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Analysis

Rancher Preferences for a Payment for Ecosystem Services Program in Southwestern Wyoming☆

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ABSTRACT

The Upper Green River Basin in southwestern Wyoming provides critical habitat for many species with ecological and recreational significance, including mule deer and greater sage grouse. A recent energy boom has increased economic opportunities in the region but has also placed development pressures on biodiversity and ecosystem services. Ranchers in the basin place high importance on good stewardship of land and water resources and are amenable to providing ecosystem services on their land in exchange for additional revenue. We conduct a rancher survey in the region to elicit preferences on program design for a voluntary "Payment for Ecosystem Services" program focused on maintaining or enhancing high-quality wildlife habitat and hydrologic services. Choice experiment results indicate management practices that reduce ranch revenues require higher levels of compensation than those that do not. Ranchers report that target ecosystem service is more important to them than associated payment levels, though reservation prices tend to be high relative to land values. Overall, ranchers do not express a preference for shorter contract length but those planning to sell their ranch operations do. Fewer than 25% of ranchers are satisfied with current mitigation programs, suggesting room for improvement. Findings have been used to inform development of a market-based PES program in the region.

1. Introduction

Public land management agencies often require energy companies to offset the residual impacts of their development activities with proximate conservation (McKenney and Kiesecker, 2009; Mead, 2015). Historically this off-site mitigation has taken place predominately on public lands. In the U.S. Intermountain West, where the landscape is often dominated by extensive ranching operations located on a patchwork of public and private lands, private land conservation can lead to better outcomes at the landscape scale (Sage Grouse Initiative, 2014). Payment for ecosystem services (PES) programs is one mechanism available for creating incentives for conservation on private lands. PES programs can match energy companies in need of mitigation with ranchers willing to implement conservation on their private lands in exchange for compensation. They encourage good stewardship of land and water resources on private lands and provide an opportunity for farmers and ranchers in rural communities to diversify their income. Such programs also have the potential to assist land management agencies and conservation NGOs in achieving their landscape-scale conservation goals.

We have conducted a feasibility analysis of the potential for establishing a PES program in the Upper Green River Basin (UGRB) of southwestern Wyoming (Duke et al., 2011; Hansen et al., 2015). Focus groups convened for the feasibility analysis reveal that area ranchers take pride in their good stewardship of land and water resources and are amenable to supplying conservation term leases in exchange for additional revenue. Examples of practices ranchers might undertake include altered grazing management and modified irrigation practices and timing. Buyers would likely be energy companies seeking off-site mitigation for impacts from their development activities that cannot be avoided or reclaimed on-site. Buyers could also include conservation foundations and others looking for ways to support the high-quality

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recreational and environmental amenities that characterize the basin. The presence of buyers motivated by regulatory and pre-compliance pressures and willing sellers make the basin a potentially viable location for an ecosystem services program.

However, the ultimate success of PES depends on establishing program features and details satisfactory to all parties (Pagiola et al., 2005; Engel et al., 2008; Duke et al., 2014). Effective program design requires careful consideration of landowner preferences. A number of studies have examined the socio-demographic and farm-level characteristics that affect farmer participation in PES programs (Wilson and Hart, 2000; Vanslembrouck et al., 2002; Ruto and Garrod, 2009; Espinosa-Goded et al., 2010). Landowner attitudes regarding conservation and the environment are also key factors determining participation (Wilson and Hart, 2000; Kosoy et al., 2007; Cranford and Mourato, 2011). Contract features (for example contract duration, paperwork burden, and flexibility in contract terms) also affect participation (Ruto and Garrod, 2009; Christensen et al., 2011; Espinosa-Goded et al., 2010), as do local governance features (Kramer and Jenkins, 2009; Cheatum et al., 2011; Torres et al., 2013).

We continue in this vein by presenting results of a rancher survey in Sublette County, Wyoming, designed to explore what factors influence rancher willingness to participate in PES within the local socio-ecological context. We conduct choice experiments based on a hypothetical PES program to elicit rancher preferences for management practices, contract length, and payment level. Survey findings have been incorporated into design of a market-based conservation program in the region. Recent federal policy directives recognize voluntary, incentive-based conservation programs as a means of acquiring off-site mitigation (BLM, 2016; Federal Register, 2016). Survey findings are thus also relevant for other regions in the West with a patchwork of public and private lands where development activities affect the natural resource base.

We provide a forward-looking, ex ante evaluation of a PES program where we test which program and contract features are most likely to be effective, taking into consideration producer incentives. Since program participation is voluntary, any feasibility analysis requires responsible estimation of potential demand. The methodological basis for this choice experiment is the random utility model. Use of this behavioral decision-making framework ensures that the results (especially regarding welfare estimates and relative rancher preferences for different management practices and target outcomes) are consistent with economic theory.

Many of the existing choice experiment studies that focus on landowner participation do not discuss specific management practices (Ruto and Garrod, 2009; Broch and Vedel, 2012; Kaczan et al., 2013; Torres et al., 2013; Cranford and Mourato, 2014; Costedoat et al., 2016). Those that do discuss specific management practices generally focus on a single target outcome, in the interest of understanding lack of participation in an existing program (Christensen et al., 2011) or assisting policymakers in developing programs to meet a single target outcome (Espinosa-Goded et al., 2010; Beharry-Borg et al., 2013; Greiner et al., 2014).

By contrast, several target outcomes are potentially feasible for a PES program in Sublette County, and a number of management practices could conceivably benefit each target outcome. We consequently present ranchers with a number of management practice and target outcome pairings. This allows us to parse the relative preference of landowners for three target outcomes that are of current and significant concern to regulators and the conservation community in Wyoming: sage-grouse habitat, mule deer habitat, and hydrologic services.[1] If there is political will and demand for a PES program in Wyoming, which of these three target outcomes are landowners most likely to embrace? This is especially important given previous findings in the literature (Wilson and Hart, 2000) and corroborated in the present study that landowners often value the conservation target outcome more highly than they do the payment level.

2. Local Context

The UGRB has experienced an energy boom in recent decades from natural gas extraction and related residential growth. Energy development has increased economic opportunities but has altered large tracts of sagebrush (*Artemesia* spp.) habitat and placed development pressures on biodiversity and ecosystem services (Walker et al., 2007).

Under the mitigation hierarchy established by the Council on Environmental Quality, environmental harm should be alleviated to the extent possible by first avoiding ecologically important areas, minimizing impacts, and reclaiming on-site (McKenney and Kiesecker, 2009). Only in situations where avoidance, minimization, and on-site mitigation are not feasible should off-site (i.e., compensatory) mitigation be considered. This mitigation hierarchy underlies the mitigation policies of the U.S. Fish and Wildlife Service (USFWS) and the U.S. Bureau of Land Management (BLM), among others.

Within this regulatory framework, PES can provide a way to match energy companies in need of compensatory mitigation with ranchers and other landowners who are able to enhance or maintain existing high-quality habitat. Three ecosystem services were repeatedly highlighted as important in the rancher focus groups conducted as part of our feasibility analysis: greater sage grouse habitat, mule deer habitat, and hydrologic services.

2.1. Greater Sage Grouse Habitat

The greater sage grouse (*Centrocercus urophasianus*) is a large, ground-dwelling bird found in Wyoming and ten other western states. The sage grouse occupies approximately 56% of its historical range; evidence suggests that habitat loss and fragmentation across much of the species' range has contributed to population declines of 17–47% from the long-term average (Connelly and Braun, 1997). Approximately 37% of the remaining range-wide population is in Wyoming (Fedy et al., 2014), and Sublette County (Fig. 1) provides some of the best remaining habitat within the state. Recent research increasingly confirms that oil and gas development has a negative impact on sage grouse and that current regulations governing large-scale energy development do not provide sufficient protections for sage grouse populations (Walker et al., 2007; Holloran et al., 2010). Two recent oil/gas development projects in Sublette County, Jonah Field and Pinedale Anticline (Fig. 1), dedicated significant mitigation funding to maintaining/enhancing sage-grouse habitat; the relationship between oil/gas development and sage-grouse habitat quality was forefront in the minds of the ranchers, energy company representatives, and regulators that participated in our focus groups.

In September 2015, USFWS determined that the greater sage grouse does not warrant protection under the Endangered Species Act (USFWS, 2015). In its decision, USFWS cited the importance of conservation partnerships in recent years between state governments, ranchers, energy companies, and conservationists to reduce threats to sage grouse habitat. Of course, future listing remains a possibility if these efforts do not continue to progress with sufficient success and positive impacts at scale.

[1] Broch and Vedel (2012) is the only study of which we are aware to investigate farmer preferences for PES contract purpose. They seek to understand, ex-post, reasons for lower-than-anticipated participation in an existing Danish afforestation program by testing farmer preferences for the purpose of agri-environmental contracts: biodiversity, groundwater quality, or recreation. Our paper is by contrast forward-looking, with an eye towards program development.

(footnote continued)