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Incentivizing cooperative agreements for sustainable forest management☆ Experimental tests of alternative structures and institutional rules

David McEvoy [a], Michael Jones [b], Michael McKee [a,*], John Talberth [c]

[a] Appalachian State University, USA
[b] Bridgewater State University, USA
[c] World Resources Institute, USA

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ABSTRACT

Non-industrial private forestland owners (NIPFs) manage the majority of US forestland. But land use conversion is the highest among this group, in part due to the relative paucity of income earned, these agreements can provide opportunities for long term payments from sales of timber and ecosystem services at levels sufficient to reduce the temptation to convert. In this structured well, these agreements can provide opportunities for long term payments from sales of timber and ecosystem services at levels sufficient to reduce the temptation to convert. In this paper we investigate various means of encouraging meaningful participation in cooperative agreements for forests that emphasize conservation. We report on the results obtained through a series of laboratory market experiments in which the participants play the role of NIPFs and make resource allocation decisions facing real financial incentives. Our results shed light on the relative factors that affect the success of these agreements. In particular, we find that when agreements include contribution thresholds (with money back guarantees) coupled with relatively long contract lengths, the groups are able to preserve a significant fraction of forested lands through conservation agreements.

1. Introduction

The southern United States has experienced rapid and extensive conversion of forestlands to residential development in the past decades. Over 15 million acres was converted from 1990 to 2002 with another 21 million acres expected to be lost by 2030 (Wear, 2002). Conversion rates have been highest among small non-industrial private forest owners (NIPFs) in part due to high transaction costs and other limitations to earning revenue from active forest management that are not present for most larger landowners. Many of the traditional techniques for active forest management such as harvesting timber, controlling pests and prescribed fire are too expensive for NIPFs and only become feasible when taking advantage of economies of scale afforded by larger, contiguous acreages (Ashton et al., 2008). In many cases family farms have been sold to developers for subdivisions. Frequently the residents of these newly created subdivisions are seasonal occupants; these dwelling units are often second homes. The pace of such development has slowed due to the current recession but it is to be expected that this is a temporary phenomenon. It is unlikely that tastes for such seasonal homes have changed.[1]

The history of the forested lands in the Southern Appalachians recounts successive periods of development. Eller (1982) describes a pattern of timber development through the purchase of timber rights from the landowners, often for pennies on the acre. The timber interests were usually from outside the southern Appalachian region. And, the harvesting of the timber was usually accomplished through clear cutting and establishing local sawmills on rail lines. In more recent years the development of these southern Appalachian forests has taken the form of subdividing the land into "acreages" and building homes (often second homes) on these parcels. In the process, some of the second growth timber has been cleared resulting in a patchwork pattern of forested lands.

The problem facing Southern Appalachian forests is one that confronts most private forest owners; the opportunity cost of leaving the land undeveloped is increasingly high. While most NIPFs are willing to accept a stream of income from conservation or sustainable management

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* Corresponding author at: Department of Economics, Appalachian State University, Boone, NC 28608, USA. Tel.: +1 828 262 6080.
E-mail address: mckeemj@appstate.edu (M. McKee).

[1] In addition, the impending retirements of the "baby boomer" generation will shift the demand curve for such properties to the right. Since much of the individual financing for these dwelling units has derived from mortgages on primary residences, often located in other states such as Florida, the recent downturn in housing prices and the attendant difficulties in obtaining housing backed financing have slowed the demand for such land conversion and development.

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that is significantly less than the benefits of converting the land to industrial forest uses or land sales (see Raunikar and Buongiorno, 2006), this "conservation premium" is increasingly unattractive when land prices reach several tens of thousands of dollars per acre and absent entirely when barriers to entry in ecosystem service markets remain too high. In the face of such pressure, one potential means of preserving forested lands is through the use of voluntary cooperative forest management agreements (CAs). Cooperative agreements for NIPFs present an emerging area for study and development of public policy incentives, globally and across the US, especially because of the significant role they can play in management for ecosystem services across large landscapes (Yang et al., 2013; Goldman et al., 2007; Kittredge, 2005; Erickson et al., 2002). Land managed under a CA, temporarily or in perpetuity, is preserved and pooled with other parcels of land by other agreement members. The agreement members manage the land with the goal of helping boost landowner incomes through the sale of timber, non-timber forest products, recreational access and emerging markets for ecosystem services. There are many benefits from joining a CA.

Small forest owners often face barriers to entry into ecosystem service markets due to the high transaction costs associated with management of relatively small parcels; pooling lands through CAs help reduce these costs. Management for timber, wildlife habitat, esthetics, outdoor recreation and privacy all can be enhanced by planning and managing forests at scales larger than individual NIPF ownerships (Kittredge, 2005). Ashton et al. (2008) identify seven major CA benefits: opportunities to share management knowledge and techniques, improved property access, coordinated forest health, shared work activities, increased profits, increased value added, community development and political clout.

In practice, CAs vary widely from one country to another and throughout the US. Kittredge (2005) identifies four basic forms: (1) information cooperatives, where landowners share information, experiences, and advice but generally operate independently; (2) equipment cooperation, where members share equipment and machinery for harvesting timber, road management or other intensive uses but still operate independently; (3) financial cooperation, where members organize for the purpose of collective marketing of wood products, and (4) management cooperation, where landowners manage cooperatively on a spatial and temporal scale for multiple objectives. Management cooperatives are most amenable to conservation and management of ecosystem services, but have the least uptake. Therefore, the structure of incentive programs to induce greater NIPF owner participation in management cooperatives – especially those with a conservation focus – is of keen interest to researchers and policy makers.

CAs can function in many different ways. For example, landowners may sell their land outright (transfer all rights) to a conservancy (for example, the Blue Ridge Conservancy) and the conservancy can either manage the lands itself or transfer to a management entity such as the State or Federal Parks Service. In this case, the landowner receives a lump sum payment — effectively selling the land to conservation practices. Alternatively, the landowner can enroll their lands in a conservancy agreement which imposes limits on the development (and perhaps modification) of the lands for the period specified in the agreement. The CA can pay the landowner for this option (essentially a lease) and generate the payment funds through selling timber or other ecosystem services (carbon sequestration, habitat preservation, watershed preservation, etc.) in the emerging markets for such services.

While the potential benefits of CAs are promising, whether these agreements can effectively lead to increased conservation of forested lands is an empirical question. These agreements can be structured in any number of ways and can include a variety of different policy components. Currently there are insufficient data from existing agreements to tease out the relative factors that lead to successful (or unsuccessful) arrangements, or answer a critical policy question: how high do CA benefits have to be to induce NIPFs to participate and conserve rather than sell their lands to developers? The empirical research is limited, but informative on the range of factors that may come into play. Yang et al. (2013) found that NIPFs stated willingness-to-participate in forest cooperatives was associated with demographic characteristics like education, forest-related income, size of forestland, and attitudes toward land tenure reform and cooperatives. Goldman et al. (2007) investigated cooperation in the production of ecosystem services and evaluated the relative merits of three incentive designs — the cooperation bonus, the entrepreneur, and the ecosystem service district. Their research underscored the importance of near-neighbor effects, specifically; they found that the cooperation bonus incentive is most likely to work where neighbors know each other or at least interact on some level. Similarly, Parkhurst et al. (2002) found in the lab that a cooperation (agglomeration) bonus for maintaining contiguous wildlife habitat almost always stimulated conservation outcomes whereas the lack of such a bonus almost always created fragmented habitat. Warziniack et al. (2007) tested the importance of communication and reputation in a spatial coordination game among small landowners with payoffs designed to encourage preservation of large contiguous blocks of land. They found cheap talk to be an effective tool, and reputation to be the strongest determinant of efficiency.

This paper builds on previous work by using controlled laboratory experiments to test the effectiveness of different agreement structures and institutional rules for a CA whose emphasis is on conservation and management of ecosystem services. In these experiments, subjects take the role of an individual NIPF and make CA membership and land use decisions facing real financial incentives that simulate the incentives forestland owners face outside of the lab.[2] To simplify the analysis so that it is conducive to experimental tests, we consider owners who have three options regarding their land. Owners can (1) sell their lands to developers who will subdivide the property and construct housing, or (2) retain their lands for present use with an option to sell or enroll land in the future, or (3) join a CA and enroll all or a portion of their land.

The first two land use options are straightforward in the sense that those options generate benefits that accrue only to the landowner. However, the third option, enrolling land in a conservation agreement, generates a private return but also creates public and club benefits. For example, a CA member's return for ecosystem services is an increasing function of the entire amount of land enrolled in the CA. This is clearly a club good. However, some benefits of a CA will also be enjoyed by non-members who do not enroll land into a conservation agreement. For example, increased conservation efforts may lead to improved scenery, more solitude and/or improved nearby recreation resources. Therefore, the decision to contribute land to a CA is effectively a voluntary contribution to a public good (with additional club benefits). Because forest owners can free ride off the benefit of others' contributions, there is a clear prediction of sub-optimal levels (underprovision) of land tendered to conservation agreements. This study explores whether such agreements can be structured in such a way to mitigate the free-rider problem.

The next section develops a simple theoretical framework that captures the tensions inherent in forestland use decisions; in particular the model captures the public good/club good nature of the CA and the

[2] Laboratory methods are now widely accepted as a methodological approach in the testing of economic theory and have increasingly been used to examine various issues in public policy. Lab experiments offer a low cost means of testing policy much as wind tunnel testing is applied to aircraft and building design. A central issue in the use of economic experiments for policy evaluation is the external validity of the experimental results. This concern is most often raised in conjunction with concerns over the subject pool consisting almost entirely of students. The external validity question is, do the results in the lab generalize to the field setting? To be useful to policy decisions, experiments must satisfy the precept of "parallelism" (Plott, 1987). Internal validity, like parallelism, can be demonstrated through the evaluation of the design. External validity requires comparisons across subject pools and with such behavior as can be gleaned from naturally occurring environments that parallel the lab setting. There is little literature in this regard since many of these incentive programs are new (and even untried). The discussion in Kittredge (2005) suggests our experimental setting meets the basic conditions for external validity.

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