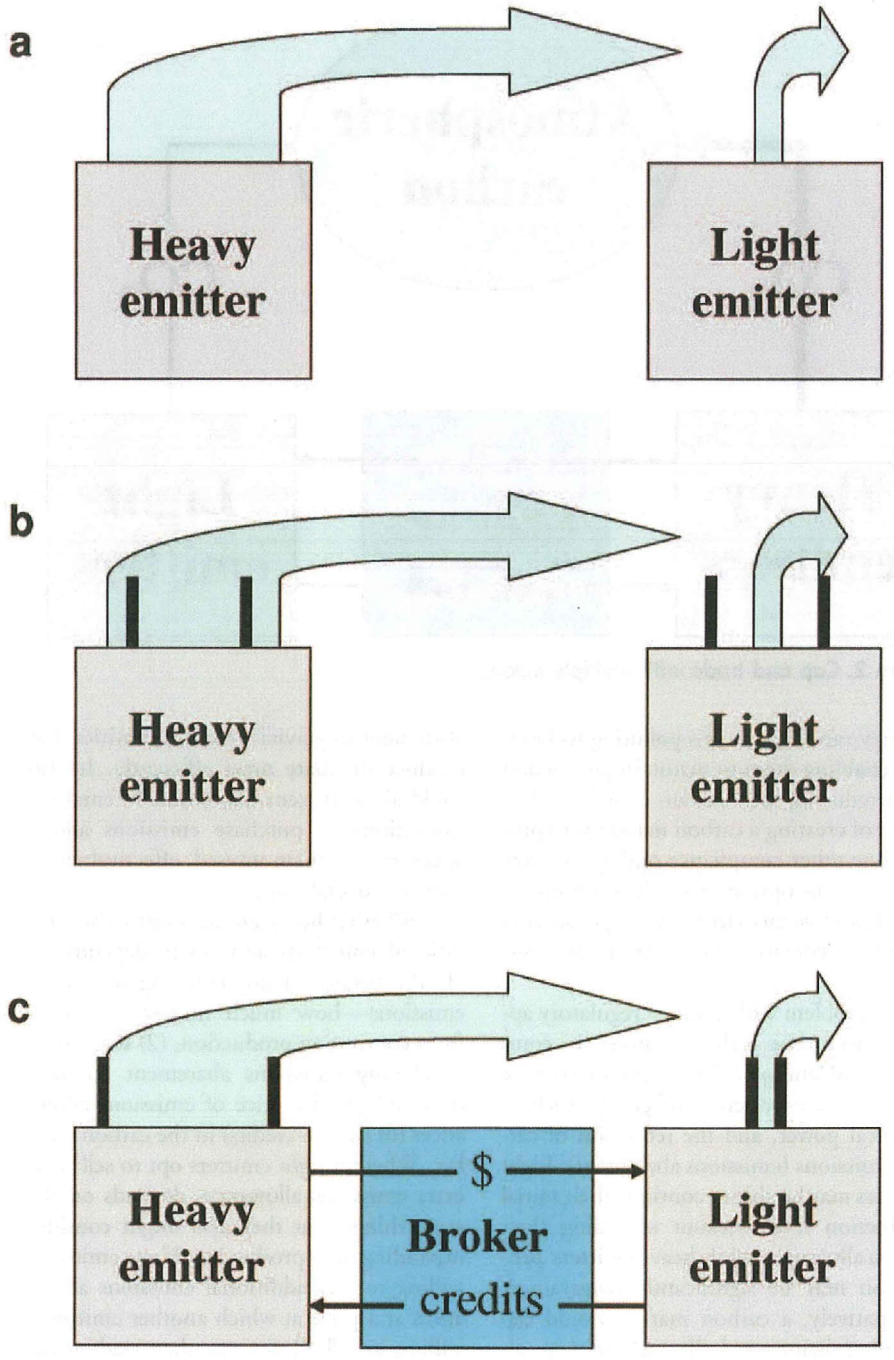

Figure 1. Cap and trade program with two actors.

A Carbon Market Example

Carbon emissions well exemplify the problem with externalities and public goods. In an unregulated world, industry, manufacturers, and power companies, e.g., all carry out production with little consideration of the carbon they emit. Some, such as old coal-fired power plants, are heavy emitters and some are light emitters that perhaps have invested in newer less polluting technologies or produce things more efficiently (Figure 1a). Either way, all producers contribute to total atmospheric carbon and the resulting negative externality of global climate change. The lack of property rights to the atmosphere provides producers little incentive not to, because they need not pay for the right to emit carbon. Public policies focused on carbon and climate change exercise the public's communal right to clean air by limiting or reducing emissions through regulation or some other approach.

With a purely regulatory approach, the goal is to reduce total emissions by establishing a uniform cap on the emissions that individual producers can emit (Figure 1b). However, such caps may be inadequate to reduce aggregate emissions because they do little to control entry into the emitting industry. Moreover, the caps might severely constrain heavy emitters, while affecting light emitters little if at all. With pure regulation, heavy emitters have two options: (1) they can curtail production to reduce their carbon emissions below their allowance, or

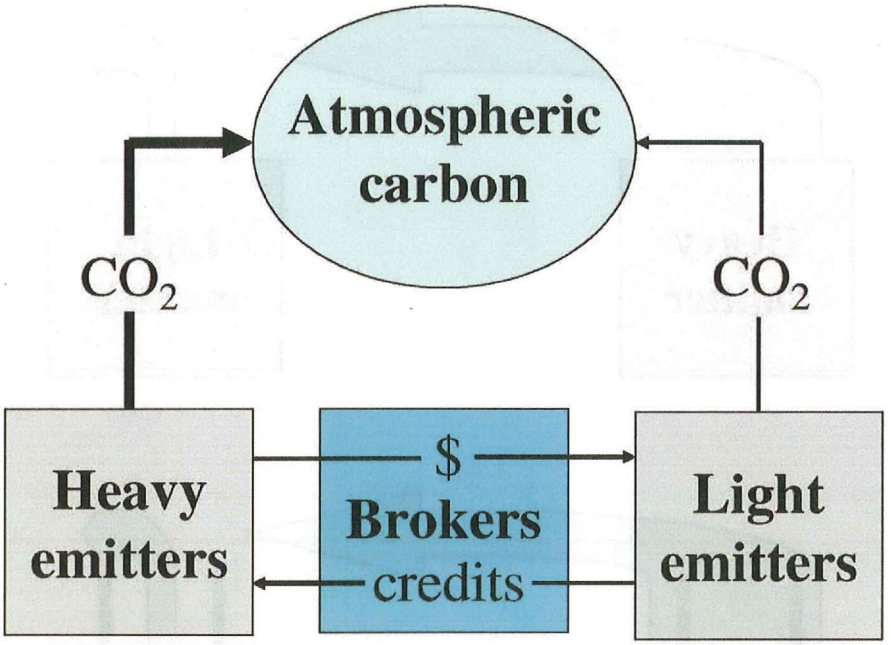

Figure 2. Cap and trade with multiple actors.

(2) they can invest in less polluting technology, enabling them to maintain production while reducing their carbon emissions. The intent of creating a carbon market is to provide one other compliance option to heavy emitters-the option to purchase additional emission allowances to maintain production without having to reduce their carbon emissions.

A problem with a purely regulatory approach to carbon is that it ignores the comparative advantages different producers have in both the production of goods, such as electrical power, and the reduction of carbon emissions (emissions abatement). Light emitters may be able to continue their initial production level without exceeding their carbon allowance, while heavy emitters' production may be significantly constrained. Alternatively, a carbon market would cap overall emissions and allocate emissions allowances to producers enabling them to emit a set amount of carbon over a set period. The initial allocation of emissions allowances might be based on an equal distribution among emitters, an auction, or some other method. The market also would allow trading so that light emitters could sell their unused carbon emissions allowances to heavy emitters who could purchase them in lieu of upgrading their production methods with newer and cleaner technology. This additional option of trading can help to lower the overall costs of environmental protection by enabling production and emissions abatement to gravitate to those entities that produce or abate most efficiently. It also could allow citizens and environmental organizations to purchase emissions allowances to hold them unused, effectively lowering the overall cap.

Whether heavy emitters opt to buy additional emissions allowances depends on (1) the benefit of not reducing their own emissions-how much money they earn from continuing production, (2) the cost of purchasing emissions abatement technology, and (3) the price of emissions allowances (or carbon credits) in the carbon market. Whether light emitters opt to sell their extra emissions allowances depends on the same things, but they also might consider expanding their production. If one emitter is willing to buy additional emissions allowances at a price at which another emitter is willing to sell allowances, then trading occurs, allowing the heavy emitter to continue some level of higher emissions relative to the light emitter (Figure 1c). In the larger market, there might be numerous buyers and sellers of em issions allowances, pl us brokers who facilitate trades (Figure 2). Over time, the regulatory agency would ratchet down the overall cap on emissions to gradually reduce total carbon emissions to the atmosphere.

In general, environmental markets do three things. They force a cap on environmental damage. They penalize the most damaging actors by making them purchase damage allowances and they reward less damaging actors who require fewer damage allowances. In this way, markets force actors to include in their financial and management decisions the costs of any environmental damage caused by their actions, providing a financial incentive to reduce damaging activities. Our example involves carbon, but the idea would be the same with ecosystem services markets. With a water quality market, e.g., a regulatory agency would cap effluent emissions and enable polluters to trade effluent allowances. With a wildlife habitat market, a regulatory agency would cap habitat degradation and enable those who cause degradation to trade the right to degrade habitat. The general idea is to cap damage and trade the right to commit damage. The Environmental Protection Agency's (EPA) Acid Rain Program that established the trading of emissions allowances for sulfur dioxide (SO_2) and nitrogen oxides (NO_X) is perhaps the most publicized example of a cap and trade program in the United States. The Program is widely viewed as a success by virtue of the significant emission reductions that have occurred, the significant cost savings over a purely regulatory approach, and the generally smooth functioning of the market (see, e.g., Burtraw et al. 2006, p. 5.21-5.27).

Including Offsets. A potential add-on to environmental markets is the offset. With offsets, other entities are empowered to increase the supply of damage allowances in a market by performing activities that offset damage committed by others. In the carbon market example, the overall cap on carbon emissions defines the total supply of emissions allowances in the market (Figure 3a). If the market were to include an offset component, it essentially would allow another source of emission allowances in the market by permitting other entities to sell emissions allowances based on their activities that offset the additional carbon emitted under those additional allowances (Figure 3b). [I] Landowners, e.g., might be given the right to sell emissions allowances based on forest management activities (that they otherwise would not undertake) that increase carbon storage on their lands above some predetermined baseline. As before, the long-term goal of the regulatory agency would be to ratchet down the emissions cap over time to reduce total carbon emissions to the atmosphere.

One can imagine ways in which offsets might work in other types of ecosystem ser-

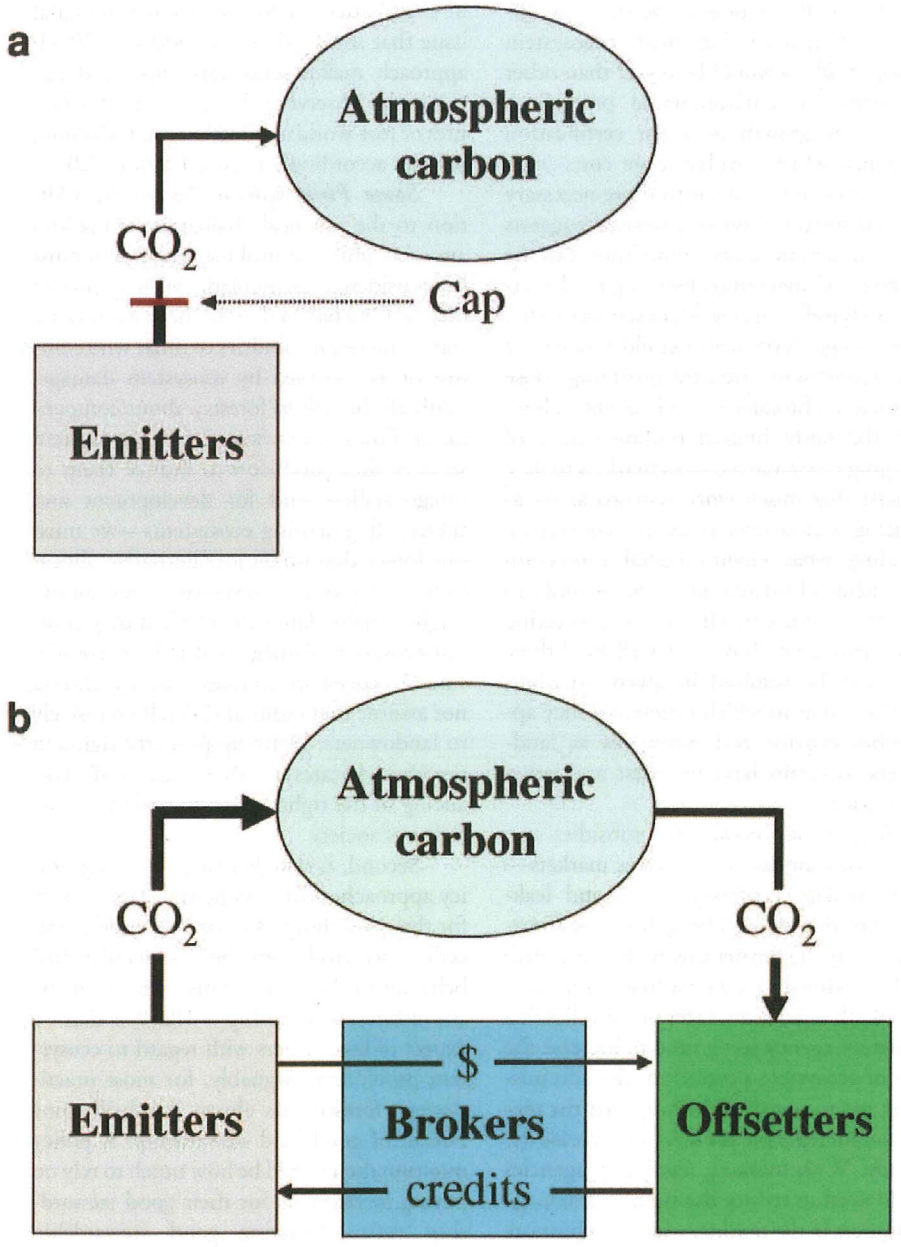

Figure 3. Cap and trade program with offsets.

vices markets. Wetlands banking, e.g., which almost solely is an offset program, sets a lower bound on the area of wetlands that must be maintained within a given region (e.g., EPA 2008). Developers who wish to develop wetlands must purchase the right to do so by financing the creation of wetlands somewhere else. In another example, one might imagine requiring developers to offset the loss of critical habitat for an endangered species by financing the creation or enhancement of habitat somewhere else. This is similar to remediation actions that sometimes are required of responsible parties after oil spills (e.g., National Oceanic and Atmospheric Administration 2007). In the context of ecosystem protection, the general idea behind offsets is to enable entities to increase the supply of damage allowances in the market based on their land-management activities that mitigate damage. In this way, offsets provide additional financing for ecosystem protection and enhancement, but at the expense of additional damage incurred by the increased supply of damage allowances in the market. For offsets to be fully effective, they must be fully interchangeable (or fungible) with the particular ecosystem service they are meant to replace. This condition is easier to meet with some ecosystem services than with others. For example, it is likely easier to ensure the one-for-one offset of a molecule of CO_2 emission than it is to ensure the one-for-one offset of a lost acre of fully functioning wetland.

Some Key Points. First and foremost with cap and trade, it is regulation-the cap-that reduces ecosystem damage, not the resulting trading. Trading reduces the cost of the regulation to entities that commit ecosystem damage *by* giving them another way to comply besides curtailing production or investing in new technology. Markets penalize those entities that commit more damage and reward those that do less. In this way, markets encourage environmentally beneficial innovation among actors by giving actors an incentive to circumvent the need for purchasing damage allowances. Not all entities that commit ecosystem damage will be able to afford damage allowances-some will curtail production and some will go out of business. Although society as a whole may benefit from the greater *ecosystem* protection markets may offer, there can be individuals who lose. Lastly, ecosystem services markets with offsets offer a potential income source to landowners who own forest and other open space lands and who are able to increase their output of ecosystem services to offset ecosystem damage. That is why ecosystem services markets are of such interest to private forest landowners and to those who desire to provide greater incentives to those landowners to maintain land in forests.

From Theoretical to Real World

From a theoretical perspective, markets can result in the same level of ecosystem protection offered by regulating or taxing ecologically damaging activities or subsidizing mitigation (see, e.g., Hartwick and Olewiler 1986, p. 406-420). However, the effectiveness of markets relative to other approaches depends on several factors (Table 2). The first is whether we as a society are able to define and enforce an appropriate level of regulation (caps) based on how much ecosystem damage we agree is acceptable. Effective ecosystem services markets depend on a well-defined goal of overall performance. Second, regulatory agencies must be able to physically measure and monitor performance, including the extent, timing, and effect of ecosystem damage and offset activities. Although not easy, both carbon emissions and carbon offsers can be more readily measured than, say, changes in habitat for

Table 2. Some factors influencing the effectiveness of ecosystem services markets.

Defining an appropriate level of damage regulation
Measuring and monitoring damage and mitigation performance
Geographic distribution of damage and mitigation
Secondary effects
Adequately addressing additionality, permanence, and leakage
Reducing transaction costs

particular species. Measurement and monitoring will be especially difficult when the production responses of some ecosystem services to management are nonlinear or where individual services interact with one another or are interdependent such that potential outcomes are uncertain in aggregate. Focusing market efforts on multiple services-what some practitioners refer to as "bundling"-likely could help to account for interactions and interdependencies associated with the joint production of several individual services, but bundling would not necessarily simplify the measurement task.

A third factor involves considering the geographic distribution of damage. If irnplementing a water quality market, e.g., how do we address the possibility that effluent allowances may gravitate to just a tight cluster of point sources that concentrate water quality damage in one location? Fourth, there are potential secondary effects arising from ecosystem services market forces. Does enhancing an ecosystem service in one location adversely affect another service, possibly in another location and to the detriment of someone else? Fifth, when incorporating offsets into ecosystem services markets there are issues of additionality, permanence, and leakage. Additionality pertains to whether offset actions would have occurred anyway without payment. Permanence pertains to how long offset benefits will last. Leakage pertains to whether offset activities implemented in one location simply shift damage elsewhere.

Finally, there is the issue of transaction costs-the costs of organizing and conducting trades and monitoring the activities of individual participants to ensure that the ecosystem damage that each participant causes remains within the legal limits defined by their damage allowances held. The potential effectiveness of ecosystem services markets declines as these costs approach the value of potential gains in ecosystem services expected to result from trades. Transaction costs generally are one of the most significant factors determining whether ecosystem services markets would be better than other approaches to environmental protection. The recent growth of forest certification programs, which involve some costs (e.g., monitoring costs) similar to those necessary with ecosystem services markets, suggests that transaction costs sometimes can be overcome. Conceivably, focusing market efforts on bundles of ecosystem services rather than a single service also could reduce per unit transactions costs by spreading those costs across a broader array of benefits. However, the fairly limited trading extent of emerging ecosystem services markets to date suggests that much work remains as far as reducing transaction costs are concerned. Deciding what environmental protection approaches ultimately are most feasible to implement and cost-effective at protecting ecosystems depends on how well all of these issues can be resolved in given situations and the extent to which different policy approaches provide real incentives to landowners to retain land in forest and other open space.

Regulation, taxes, and subsidies can suffer from similar challenges as markets-most notably secondary effects and leakage- but they may make up for those shortcomings by the greater ease with which they can be modified in response to new information. With regulation, taxes or subsidies, if a regulatory agency sees a need to increase the level of ecosystem protection, the administering agency needs only to tighten the regulation, increase the tax level, or increase the subsidy. With markets, regulatory agencies would need to reduce the supply of damage allowances in the market, which can be more time-consuming and costly. Taxes also have additional advantages over markets in their greater certainty regarding the resulting economic impacts of associated regulations and tax revenue generated (e.g., Raymond and Shively 2008). Purchasing land and conservation easements can be a slow and costly undertaking that, at best, results in a spotty patchwork of protected land. However, the permanence of such protection might better withstand changing political climates that otherwise might lead to changes in regulation, tax, subsidy, and market programs. In some cases, such as with the EPA's Acid Rain Program, a particular set of circumstances align to make a market approach seem effective (e.g., Burtraw et al. 2006, p. 21-27). However, market approaches will not work in every situation for every environmental issue that society desires to address. Which approach makes sense can only be determined by observing the successes and failures of real-world applications and adjusting policies accordingly (Coase 1960, p. 22).

Some Philosophical Issues. In addition to the practical challenges of markets are some philosophical issues that also must be considered, particularly with regard to offsets. One has to do with how we allocate rights and responsibilities to those who commit or are harmed by ecosystem damage. With all the talk in forestry about compensating forest landowners for the ecosystem services they produce-to induce them to forego selling land for development and thereby fragmenting ecosystems-we must not forget that under an alternative allocation of rights and responsibilities society might penalize landowners when they commit ecosystem damage that reduces socially valued ecosystem services. Society should not assume that rights always fall exclusively to landowners. Defining property rights in the United States has always involved a balancing of the rights of landowners with the rights of society.

Second, is whether by advocating policy approaches that compensate landowners for the good things they do, we build a precedent that erodes our ability to regulate bad behavior in the future. This involves the issue of forest stewardship- what it is that we expect of landowners with regard to ecosystem protection. Arguably, for most practitioners, forestry has always involved some notion of good land stewardship. A policy question then would be how much to rely on paying landowners for their good stewardship versus fostering good stewardship through nonmonetary means. The third issue involves treating nature as a commodity. With ecosystem services markets we are treating nature as just another thing to be bought and sold. There are many people who object to that approach, people who would prefer that we address ecosystem protection in other ways (see, e.g., Mazzotta and Kline 1995).

Voluntary Markets

The final issue we will address is the idea of so-called "voluntary markets." As we understand them in the context of how the term is used by their advocates, voluntary markets involve situations in which someone is willing to pay for ecosystem protection when they do not have to. Other

observers have called such programs "beneficiary-pays markets" (e.g., Pearce 2004) because there is no overarching regulation that forces anyone to reduce or offset ecosystem damage. Rather, people pay for such activities of their own volition, presumably because they themselves perceive a benefit from doing so. An example is the Chicago Climate Exchange to whom you can send a donation to offset your own carbon footprint and they will see to it that appropriate activities (e.g.,treeplanting) are undertaken (Collins et al. 2008). Forest certification programs are a somewhat related example, by enabling consumers to voluntarily pay more for wood products thar are produced in compliance with certain environmental or socially responsible standards. Programs that depend on voluntary contributions are valid ways to finance ecosystem protection. Nonprofit conservation groups such as The Nature Conservancy, after all, have long financed the purchase and management of conservation easements and land using the voluntary contributions of members. However, we caution that if environmental advocates truly believe that the current level of ecosystem protection in the United States is insufficient, then voluntary markets, at best, are *only* part of a remedy and, at worst, are a serious distraction from addressing a more difficult task at hand.

Voluntary markets are akin to the types of private arrangements envisioned by Coase (1960) that would be negotiated between individuals who create or are affected *by* externalities (Coase won the 1991 Nobel Prize in Economics for this work). With clearly defined property rights regarding, say, pollution, two individuals through private bargaining would arrive at a mutually agreed on level of pollution. If property rights initially gave polluters the right to pollute, then an individual adversely affected by pollution would willingly compensate a polluter for reducing their polluting activity to the point where the marginal external cost of pollution to the affected individual just equaled the marginal benefit of polluting to the polluter. Conversely, if property rights initially gave nonpolluting individuals the right to live free of pollution, then a polluter would willingly compensate an individual adversely affected by pollution in return for their accepting an increase in pollution to the point where the marginal external benefit of pollution to the polluter just equaled the marginal external cost of pollution to the affected individual. In a carbon offset example, individuals who "benefit" from reducing their carbon footprint might use the Chicago Climate Exchange as an intermediary with which to compensate forest landowners for planting more trees. In an ecosystem protection example, individuals who "benefit" from ecosystem protection might use The Nature Conservancy as an intermediary with which to purchase conservation easements or land from landowners who otherwise would sell their land for development.

Advocates praise the seemingly new source of conservation funding offered by voluntary markets while noting that it arises completely apart from government intervention. However, there is a potential problem, one fully acknowledged by Coase (1960). Whether or not individuals will voluntarily negotiate such private arrangements greatly depends on whether the net gains from trading are sufficiently high for both individuals to overcome the costs of negotiating, i.e., transaction costs. Successful negotiations will be more likely when the benefits of such arrangements are more certain, measurable, and enforceable-some of the same factors that influence the feasibility and effectiveness of environmental markets generally. Voluntary negotiations also will be more likely when there are just a few actors involved in creating a harmful externality or seeking redress for an externality, as opposed to many. However, private bargaining will be decidedly less likely when the externality at issue is more "public" in nature and when there are a large number of actors either affected by the externality or responsible for its production, again, largely because of prohibitive transaction costs (e.g., Hartwick and Olewiler 1986, p. 408). This last condition is more characteristic of situations with most ecosystem services. At the extreme is carbon and climate change, a problem so big, with so many actors, and with conceivable impacts so uncertain in their exact spatial configuration and timing that people have significant difficulty grasping how it might affect them personally. If there is any promise to voluntary markets, it is that many traditional and emerging nongovernmental organizations are stepping up to play the role of intermediary, which could be one step toward lowering transaction costs involved in private ecosystem protection arrangements.

However, there is still one other problem with voluntary markets, and it involves the public goods nature of ecosystem protection. Unlike a true regulatory-based *ecosystem* service market, voluntary markets as we define them are not based on an initial reckoning of how much ecosystem damage we as a society are willing to accept, as well as the implementation of an overarching system of regulation designed to get us there. Rather, voluntary markets are based on the whims and good wishes of select individuals who desire to do good by contributing to the environment. The primary problem then is that in voluntary markets "shoplifters" are not prosecuted (Figure 4). You have some people willing to finance ecosystem protection, but you have others who are still willing to receive their ecosystem services for free. In economic jargon they are free riders. In this way voluntary markets fail to correct for the market failures inherent in the externality and public goods nature of ecosystem services that are at the root of the problem of insufficient ecosystem protection in the first place. Rather than being a new innovation, we see voluntary markets as a retooling of traditional environmental philanthropy that has long directed voluntary contributions toward environmental protection activities such as the purchase of conservation easements and land and lobbying on behalf of the environment.

All of this does not mean that voluntary markets are without merit; only that we feel that current enthusiasm for them could be more guarded. Some questions we might ask about voluntary markets are What is the extent of free riding domestically, but also internationally if an issue is of global concern? To what extent are voluntary markets solving the problem of insufficient ecosystem protection over and above what other approaches are doing? Are additionality, permanence, and leakage adequately addressed? Do charitable contributions to emerging voluntary markets represent new conservation money or do they simply draw from the existing population of contributors who have long financed environmental philanthropy? That is, are we getting more ecosystem protection or are contributors simply spending limited conservation dollars on a different set of activities?

There is a value to the earnest consideration of new ways to protect ecosystems. However, policymakers and environmental advocates should not be lulled into a false sense of optimism by current enthusiasm for markets and especially voluntary markets that we feel has permeated numerous conferences and workshops in recent years. In

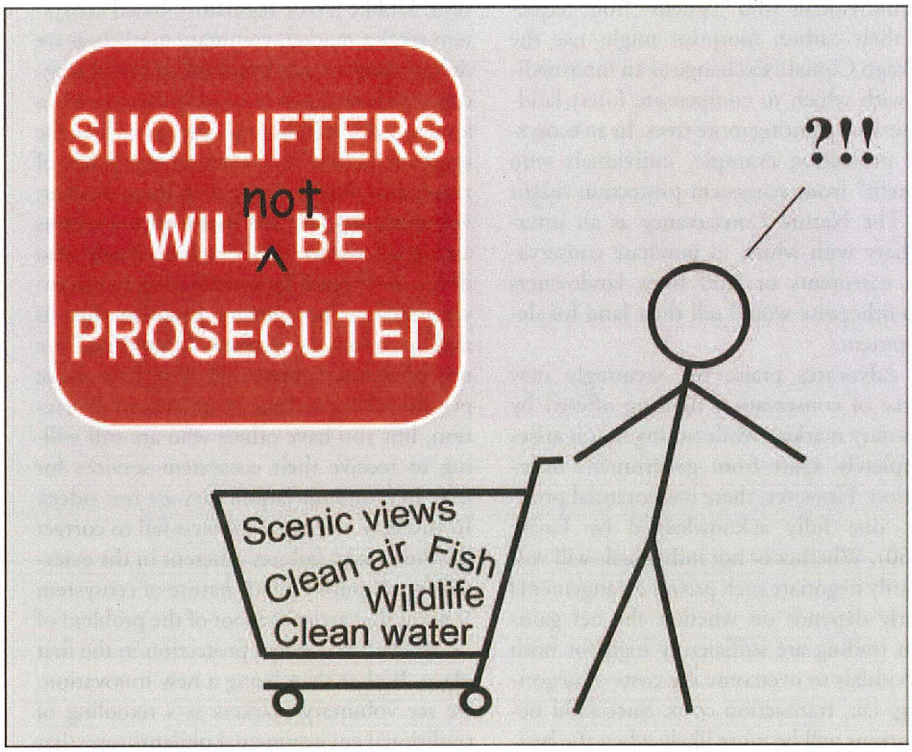

Figure 4. Voluntary ecosystem services markets.

addition, they should not overlook the success of more traditional approaches to ceosystem protection now seemingly viewed as inadequate. What may be needed is a strategic application of different approaches chosen alone or in combinations as particular circumstances and potential complementaritics among approaches warrant.

Protecting Open Space

Of broader concern in the quest for ecosystem protection is whether ecosystem services markets or any policy prescription, for that matter, can offer sufficient incentive to landowners to retain land in forest and open space when development may present them with tempting financial opportunities. Federal, state, county, and municipal governments and nongovernmental organizations have for years provided funding for purchasing development rights, conservation easements, and land in fee simple. All states grant landowners who own forests and other open space lands some measure of preferential tax assessment for property tax purposes. Many states, counties, and municipalities also attempt to regulate land use and development via zoning and other planning mechanisms. Can policymakers and protection advocates have any hope that yet another policy approach added to the conservation toolbox will finally win the battle of ecosystem protection in the United States?

A stark truth is that ecosystem protection efforts often face an uphill battle because some development of open space lands is inevitable, resulting as it does from market forces in response to an ever increasing population and rising incomes, among other factors. People have to live somewhere, after all, and they also crave the material rewards that their greater income affords. Interestingly, however, over time, the market forces that favor development often can be offset by accompanying shifts in public perceptions and preferences regarding the value of open space lands, because increasingly urban and wealthier people tend to favor greater protection. However, whether these dynamics result in meaningful ecosystem protection opportunities depends a bit on timing.

Hidden beneath concerns that too little ecosystem protection is taking place lies a dilemma: people in the United States tend to be willing to address open space loss only when they see open space becoming sufficiently scarce (e.g., Kline 2006b). A secondary factor is peoples' willingness to afford greater protection, which tends to be correlated with their personal incomes (Kline 2006b). As a result, people may be unwilling to do something about ecosystem protection until the situation becomes sufficiently dire-until the perceived benefits of protection outweigh the perceived costs in the collective mind of the public. There can be situations in which intact ecosystems still exist but people are unwilling to invest in protection, and situations in which people are willing to invest in protection but it comes too late-ecosystems of concern are too far gone. This dilemma may not be something that ecosystem services markets can remedy. Finding effective ways to provide sufficient incentives to landowners to retain land in forest and other open space in the face of growing development pressures is only part of the challenge. Ecosystem protection also depends on fostering public support necessary to enact and fund ecosystem protection efforts. Building that public support will not come from implementing new policy approaches such as ecosystem services markets. Rather, it may require a carefully framed educational campaign designed to sway the public to the greater importance of maintaining ecosystems. This may be the greatest value of those ecosystem services typologies-that they provide a descriptive framework of ecosystem benefits with which to foster social discourse about the need for and value of ecosystem protection.

Ecosystem services markets certainly are one approach among several to include in an arsenal of approaches to ecosystem protection; but perhaps the real battle-at least in the United States-is making a more convincing argument to the public that greater ecosystem protection is necessary, beneficial, and affordable. Marketlike programs to enhance the provision of ecosystem services and foster ecosystem protection deserve the current level of interest they enjoy. However, they also warrant our close scrutiny so that we might gauge their promise and likely effectiveness relative to other time-tested approaches that are more familiar. In this way, current enthusiasm for ecosystem services markets might be fitted within a pragmatic overall strategy of ecosystem protection and open space conservation that is not blind to the fact that easy remedies to the decline of ecosystems and open space are rare if not altogether nonexistent.

Endnotes

[11 Figure 3b modeled after "Generalized carbon credit marker" figure in Williams and Aller (2000).

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