

Auctioning the Forest: A Qualitative Approach to Exploring Stakeholder Responses to Bidding on Forest Ecosystem Services

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Abstract The loss of private forestland diminishes ecosystems, including wildlife habitat, carbon sequestration and clean water. The emergence of new markets for forest ecosystem services offers one solution for private forestland financing while having the potential to increase the provision of forest ecosystem services. The general public's willingness to participate in an auction mechanism for private forest ecosystem services was assessed for a regionally representative forest in Washington State using focus group methodology. The auction mechanism utilizes cost-effective management scenarios that stakeholders competitively bid on. Participants exhibited preferences for specific management plans while also making trade-offs in order to ensure that a plan would win. Participants expressed clear preferences for recreational access, mature forest habitat, aesthetic amenities, and improved water quality. Participants were receptive to the auction mechanism while maintaining concerns over viability, transparency, and local stakeholder involvement.

Keywords Auction mechanism · Ecosystem services markets · Focus groups · Recreation · Water quality

Introduction

The emergence of markets for ecosystem services offer a solution for financing private forestland management in order to maintain private forestland while also increasing the potential to provide greater environmental benefits at cost-efficient

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levels (Greenhalgh et al. 2007; Selman et al. 2007; Cochran and Logue 2011; Deal et al. 2012). These markets offer ways to incentivize forestland preservation for forest landowners of various sizes, with the potential for small forest landowners to aggregate land holdings to “sell” ecosystem services. While there are ethical concerns that payments for ecosystem services are akin to the commodification of “nature” itself, some would argue that these markets should be explored as an option for encouraging greater provision of the non-market goods that forests provide (Krieger 2001; Bishop and Pagiola 2012). Timber harvest has been a primary revenue generator for private forest landowners in the U.S. (industrial and non-industrial alike). Forests, however, provide complex arrays of ecosystem services, in addition to provisioning services (e.g., wood products), which benefit society both directly and indirectly. In a market context, these ecosystem services, largely public goods, are typically underprovided (Krieger 2001; Chee 2004). Furthermore, passive-use values are often a substantial component of the total economic value of forest ecosystems (Krieger 2001; Pearce 2001). Markets typically under-provide public goods on privately owned forests, which can lead to a greater emphasis on short-term timber interests, and non-forest development that impacts broader ecosystem functionality (Bradley et al. 2007; Tóth et al. 2010; Ruseva and Fischer 2013). Therefore it makes sense to explore ways to create forest ecosystem services markets that can reduce the inefficiency of market failures associated with public goods provision.

Market-like mechanisms for ecosystem services are being explored within the US and across the globe (Bradley et al. 2007; Halsey 2010). Stanton et al. (2010) assessed ten US led markets for ecosystem services, with the majority of those being driven by federal conservation priorities and municipalities looking to provide clean drinking water or improved water quality as impacted by farm and forestry land use. Governmental and non-governmental organizations in Washington and Oregon have been exploring the role of forest ecosystem service markets as a way to maintain the private forestland base (Cochran and Logue 2011; Institute for Natural Resources 2012). More directly, state agencies in Washington are exploring the potential of a state-sponsored ecosystem services marketplace (Batker et al. 2010; HR 2541 2010). New York City’s payment for ecosystem services to protect drinking water by preserving forestland in upstate New York is perhaps the best U.S. example of a successful payment for ecosystem services project (Kenny 2006).

Underlying the potential for ecosystem service markets, a number of studies have explored general public willingness-to-pay for forest ecosystem services which highlights the existence of latent demand for greater provision of the public goods that forest ecosystems provide, including outcomes such as maintaining old growth habitat, water quality protection and carbon sequestration (Shapansky et al. 2003; Xu et al. 2003; Garber-Yonts et al. 2004; Davis, Midghall and Hibbits, Inc. 2010; Moore et al. 2010). However, little research has been conducted on public willingness to participate in markets for forest ecosystem services nor has much research examined market-based mechanisms that provide for efficient ecosystem services delivery and actively engage participants in the market process (Mercer et al. 2011; Bishop and Pagiola 2012).

To address this issue, a group of researchers at the University of Washington developed ECOSEL, a virtual-marketplace that provides a voluntary auction-based mechanism designed to match potential buyers of ecosystem services (e.g., private individuals, corporations, and philanthropic organizations) with private forest landowners who are interested in diversifying their forest-based income. The study described here is a qualitative exploratory effort aimed at better understanding potential stakeholder involvement in markets for ecosystem services, while specifically evaluating an ECOSEL platform for bidding on forest ecosystem services. This research examines emergent themes associated with participant responses to putting a price tag on essential forest ecosystem characteristics.

ECOSEL: An Ecosystem Service Auction Tool

ECOSEL is a decentralized, online mechanism where potential buyers of forest ecosystem service can bid on alternative management plans that, if implemented, are projected to lead to a suite of ecosystem services (Tóth et al. 2013). The ECOSEL mechanism resembles an auction in that bidders can compete on different management plans, reflecting diverse preferences among stakeholders. ECOSEL is also a subscription game so that bids placed on the same plan add up, aiding in bidder cooperation. Additionally, ECOSEL is a multi-unit game where various management plans, with their concomitant environmental benefits, are offered up simultaneously for bidding.

Professional foresters and forest ecosystem modelers designed spatially explicit, long-term forest management plans¹ on 30-year management horizons to provide for a steady flow of forest products while also providing for varying levels of carbon sequestration and mature forest habitat. Variable intensity of forest management options are included in the management plans, with some incorporating clearcut patches, others thinning specific age classes out of stands through selective harvesting, and other plans that maintain intact mature forest riparian corridors. Expected management outcomes are explicitly predicted using least-cost, multi-objective optimization modeling (Tóth et al. 2013).

In the context of structuring the purchase of a management outcome, using an online platform, potential buyers review modeled outcome assessments of the various management plans that spatially-illustrate and explain relative trade-offs between sequestered carbon, total acres of late successional habitat, and the net present value of timber products. Each plan has a reserve price that represents the net present cost to the landowner for implementing a specific management plan. Buyers then bid on their preferred management plan and the plan that attracts bids with the largest combined value above the reserve price wins the auction. The

¹ For each modeled management plan, basic Forest Practices rules given under the Washington Department of Natural Resources criteria are met.

ECOSEL platform allows costs associated with specific management plans, typically due to losses in timber revenue, to be offset by bids.²

Research Method

Two separate focus group discussions³ were held during the winter of 2010, with participants recruited from Pierce County, the second most populous county in Western Washington State. Human Subjects approval was obtained through University of Washington's Institutional Review Board. Participants consisted of semi-urban and rural citizens living within 90 min of the case study forest. Participants in both focus groups were considered to be local stakeholders with one group purposively recruited from the Nisqually River Council (FG1), a local stewardship council focused on sustainability of the Nisqually Watershed where the case study forest is located. The other group was recruited through an open call for participants who live in the area (FG2). Overall, participants were not forestry professionals and so did not have in-depth knowledge of silviculture. Due to the selection process of the focus group participants, there is some self-selection bias inherent in the sample. The results of this research should be considered within the context of these participants.

The first part of the focus group discussion was designed to give participants an experience of the ECOSEL auction mechanism after listening to a short presentation (~20 min) on the auction format; participants engaged in the mock auctions for a set period of time (~30 min) after being given a hypothetical dollar amount of \$10, which was the same for each participant, was to be used for online bidding, however, participants could message each other online to generate interest in a winning option. After participating in the auction, participants joined the moderator for an hour-long focused discussion. The focus groups were moderated with the purpose of exploring and gaining better understanding of participants' experience with the auction mechanism and followed a semi-structured questionnaire format commonly used in focus group research (Krueger 1994). Focus group data consist of transcribed digital recordings of each of the focus groups, including summarized notes taken by the lead moderator. Analysis was conducted using NVivo 9 Software used for coding data and organizing them into categories. Participant comments were coded into two main themes presented in the results section with the first theme as perceived trade-offs and challenges, with sub-themes of viability, transparency and openness and stakeholder engagement. The second theme is stakeholder preferences for aspects of forest management plans.

² The ECOSEL auction analyzed in this study was hypothetical in nature; however, the ECOSEL mechanism is designed to actually be implemented, which includes legal provisions that guarantee compliance by the "seller" of the winning management plan purchased by bidders.

³ There are no clear guidelines on sampling for qualitative data given that a suite of factors might drive the sampling approach. Additionally, qualitative data is not intended to be generalized to a broader population as is common in quantitative analyses, therefore there are no hard and fast rules for how many focus groups to conduct as part of a study (Powell and Single 1996), it is fair to note that a sample of two focus groups is small, yet still useful, particularly in exploratory studies.

The management plans that served as the context for focus group participants were developed using the University of Washington's Pack Forest (Eatonville, WA, United States) as the case study forest. The Center for Sustainable Forestry manages this 1700 ha, 186-management units of Douglas fir (*Pseudotsuga menziesii*) and mixed conifer species. Timber revenue supports forestry operations as in a private forest. As structured by the ECOSEL mechanism, participants evaluated management plans during the auction experience in order to better explore the relative preference they have for certain management options and their associated environmental benefits. The notable difference between the plans that focus group participants evaluated were that FG1 evaluated management plans that emphasized water quality and improvements to salmon habitat due to their special interest in water quality in the Nisqually River Watershed. FG2 looked at more aesthetically oriented management options, designed to target residents of the nearest town of Eatonville in order to explore local stakeholder preferences for viewshed amenities. Together these groups weighed the trade-offs between different management types in order to bid on their preferred management option (Table 1). Participants were able to choose from different management options up until the bidding period ran out and then they had to settle on their final management preference. During the allotted bidding time, participants were able to message each other online to generate support for different options.

Results

Perceived Trade-Offs and Challenges

Participants in both groups used the entire bidding time allotted for management plan selection thereby coming to a final decision only as time was expiring. Some viewed the time constraints and compromise in the decision process as impacting their ability to fully express their preferences. Each participant recognized that compromise was inherent in the bidding process. Some saw compromise as a route to facilitate the completion of a bid. For example, a quote from a FG2 participant was representative of the need to compromise in order to move the process forward, "I want to see a process go forward, I don't want it [the process] to be stalled with a bunch of haggling and I am willing to compromise." Interestingly, FG1 participants spoke at length that one benefit of this kind of auction is that it forces people to compromise to get the best solution for the most people thus requiring a sort of trade-off between individual preference and commonly shared goals. Often in natural resource management issues, particularly those that impact a broad base of stakeholders, it is important but often difficult to reach a compromise that a diverse set of stakeholders can accept.

Discussions about the actual outcomes of some of the management options indicate that participants did not always understand what the benchmark was for a particular plan or what the future desired conditions of a management option would "look like" once implemented. This may have been a product of limited information, as highly detailed management plans were not available for these mock auctions. Some

Table 1 Each management option outlined in the table includes general management goals and the primary environmental benefits provided by the management plans

Riparian buffer	Thinned only	FSC full acreage	FSC half acreage
<p>This management plan emphasizes protecting stands adjacent riparian zones. It places all riparian buffer zones in habitat reserves to the equivalent of double the current buffer width that is currently mandated under law. The harvest system outside of these buffer zones is to clearcut the remaining stands. This management option focuses attention on improved water quality at the expense of upland wildlife habitat but is designed to improve aquatic habitat</p>	<p>This management plan emphasizes keeping the land covered with forest across the entire landscape. This approach takes advantage of the fact that when stands are thinned to reduce competition then remaining trees grow faster. The residual trees often fill the growing space after only a few years following a light thinning and the stand returns to a closed canopy condition. The management approach of repeatedly entering stands to harvest material through thinning will drive stands toward single canopy layered stands with large trees</p>	<p>The FSC program imposes many restrictions on landowners including developing management plans, adhering to fair labor practices, restrictions on plantations, and requirements of 3rd party verified audits. The harvest restrictions typically reduce income for the landowner. For details on management requirements look at www.fsc.org</p>	<p>This management plan places half (870 ha) of the case study forest under FSC certification and the other half is managed under the Sustainable Forestry Initiative's certification program</p>
Middle of the road	Maximum cut	Eatonville viewshed	30 % retention harvest
<p>This management plan only harvests 64 % of maximum timber revenue. This bundle sequesters and additional 76,773 tons of carbon and creates 283 hectares of mature forest habitat by 2050</p>	<p>This option represents the status quo and emphasizes the goal of profit maximization through timber harvest</p>	<p>This management scenario concentrates all harvest activities outside of the Eatonville viewshed (local town near to where some participants live)</p>	<p>This management scenario mandates that 30 % of the trees in a management unit are retained at the time of first harvest. A second harvest is permitted 25 years later, leading to an uneven aged forest</p>
<p>Limited information was given regarding silvicultural treatments while emphasis was put on expected environmental benefits provided under different management scenarios</p>			

participants were really concerned with the extent of clearcuts allowed under specific management plans asking questions like, “to the average person, would a thinned stand look like a clear cut?” or “in [this particular management plan], how big can a clearcut be?” Questions such as these indicate that participants might need additional information on management plans and their associated outcomes.

Viability of Auction Mechanism

Focus group participants found the concept of an ECOSEL-type auction intriguing. The auction process garnered appreciation for the goal of such markets and elicited general interest in the collective action potential of such markets. A participant in FG1 said that,

“I would write a check myself if you came to me and said for a \$100 bucks [you could get a management plan of your choice]... I mean, maybe if everyone got together and we all chipped in a \$100 bucks to reserve and we [don't] cut any [forest] in year one, maybe ...when the market improves we can come back and revisit [timber harvest] in the future. That is the kind of thing you are going to see some support [for among interested people].”

Participants were concerned that an ECOSEL-type market would have limited scope or public interest, thus limiting the pool of potential bidders. For example, most of the participants had spent time in the case study forest and had a strong desire for recreational amenities (e.g., hiking, running, and wildlife viewing) and approached many of the plans with the desire to protect the forest from an aesthetic point of view, which is unique since recreational access is not always allowed on private forestland, particularly in the U.S. There was a general concern that bidding on forest management plans in the context of broad-based environmental quality might be a bit too technical for people who do not have direct knowledge or experience with the forest in question. Those who might prefer to preserve a particular forest more generally for a broad set of aesthetic, recreational and ecosystem health reasons may not have enough silvicultural information to make a decision regarding different management plans and their associated outcomes.

Transparency and Openness of Auction Mechanism

While the auction format was generally appreciated for its ability to bring people together for common goals, focus group participants were simultaneously concerned about the possibility that an auction could create an opportunity for land to be effectively outsourced to people living far away from the sites in question. The auction format represented a conflict between local ownership and control with concerns about the potential for resources and outcomes to be effectively “bought” by better-financed outsiders, who may include powerful timber interests or well-meaning but “misguided” outsiders. The implicit conflict occurring when outsiders, who may not share or even recognize the values or sense of history among regional community members where these forests are located, have motivations that runs

counter to the broad preferences of the community (e.g., utilitarian outcomes weighing more heavily than environmental or recreational goals or vice versa). A sentiment expressed by one of the participants helps illustrate this,

“It is a little worrisome sometimes since we live here, we might have someone from [say] Oregon bidding and they might not [fully understand the consequences of a particular management decision]. I don’t want to say I have more [at] stake because I live here, but they could choose to make a clearcut outside of our house or something. It is a little worrisome.” (FG2 participant)

There were specific concerns regarding the potential role of corporate interests. Many of the participants agreed that local stakeholders might not have the dollars to bid on management plans, thus creating the potential for corporate interests and other wealthy outsiders to influence decisions in the forest of interest. Not all participants were equally concerned about outside powerful interests buying the forest but there was an apprehensiveness among many that big money was going to have the power to dictate what kinds of management plans won in the end. One participant said, “If I see Pack Forest going off to some large corporate person or entity I am not going to be happy.” With another participant chiming in that, “at that point Pack Forest ceases to be Pack Forest.”

Stakeholder Engagement

The discussion concerning trade-offs and alternative revenue generation seemed to originate, at least in part, from a desire for local engagement in the forest by stakeholders who utilize and appreciate the forest for both ecological and cultural services. In part, participants feared outside corporate control and generated a laundry list of alternative revenue generation options because they seemed to desire maintaining their relationship with the forest as a place where they could appreciate the woods. In particular, participants were interested in other recreation or educational options for Pack Forest that would provide revenue generation but that would not be reliant on an auction mechanism. One idea generated by a FG2 participant emphasized the idea that the forest could generate more opportunities for businesses to spend time in the woods as a form of retreat, “I think Microsoft has places [or] let’s say Amazon [where] they like to get away with their staff, [a] retreat type thing because they have money [to pay for this type of thing]. This [Pack Forest] is a great setting.” Additionally, during FG1, participants identified a lot of additional organizations, including the local Nisqually Tribe who should be engaged in the discussion concerning an auction.

Specific Stakeholder Preferences for Aspects of Forest Management Plans

FG1 participants decided on the Riparian Buffer management option (Table 2), which essentially doubled the amount of forested riparian areas in the case study forest and allowed multiple clearcuts on other portions of the land outside of the

Table 2 Participants chose from a suite of practices that emphasized different ecosystem services during their auction experience

Management plan option	Count FG1	Count FG2
Riparian buffer (winning in FG1)	17	NA
Thinned only	17	13
FSC half acreage	10	NA
Middle of the road (winning bid in FG2)	4	20
FSC full acreage	3	21
Maximum cut	NA	6
Eatonville viewshed	NA	0
30 % harvest	NA	0

A specific count is provided for each focus group (FG1 and FG2) in order to illustrate the number of times that participants chose that particular option. Counts are provided in order to see the popularity of different management plans. NA indicates differences in plans viewed by each focus group

riparian buffer. This management plan was designed to enhance water quality (cooler and cleaner water) for improved salmon habitat; however there was little discussion about salmon habitat or improved water quality specifically. Many participants had preferences for the thinning only management option, as a means for achieving mature forest structure as expressed by this focus group participant, “I like the ‘Thinned Only’ stands...best approach for a natural, mature forest structure.” In FG1 the participants spent extra time discussing the thinned only option but many of the participants were questioning what this would look like in reality with some participants advocating for a simple description of management plans and outcomes, including an endorsement of specific plans by a trusted organization (e.g., Ducks Unlimited).

FG2 eventually settled on a middle of the road option that provided some additional old growth acreage and carbon storage compared to current management of the case study forest (Table 1). FG2 participants were very interested in Forest Stewardship Council (FSC) certified management plans as well and at one point this option was winning (Table 2). It is not entirely clear what participants valued so highly about FSC certification but one participant summed up the benefits as a form of compromise between conservation and timber harvest by saying FSC “starts with the soil, you are trying to keep the soil on the hillside, your impact is smaller but you are still getting revenue and timber off the land.” Additionally, FSC certification provides, in a sense, the same thing as an expert endorsement so that participants can assign some responsibility to an external third party to verify the forest management plans.

Despite the fact that participants were not forestry professionals, many seemed to have an understanding of the relationship between forest structure, manipulation of structure (via management) and multiple use outcomes. For example, perspectives on aesthetics typically had to do with wanting more mature forest structure, with fewer clearcuts. However, some participants felt that some clearcutting was acceptable, particularly if it brought additional hunting or other recreational opportunities, which might also have the added benefit of bringing revenue to the rural economy.

I am not opposed to clearcutting if it is done the right way, because clearcutting creates habitat for big game animals and a lot of people want to come up here and see big game animals, deer, elk, and all those kinds of things. So when you have a forested canopy, that is not an environment that is good for big game and [game] brings in a lot of money to the local economy. (FG2 Participant)

Participants were also interested in forest accessibility and recreational opportunities, best illustrated by a quote from a participant who said, “I mean there are a lot of people in Seattle and maybe they would like to come down and spend a day in the woods and not have to worry about walking through some area that has been harvested” (FG2). The quote illustrates the value of recreation and time spent in the woods but also the trade-off associated with limited harvest in order to enhance certain values preferred by bidders, in particular a preference for forest aesthetics, which typically meant management that would not lead to clearcutting.

Discussion and Policy Implications

Mature forest habitat was the most emphasized forest ecosystem service brought up through discussions about forest structure and function and is consistent with valuation studies that explore willingness-to-pay where old growth is consistently valued very high, particularly when compared to other ecosystem services (e.g., Shapansky et al. 2003; Garber-Yonts et al. 2004; Boxall et al. 2009). FG1 chose a final management plan that would improve water quality and salmon habitat, consistent with other payment for ecosystem services schemes that focus on water quality (e.g., Davis, Hibbitts and Midghall 2010; Stanton et al. 2010; Cochran and Logue 2011; Shabman et al. 2011).

Participants were receptive to the auction mechanism while noting major concerns about transparency. Participants were concerned that non-corporate, local stakeholders might struggle to compete in an auction-based decision-making process and articulated fears about wealthy outsiders and corporations making decisions that would affect them locally. In a private market auction for forest ecosystem services it will be important to involve local stakeholders in the process as their buy-in may have important effects on the success of the overall project even if it does not affect the overall financial success of the auction. From a community-oriented perspective, while local stakeholders may *not* have the funds to bid large amounts on management plans, their support would still be essential for credibility and future marketing (Sheppard 2005).

Based on the feedback provided by the focus group interactions, the ECOSEL auction process was able to engage potential bidders in a mock auction for ecosystem services. Thus the ECOSEL mechanism appears to have the capacity to create a virtual market and provide a platform for consumer interaction and expression of willingness to pay for complex outcomes. Focus group participants thought that bidding decisions involved compromises in their preferences, which came across in discussions of the complexity of the management plans and their

associated outcomes. At times it was unclear if individual bids were tied specifically to a desired set of preferred outcomes that would lead to some semblance of optimization or if participants were more focused on compromising or focusing on one dimension of ecosystem services (e.g., water quality improvement for salmon). While the implications of this issue are unknown at this time, such questions can suggest that utility maximization (or constrained utility maximization) may not be the underlying motivation for bidding and other land use values are at play (Chee 2004).

More research, particularly in-depth qualitative research, should be conducted to explore the nuance associated with public willingness to engage in markets for forest ecosystem services, particularly those provided by private forest landowners, while also seeking to understand the most relevant services desired by potential buyers, including households, government and industry. There is no doubt that willingness-to-pay studies have value as they help assess willingness on behalf of a specific population to bear the burden of the costs typically associated with commonly held goods with non-market benefits (Adamowicz et al. 1998; Xu et al. 2003; Montgomery and Helvoigt 2006); however, there are challenges with eliciting realistic values for public goods using willingness to pay studies due to issues with incentive compatibility (whether an individual has a private incentive to state their preferences truthfully) and consequentiality (or whether an individual believes that their choice will actually have an influence on the stated outcome) (Roesch-McNally and Rabotyagov 2016) as well as broader critiques about trying to place a monetary value on ecosystem services. Qualitative data will help those interested in emerging markets for ecosystem services tailor their design of a bidding platform and explore the potential attributes for 'sale' while getting important feedback from key stakeholders who may later seek to engage in these markets.

One of the key benefits of an auction platform such as ECOSEL is that it forces a compromise where respondents must weigh trade-offs associated with management and choose the best option that can win, forcing people to engage in competitive bidding and collaboration across individuals and agencies. This approach may help to resolve conflict over private land management in situations where stakeholders are weighing the direct costs and benefits associated with forest management while providing stakeholders more meaningful engagement in local forest resource management (Sheppard 2005; Tóth et al. 2010). A voluntary payment mechanism such as the ECOSEL auction mechanism may prove more politically and socially acceptable given the aversion to other regulatory and tax-based solutions for maintaining the private forestland base while providing additional ecosystem services that will enhance landscape functionality and habitat. These payments could theoretically be made by one large entity or a collection of many small bidders, in this way, the bidding exercise may allow a diversity of entities to bid on preferred land use outcomes leading to a more democratically controlled process. This may also be true for the sellers of management outcomes as these could be sold by a single large forest landowner or many small forest landowners who might sell ecosystem services, in aggregate, as a way to incentivize specific land use practices in their region. Further research should be conducted to investigate whether sufficient dollar amounts could be generated to offset the costs to management for

additional provision of forest ecosystems services across different forest types and in different geographic locations.

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